



ISSN: 2223-9553, ISSN: 2223-9944 Print

ACADEMIC RESEARCH INTERNATIONAL

Vol. 1 Number 2, September 2011

SAVAP International

www.savap.org.pk

'Research for Peace and Development'

SAVAP International

Academic Research International

Vol. 1, No. 2

September 2011

SAVAP International

Bright Home, Lodhran City - 59320, PAKISTAN.

URL: [http:// www.journals.savap.org.pk](http://www.journals.savap.org.pk)

ACADEMIC RESEARCH INTERNATIONAL

Vol. 1, No. 2, September 2011

ISSN-L: 2223-9553
ISSN: 2223-9944 Print
ISSN: 2223: 9952 CD

Academic Research International is open access journal. Any part of this journal may be reprinted or reproduced for academic and research purpose only.

EDITORIAL TEAM

Editor:

Muhammad Ashraf Malik

Chairman, SAVAP International

Associate Editor:

Prof. Hafiz Habib Ahmed

Assistant Editors:

Mian Muhammad Furqan

Rana Muhammad Dilshad

Muhammad Rafiq Khwaja

Hameedullah

Khawaja Shahid Mehmood

Salman Ali Khan

Malik Azhar Hussain

Muhammad Akbar

Ms. Rafia Sultana

Indexed by:

Ulrichs' Web, USA, Index Copernicus
International, SCIRUS (Elsevier),
EBSCOHost Research Database
/Electronic Journal Services, Research
Gate Germany, Open J-Gate, Directory of
Open Access Journals (DOAJ), Die
Elektronische Zeitschriftenbibliothek
(ZDB), Germany, ourGlocal Academic
Resources Japan, Google Scholar

*Note: Views expressed in the articles of
this journal are of authors and do not
reflect the views of the "Academic
Research International"*

Subscription :

30 USD Per Copy

EDITORIAL BOARD

Prof. Dr. T. F. "Tim" McLaughlin,
Gonzaga University, WA, USA.

Prof. Dr. Hong Lin,
University of Houston-Downtown,
Houston, Texas, USA.

Prof. Dr. Noraini Binti Idris,
University of Malaya, MALAYSIA.

Prof. Dr. Ghulam Shabir,
The Islamia University of Bahawalpur,
PAKISTAN.

Prof. Dr. Azman Bin Che Mat,
Universiti Teknologi Mara,
MALAYSIA.

Prof. Dr. Ata ATUN,
Near East University,
NORTH CYPRUS.

Prof. Dr. Kyung-Sung Kim,
Seoul National University of
Education, SOUTH KOREA.

Prof. Dr. Reena George,
Karmela Rani Training College,
Kerala, INDIA.

Dr. Abdullatif I. AL-Hussein,
AL-Imam Mohamed Ibn Saud Islamic
University, SAUDI ARABIA.

Dr. Huda Aldulajjan,
King Faisal University, SAUDI
ARABIA.

Dr. T. Tammy Orunaboka,
University of Port Harcourt, NIGERIA.

Dr. Sorinel CĂPUȘNEANU,
Artifex University Bucharest,
ROMANIA.

Md. Haider Ali Biswas,
Khulna University, BANGLADESH.

Dr. Arab Naz,
University of Malakand, PAKISTAN.

Prof. Dr. Muhammad Aslam Adeeb,
The Islamia University of Bhawalpur,
PAKISTAN.

Professor Dr. Ugur DEMIRAY,
Anadolu University, TURKEY.

Prof. Dr. Chris Atkin,
Liverpool Hope University, UK.

Prof. Dr. Ken Kawan Soetato,
Waseda University, Tokyo, JAPAN.

Prof. Dr. Sinan Olkun,
Ankara University, TURKEY.

Prof. Dr. Tahir Abbas,
B. Z. University, Multan, PAKISTAN.

Prof. Dr. Rosnani Hashim,
International Islamic University Kuala
Lumpur, MALAYSIA.

Prof. Dr. Alireza Jalilifar,
Shahid Chamran University of Ahvaz,
IRAN.

Prof. Dr. Osamu Aoki,
Hokkaido University, Sapporo,
JAPAN.

Prof. Dr. Badar Alam Iqbal
Aligarh Muslim University, INDIA

Dr. Pang I. Wah,
The Hong Kong Institute of
Education, HONG KONG.

Dr. Naoko Suzuki,
University of Tokushima, JAPAN.

Dr. Fariba Tadayon,
Islamic Azad University, IRAN.

Dr. Lutfi Oksuz,
Director, Turkish Standards Institution,
Konya, TURKEY.

Dr. Muhammad Saeed,
University of the Punjab, PAKISTAN.

Inquiries, comments, and suggestions should be addressed to the Editor Academic Research International

Published by:

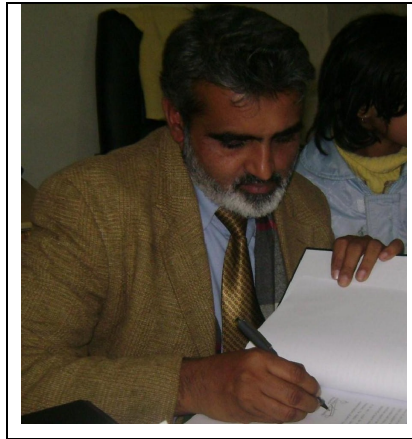
SAVAP International

Bright Home, Eidgah Colony, Lodhran City - 59320, PAKISTAN.

Email: editor.arint@journals.savap.org.pk, mail@savap.org.pk

Telephone & Fax: +92 608 361176, Cell: +92 300 6826926

RESEARCH FOR PEACE AND DEVELOPMENT



There are two predominant ways through which research promotes our awareness of the value and necessity of knowledge. They are: the never-ending expansion of the frontiers of the world we experience, and the creation of foundations for educational needs of the society. The same two objectives lay at the roots of the 'SAVAP International' which, being a civil society organization is determined to ensure that all activities it pursues meet the highest standards.

Recognizing the great significant power of a competent and efficient publishing policy, the SAVAP International has embarked on the launching of a journal addressed to the whole academia and researchers' community, in a belief that it will be of particular interest to young researchers at the beginning of their path as well as all those who are interested in humanities, social science, management sciences, natural and applied sciences, their achievements and prospects. Our main aim is to provide information on discoveries and phenomena that determine the rhythm of life in Asia and other regions of the globe.

The times we are now living in abound in important events and transformations that will be surely influencing the directions of global future development. Here again, the responsibility of academicians and researchers is to shape and promote attitudes for which the truth and human well-being are a primary value.

I hope that 'Academic Research International' will be well received by the research and academic community. I also believe that it will make an essential contribution to the popularization of research in world for peaceful globe.

(Muhammad Ashraf Malik)
Founder Chairman
SAVAP International
malik@savap.org.pk

LIST OF CONTENTS

Sr. No.	Detail of Contents	Pages
Part I: Natural and Applied Sciences		
1	REINFORCEMENT LEARNING BASED FIVE LEGS ROBOT FOR RESCUE OPERATIONS Prihastono, Dr. Son Kuswadi, Prof. Dr. Achmad Jazidie Bhayangkara Surabaya University, Electronic Engineering Polytechnic Institute of Surabaya, & Sepuluh Nopember Institute of Technology, INDONESIA.	6-14
2	FLORA OF TIGEM ALPARSLAN FARM AND SURROUNDINGS (MUŞ) Cihat ÖLÇÜÇÜ, Dr. Fazlı ÖZTÜRK Department of Biology, Faculty of Sciences, Yüzüncü Yıl University, Van TURKEY.	15-44
3	HOW CHAN CAN BE RELEVANT IN MODERN SOCIETY: A SCIENTIFIC VIEW Prof. Dr. Hong Lin Department of Computer and Mathematical Sciences, University of Houston-Downtown, Houston, Texas, USA	45-60
4	OPTIMIZATION OF ELECTRICAL ENERGY AT BATUTEGI DAM, LAMPUNG PROVINCE, INDONESIA Anggara WWS, Lily Montarchi Department of Water Resources, Faculty of Engineering, Brawijaya University, Malang, INDONESIA.	61-69
5	H ₂ S EMISSIONS CONTROL IN INDUSTRIAL EXHAUSTS USING TiO ₂ NANOPARTICLES Naeem Shahzad, Prof. Dr. S. Tajammul Hussain, Muhammad Anwar Baig Institute of Environmental Sciences and Engineering (IESE), NUST, & National Centre for Physics, Islamabad PAKISTAN.	70-73
6	ISOLATION AND CHARACTERIZATION OF INDIGENOUS LUMINESCENT MARINE BACTERIA FROM KARACHI COAST Aisha Nawaz and Nuzhat Ahmed Center for Molecular Genetics, University of Karachi, PAKISTAN.	74-83
7	COMPARISON OF LOCAL DISCRIMINANT ANALYSIS AND SINGULAR VALUE DECOMPOSITION FOR CLASSIFICATION OF SURFACE EMG SIGNAL Navleen Singh Rekhi, Ajat Shatru Arora, Hari Singh Dr. B.R. Ambedkar NIT, Jalandhar, SLIET, Longowal, Punjab, & DAVIET, Jalandhar, Punjab, INDIA.	84-88
8	EFFECTS OF STRONG COLUMN WEAK BEAM RATIO AS CONSTRAINT FOR STEEL FRAME OPTIMIZATION Mohammad Khozi, Dr. Tench. Pujo Aji, Prof. Dr. Priyo Suprobo Bhayangkara Surabaya University, & Sepuluh Nopember Institute of Technology, INDONESIA.	89-95
9	REDUCE SCANNING TIME INCREMENTAL ALGORITHM (RSTIA) OF ASSOCIATION RULES Yehia.M EL-Rahman, Mohammad.M AL-Widyan Computer Science, Philadelphia University, Amman, & Department of Computer Science, Al al-Bayt University, Mafrq, JORDAN.	96-102
10	OPTIMIZATION DIAMETER OF PIPE AT FRESH WATER NETWORK SYSTEM Chairil Saleh, Sulianto Department of Civil Engineering, Faculty of Engineering, University of Muhammadiyah, Malang, INDONESIA.	103-109

- 11 ROLE OF TOILET TYPE IN TRANSMISSION OF INFECTIONS 110-113
Dr. Mohammadjavad Mahdavejad, Dr. Mohammadreza Bemanian, Saeed Farmahin Farahani, Dr. Ali Tajik
 College of Art & Architecture, Tarbiat Modares University, **IRAN**.
- 12 LEARNING PARADIGMS FOR GAME ARTIFICIAL INTELLIGENCE 114-123
Chukwuchekwa Ulumma Joy, Chukwuchekwa Nkwachukwu
 Department of Mathematics, & Department of Electrical/Electronic Engineering,
 Federal University of Technology, Owerri, **NIGERIA**.
- 13 SCREENING OF ENVIRONMENTAL BACTERIA HAVING POTENTIALLY 124-133
 ACTIVE CHARACTERS FOR INCREASING SOIL BIOLOGICAL ACTIVITIES
Nadia Jamil, Nazia Jamil, Nuzhat Ahmed
 Centre for Molecular Genetics, University of Karachi, **PAKISTAN**.

Part-II: Social Sciences and Humanities

- 14 THE EFFECTS OF READING RACETRACKS AND FLASHCARDS FOR TEACHING 134-148
 OF SIGHT WORDS
Holly R. Romjue, Dr. T. F. McLaughlin, K. Mark Derby,
 Department of Special Education, Gonzaga University, WA, **USA**.
- 15 ECONOMIC GROWTH AND THE ENVIRONMENT 148-189
Prof. Dr. Dimitrios Nikolaou Koumparoulis,
 Department of Economics, Monarch Business School, University for Graduate Studies in
 Management (UGSM), **SWITZERLAND**.
- 16 WRITING APPREHENSION IN ENGLISH AMONG JORDANIAN POSTGRADUATE 190-198
 STUDENTS AT UNIVERSITI UTARA MALAYSIA
Ibrahim Fathi Huwari, Dr. Noor Hashima Abd Aziz
 Universiti Utara MALAYSIA.
- 17 THE PSYCHOSOCIAL IMPACT ON THE LINGUISTIC AND COMMUNICATIVE 199-205
 COMPETENCE OF TEACHERS AT COLLEGE LEVEL IN DISTRICT MARDAN,
 PAKISTAN
Mir Alam Said,
 Department of Education, Abdul Wali Khan, University, Mardan, **PAKISTAN**.
- 18 REPOSITIONING EARLY CHILDHOOD EDUCATION IN NIGERIA: THE 206-214
 CHILDREN'S THEATRE APPROACH
Osakue Stevenson Omoera,
 Department of Theatre and Media Arts, Faculty of Arts, Ambrose Alli University,
 Ekpoma, **NIGERIA**.
- 19 RE-EXAMINATION OF CHILD LABOUR FROM FEW UNNOTICED 215-219
 PERSPECTIVES
Dr. Steven Wind, Dr. Devajana C Nanjunda,
 Arizona, USA, & National School for Advanced Study, Kushalnager Kodagu, **INDIA**.
- 20 DEVELOP HUMAN CAPITAL THROUGH MUSIC EDUCATION IN MALAYSIA. 220-227
Mubin Md Nor
 Lecturer in Music Education, Ipoh Teacher Training Institute Campus, & Sultan Idris
 Education University, **MALAYSIA**.
- 21 SPECIAL EDUCATION IN PAKISTAN: IN THE PERSPECTIVES OF 228-231
 EDUCATIONAL POLICIES AND PLANS
Saeed Ahmad, Prof. Dr. Muhammad Yousaf
 Department of Education, B. Z. University, Multan. **PAKISTAN**.
- 22 PORTRAYAL OF SCIENCE KNOWLEDGE IN THE 'CHILDREN'S PAGE' OF TWO 232-127
 URDU NATIONAL DAILIES OF PAKISTAN
Dr. Masood Nadeem, Abida Parveen, Aqeel Ahmed Khan
 Department of Applied Psychology, The Islamia University of Bahawalpur, **PAKISTAN**.

- 23 GENDER STRATIFICATION: A STUDY OF DISCRIMINATION AND OPPRESSION 238-245
IN SELECTED COMMUNITIES IN NIGERIA
Dr. Nsirim-Worlu Heoma Gladys
Sociology Department, University of Port Harcourt, **NIGERIA.**
- 24 INFLUENCE OF MANAGERIAL SKILLS OF MIDDLE-LEVEL MANAGERS ON 246-253
ORGANIZATIONAL EFFECTIVENESS, IN NIGERIAN COLLEGES OF
EDUCATION.
Dr. G.O. Olorisade
Department Of Business And Vocational Education, Kwara State University, **MALETE.**
- 25 A STUDY OF TEACHING APTITUDE AND RESPONSIBILITY FEELING OF 254-259
SECONDARY SCHOOL TEACHERS IN RELATION TO THEIR SEX AND LOCALE
Ravi Kant
PG Department of Education, Teerthanker Mahaveer Institute of Management and
Technology, Moradabad, UP, **INDIA.**
- 26 STAKEHOLDERS' PERCEPTION ABOUT RISK MANAGEMENT IN THE PROCESS 260-269
OF CHANGE FOR ORGANIZATIONAL SUCCESS
Jalil-Ur-Rehman Baloch, Dr. Asif Jamil, Muhammad Younis
Institute of Education & Research, Gomal University, DI Khan, & GDC No.2 DI Khan,
PAKISTAN.
- 27 PUNJABI COLOR CATEGORIES: AN ANALYSIS OF WORLDVIEW OF RURAL 270-275
COMMUNITY IN GUJRAT, PAKISTAN
Sarfraz Khan, Prof. Dr. Hafeez-ur-Rehman Chaudhry
Department of Sociology, University of Gujrat, & Department of Anthropology, Quaid-i-
Azam University, Islamabad, **PAKISTAN.**
- 28 PRESERVICE SECONDARY SCHOOL MATHEMATICS TEACHERS' SUBJECT 276-285
MATTER KNOWLEDGE OF CALCULATING PERIMETER AND AREA
Dr. Wun Thiam Yew, Dr. Sharifah Norul Akmar Syed, Dr. Lim Hooi Lian
School of Educational Studies, Universiti Sains Malaysia, Faculty of Education,
University of Malaya, **MALAYSIA.**
- 29 UPGRADING THE INTEREST OF STUDENTS' LEARNING ON INTRODUCING 286-291
NUMBER CONCEPT
Soelistianah Harjanto
Kindergarten Educational Department, Open University & Kindergarten School of Taman
Harapan, Malang, **INDONESIA.**
- 30 OCCUPATIONAL RISK FACTORS ASSOCIATED WITH REPRODUCTIVE 292-300
HEALTH OF WORKING WOMEN: A CASE STUDY OF UNIVERSITY OF GUJRAT
Muhammad Shoaib, Sarfraz Khan, Amara Ashraf
Department of Sociology, & Department Population Sciences University of Gujrat,
Gujrat, **PAKISTAN.**
- 31 PROTOTYPE FRAMEWORK: PROTOTYPES, PROTOTYPING AND PILOTING IN 301-307
TERMS OF QUALITY INSURANCE
Muhammad Azeem, Dr Muhammad Bashir Gondal
Punjab Education Assessment System (PEAS) Lahore, & Punjab Examination
Commission (PEC), Lahore,
PAKISTAN.
- 32 PROBLEMS OF PROSPECTIVE TEACHERS DURING TEACHING PRACTICE 308-316
Muhammad Azeem
Assessment & Research Section, Punjab Education Assessment System (PEAS), Lahore,
PAKISTAN.
- 33 SOME INITIATIVES ON ICT ENABLED TEACHER EDUCATION IN IRAN 317-321
Dr. Nayereh Shahmohammadi
Islamic Azad University, South Tehran Karaj Branch, **IRAN.**

- 34 RELATIONSHIP BETWEEN AGRICULTURE AND GDP GROWTH RATES IN PAKISTAN: AN ECONOMETRIC ANALYSIS (1961-2007) 322-326
Dr Anwar Hussain, Dr Abdul Qayyum Khan
PIDE, Islamabad, & COMSATS, Institute of Information Technology, Wah Campus, PAKISTAN.
- 35 REGIONAL DIFFERENTIALS IN STUDENTS' PREFERENCES REGARDING THEORY OF MULTIPLE INTELLIGENCES AT ELEMENTARY LEVEL 327-331
Maqsood Ahmed, Dr Ishtiaq Hussain, Dr R. A. Farooq, Sarfraz Ahmed
Institute of Education & Research, Kohat University of Science & Technology, Kohat, and Faculty of Social Sciences, Northern University, Nowshehra, PAKISTAN.
- 36 WOMEN'S EMPOWERMENT THROUGH MICROCREDIT: A CASE STUDY OF DISTRICT GUJRAT, PAKISTAN 332-343
Authors: **Sarfraz Khan, Mirza Rizwan Sajid, Prof. Dr. Hafeez-ur-Rehman**
Department of Sociology, & Department of Statistics, University of Gujrat, Department of Anthropology, and Quaid-i-Azam University, Islamabad, PAKISTAN.
- 37 DEREGULATION OF SECONDARY EDUCATION IN PORT HARCOURT: ISSUES AND CHALLENGES 344-353
Archibong, Florence Imaobong
Department of Educational Management, University of Port Harcourt, Rivers state-NIGERIA
- 38 E-LEARNING ADOPTION AMONG ADULT WORKERS IN JORDAN 354-374
Ahmad Issa Al-Zoubi, Thi Lip Sam
Technology Management Department, & College of Business, University Utara Malaysia, MALAYSIA.
- 39 JOB SATISFACTION AMONG TEACHERS OF TECHNICAL TRAINING CENTERS (T.T.Cs.) IN BANGLADESH 375-382
Md. Aktaruzzaman, Prof. Dr. Che Kum Clement, Md. Faisal Hasan
Department of ITS, Islamic University of Technology, Dhaka, BANGLADESH.

Reviews

- 40 STAGES, ALCOHOLISM AND GENETIC BASIS OF BREAST CANCER: A MINI REVIEW 383-385
Khalid Hussain Janbaz, M. Imran Qadir, Zeeshan Siddiq
Department of Pharmacy, Bahauddin Zakariya University, Multan, & College of Pharmacy, G.C. University, Faisalabad, PAKISTAN.
- 41 BOOK REVIEW: POLITICAL THOUGHT IN MEDIEVAL ISLAM: AN INTRODUCTORY OUTLINE ENGLAND, BY: ERWIN I.J. ROSENTHAL UNIVERSITY PRESS; NEW YORK: CAMBRIDGE UNIVERSITY PRESS; 1958 386-388
Adil Khan
Department of Political Science, Hazara University, Mansehra, PAKISTAN.

Guideline for Authors

i-v

Academic Research International

ISSN-L: 2223-9553, ISSN: 2223-9944 Print, ISSN: 2223: 9952 CD

Vol. 1, No. 2

September 2011

Part I

SAVAP International

Bright Home, Lodhran City - 59320, PAKISTAN.

URL: [http:// www.journals.savap.org.pk](http://www.journals.savap.org.pk)

REINFORCEMENT LEARNING BASED OF FIVE LEGS ROBOT FOR RESCUE OPERATIONS

Prihastono

Bhayangkara Surabaya University
and PhD Student, Sepuluh
Nopember Institute of Technology
INDONESIA
prihastono@ubhara.ac.id

Dr. Son Kuswadi

Electronic Engineering
Polytechnic Institute of
Surabaya
INDONESIA
sonk@eepis-its.edu

Prof. Dr. Achmad Jazidie

Sepuluh Nopember Institute of
Technology
INDONESIA
jazidie@ee.its.ac.id

ABSTRACT

This research developed small scale prototype five legs robot which can be used for searching victims in tsunami disaster. The robot used dc servomotor as the actuator, ultrasonic range finder, magnetic compass, and limit switch as the sensor. Remote control is used to operate the robot, and wireless camera for the visualization. To implement intelligent control system in robot which not depend on the model, both of dynamic system model and dynamic environment model, this research use "behavior based" algorithm. Learning robot ability in navigation is developed using "reinforcement learning" algorithm. Learning processes are applied by interaction between system and environment with "reward" and "punishment" rule. In this case, the environment is everything around the robot and human is one of the environment. It will be very interesting if human and robot can interact each other. Everything that human want will be understood and then will be executed by robot Three street conditions are tested for robot's performance and the result will be discussed.

Key word: five legs robot, reinforcement learning, reward and punishment.

INTRODUCTION

Contribution of robotics technology to today's sophisticated tasks is an inevitable progress, leading to a gradual minimization of human share, mostly, due to saturation in improvements of human abilities or to complementation of human activities. Education and training are insufficient for dealing with the complex and exhaustive tasks (Zhiying, 2007). Thus, from the robotics point of view, the trend is to provide an intelligent versatile tool to be a complete substitution of human in risky operations and complement human operations when auxiliary intelligent dynamics are required for extra dexterity. As a part of this progress, Search and Rescue (SAR) is the one of the most crucial fields that needs robotics contribution.

Search and rescue (SAR) robotics can be defined as the utilization of robotics technology for human assistance in any phase of SAR operations (Inagaki, 1997). Robotic SAR devices have to work in extremely unstructured and technically challenging areas shaped by natural forces. One of the major requirements of rescue robot design is the flexibility of the design for different rescue usage in disaster areas of varying properties. Rescue robotic devices should be adaptable, robust, and predictive in control when facing different and changing needs. Intelligent, biologically inspired mobile robots and, in particular hexapod walking robots have turned out to be widely used robot types

beside serpentine mechanisms; providing effective, immediate, and reliable responses to many SAR operations.

Legged locomotion offers a significant potential for mobility over highly irregular natural rough terrains cut with ditches and high unpredictable in comparison to wheeled or tracked locomotion (Teruya, 2005), (Richard, 1998). Legs can provide the capabilities of stepping over obstacles or ditches, and maneuvering within confined areas of space. They can handle with softness, the unevenness of the terrain. Beside their main function in locomotion, legs are almost in every external process of animals. The articulated structures of legs serve as manipulators to pull, push, hold, etc. or as tactile sensors to explore the environment.

We should select the number of legs carefully by considering their locomotive environments, because each walking machine has peculiar merits. In case of heavy walking environments, hexapod walking may be more suitable than quadruped walking. If one of the six legs is broken down, continuation of the static walking may be ensured by the left five legs, while some parts of walking functions are reduced. In case of quadruped walking robot, it may not be possible to continue their static walking.

The research of legged robot was rapidly developed. It can be seen from recent ideas about new systems of mechanism of robot that take ideas from nature, called biology inspired robot. The proposed robot is mechanism five legs that inspired from sea star (phylum echynodermata). The robot, in which each of its leg may become front centre, make it possible to maneuver difficult done by the other legged robot. In addition, the robot can rotate in its centre of its body easily, that the other legged robot difficult to do so.

THEORY AND SYSTEM DESIGN

The learning of five-legged walking is realized with the actual robot. This section introduces the system design of robot and application of reinforcement learning.

A. System Hardware Specification

The amount of joints on each leg will decide the Degree of Freedom (DOF) where in this case there will be 3 DOF for each leg.

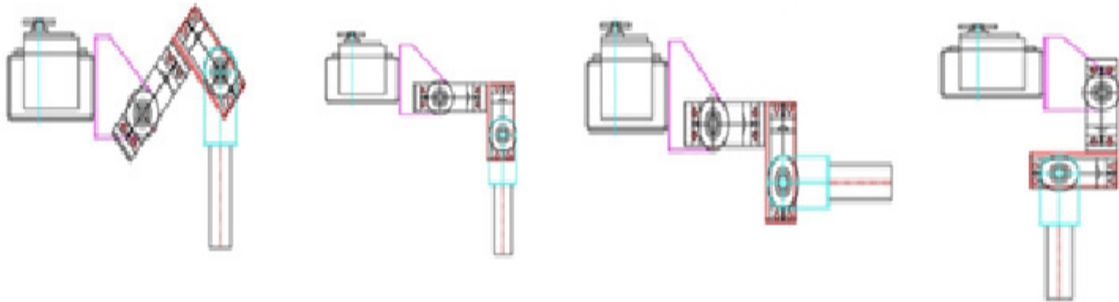
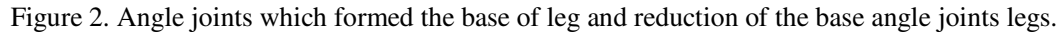


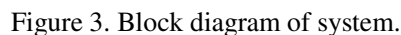
Figure 1 *Example of leg with 3 DOF*

The gait is an order for the lift and release activity on each legs. It's depends at the amount of the legs. The number of possible gate event can be formulated with : $N=(2k-1)!$

Angle joint on hinge base of the legs is referred to the point that can be reached by leg movement of joints that are most close to the body of robot (center of body). Because there are five legs, between the legs with one leg to the other leg is 72° away. So that each leg can move 72° (clockwise) and -72° (counter clockwise). But in reality, robot can only reach -50° to 50° because of mechanical robot legs require some space. Angle joint on hinge base of the legs is shown in Figure 2.



The system is divided into several sections: actuator and sensor selection, mechanical and hardware building, and next reinforcement learning algorithm implementation in robot. The type of Actuator that we select is standard servo-motor (180 degree rotation) and we choose Hi-Tech servo-motor type HS-422 because it has several advantages compared with other servo motor. One of the benefits, it have a high enough torque (4.1kg.cm/56.93oz.in) and supported with the gear made of iron (iron dual-oilite bushings), making it possible to drive a significant burden. To detect the distance with robot obstacle (obstruction, Ping)))TM Ultrasonic Range Finder has been used which have the ability to measure the distance of objects as far as 3 cm to 300 cm. Limit switch is used to detect position of the robot. Limit switch installed in each leg. When the limit switches are touching objects, it will send a signal to the microcontroller to be processed further. We used two types of microcontroller, first is ATtiny2313 to control ultrasonic sensors and send the data series (USART) to ATmega16 handled limit switches and moved servo motor. Block diagram of system is shown in Figure 3.



In nature, five legs design can be found on the star sea. The design is inspiring writers to develop this type of robot. Mechanical design of robot developed with five-legged actuator. In every leg, there is 3 DOF as a reference for the movement of robot. Here's a picture viewed from the front of robot.

Robot kinematics mechanism

In the following is a robot kinematics analysis in brief. Fig. 4 shows robotic diagram and its notation.

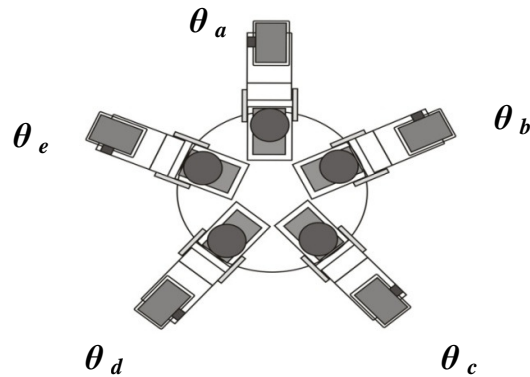


Figure 4. Robotic diagram and its notation used for kinematic analysis

Fig. 5 shows notation for kinematics development of one leg of the robot.

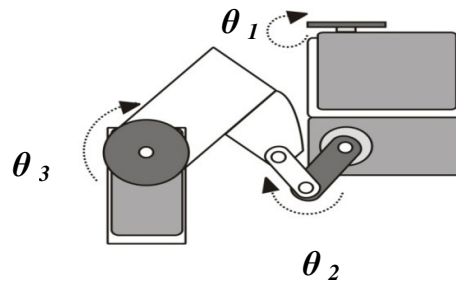


Figure 5. Notation for one legged

Since robot has five leg, and every leg has three angle of robot movement, then the forward kinematics of the overall robot is :

$$q(x,y,z) = f(\theta_{a1}, \theta_{a2}, \theta_{a3}, \theta_{b1}, \theta_{b2}, \theta_{b3}, \theta_{c1}, \theta_{c2}, \theta_{c3}, \theta_{d1}, \theta_{d2}, \theta_{d3}, \theta_{e1}, \theta_{e2}, \theta_{e3}) \quad (1)$$

In this research we will not going into detail of derivation of kinematics equation, since we use different approach to control the movement of robot.

B. System Software

The sources of intelligence for primitively facilitated robotic agents exist in their reconceptualizing capability of what they physically sense from the environment. To implement this capability, we adopt an inductive learning method of conceptual formation for adaptively organizing a state space and develop a new algorithm for a robot to construct its task-relevant state space efficiently through matching encountering states with the similar situations in the past and through generalizing them. This research propose a methodology to dynamically increase the resolution of state spaces both adaptively and selectively by applying a concept formation technique from machine learning recursively to a record of a sensorimotor history of a learning agent. By connecting this with conventional reinforcement learning, we showed our algorithm can perform tasks without suffering from hidden state problems in an artificial maze environment, and also present its robustness even for a robot whose perceptual resources are quite restricted and/or bounded.

B.1.Reinforcement Learning

Reinforcement learning is learning what to do--how to map situations to actions--so as to maximize a numerical reward signal. The learner is not told which actions to take, as in most forms of machine learning, but instead must discover which actions yield the most reward by trying them. In the most interesting and challenging cases, actions may affect not only the immediate reward but also the next situation and, through that, all subsequent rewards. These two characteristics (trial-and-error search and delayed reward) are the two most important distinguishing features of reinforcement learning. Reinforcement learning is defined not by characterizing learning methods, but by characterizing a learning problem. The basic idea is simply to capture the most important aspects of the real problem facing a learning agent interacting with its environment to achieve a goal. The formulation is intended to include just these three aspects (sensation, action, and goal) in their simplest possible forms without trivializing any of them.

Reinforcement learning is different from supervised learning. Supervised learning is learning from examples provided by a knowledgeable external supervisor. In uncharted territory-- where one would expect learning to be most beneficial--an agent must be able to learn from its own experience. To obtain a lot of reward, a reinforcement learning agent must prefer actions that it has tried in the past and found to be effective in producing reward. When reinforcement learning involves supervised learning, it does so for specific reasons that determine which capabilities are critical and which are not. For learning research to make progress, important sub-problems have to be isolated and studied, but they should be sub-problems that play clear roles in complete, interactive, goal-seeking agents, even if all details of the complete agent cannot yet be filled in (Richard, 1998). The reinforcement learning algorithm is shown in Figure 6.

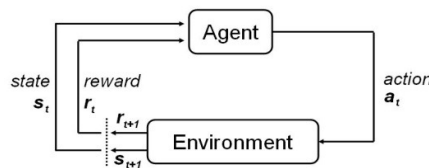


Figure 6. Reinforcement Learning Architecture.

This important thing for the learner and environment is:

- Agent : Learning and decide action
- Input : state (s_t) and reward (r_t)
- Release : action (a_t)
- Goal : to maximize the amount of reward
- Environment:
 - o All outside the agent (learner)
 - o React to the action with a new state
 - o Contains functions that generate reward or punishment

B.2.Related Work

Reinforcement learning (RL) has been used to train robot. Expressing such beliefs in a manner that can be naturally and effectively exploited by an reinforcement learning system can be a challenge. At the same time, it holds the promise of helping reinforcement learning to scale up to complex real-world tasks. Here is some research that use reinforcement learning to maximize gait on legged robot.

EXPERIMENT

The hip leg center position is in every corner of the fixed pentagon as a reference for the position and servo position at 0^0 .

Forward Movement

The center front leg work as a sweeper while the other four legs can move into 50^0 position, the leg movement combination that work as a balance are when the front leg is in opposite direction of the back leg

Backward Movement

The backward movement is actually the same as the forward movement, the difference is that four of the leg move in -50^0 direction while the front leg help push backward.

Askew Movement

There are two askew movement that can be done, which is the right askew and the left askew.

The askew movement is also the same with the forward movement, the only difference is that while doing the left askew, the front and the back left leg have a $< 50^0$ movement. In the other hand, while doing the right askew, the front and the back right leg have a $< 50^0$ movement.

Turnback Movement

This turnback movement consist of two movements, which is cw and ccw that controlled by the rotation of the leg, whether is in 50^0 or -50^0 direction. The turn movement for the turn right movement are the front leg turn around -50^0 folowed by the right front leg, right back leg, left back leg, right front leg, and continued by all of the hip servo at 0^0 position.

The performance of robot are tested in three conditions (flat street, bumpy and sloped street) by comparing the analyzed parameters :

1. Speed
2. Slope Error
3. Current consumption

RESULT AND DISCUSSION

4.1 Robot in flat street

The robot is tested to run on flat street (in this case is on wooden floor). The results are displayed on Fig.7 below.

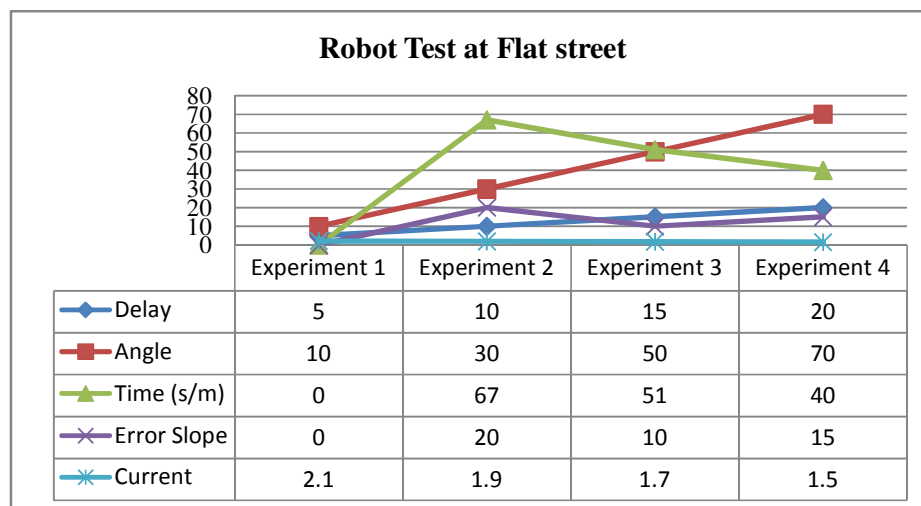


Figure 7. Comparison of parameters at flat street.

As Time Analysis (from speed variables) it can be found that the smallest time is at parameter $20/70^\circ$ and the biggest Time is at parameter $5/10^\circ$ (At $5/10^\circ$ robot unmoved). As Slope Error Analysis, from fig. 7 above can be found that the smallest slope error is found at parameter $15/50^\circ$, and the biggest slope error is found at parameter $25/70^\circ$. As Current Consumption Analysis, the smallest Current Consumption is found at parameter $20/70^\circ$, and the biggest current consumption is found at parameter $5/10^\circ$.

4.2 Robot in Bumpy street

In second test, The robot is tested to run on bumpy street (in this case is on grass). The results are displayed on Fig. 8 below.:

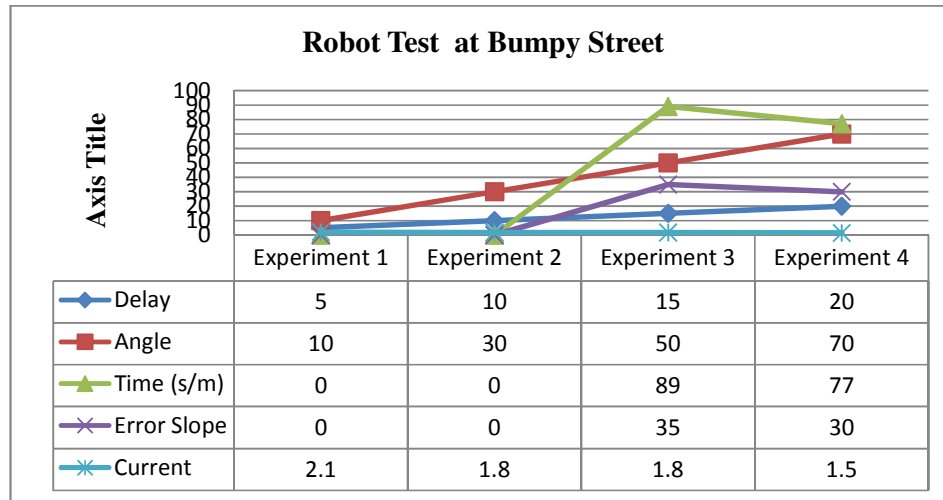


Figure 8. Graphic comparison of parameters at bumpy street

As a time analysis (or Speed analysis), the smallest time is at parameter $25/70^\circ$, and the Biggest Time at parameter $15/50^\circ$ (robot unmoved at Parameter $5/10^\circ$ & $10/30^\circ$). From slope error analysis, the smallest slope error is found at parameter $20/70^\circ$, and the biggest slope error found at parameter $25/70^\circ$. For Current Consumption Analysis, the smallest current consumption is found at parameter $25/70^\circ$, and the Biggest Current Consumption found at parameter $5/10^\circ$ (see Fig. 8 above).

4.3 Robot in sloped street

In the third test, the robot is tested to run on sloped street (in this case is on sloped wooden floor). As a time analysis (or speed test), the measurable time only found at parameter $25 / 90^\circ$, (at parameter $5/10^\circ$, $10/30^\circ$, $15/50^\circ$, $20/70^\circ$, the robot unmoved). For slope error analysis, slope error is found at parameter $25 / 70^\circ$ (at parameter $5/10^\circ$, $10/30^\circ$, $15/50^\circ$, $20/70^\circ$, the robot unmoved). And for current consumption analysis, the smallest current consumption is found at parameter $15/50^\circ$ & $20 / 70^\circ$, and the biggest current consumption is found at parameter $25/70^\circ$. The results are displayed in Fig. 9 below.

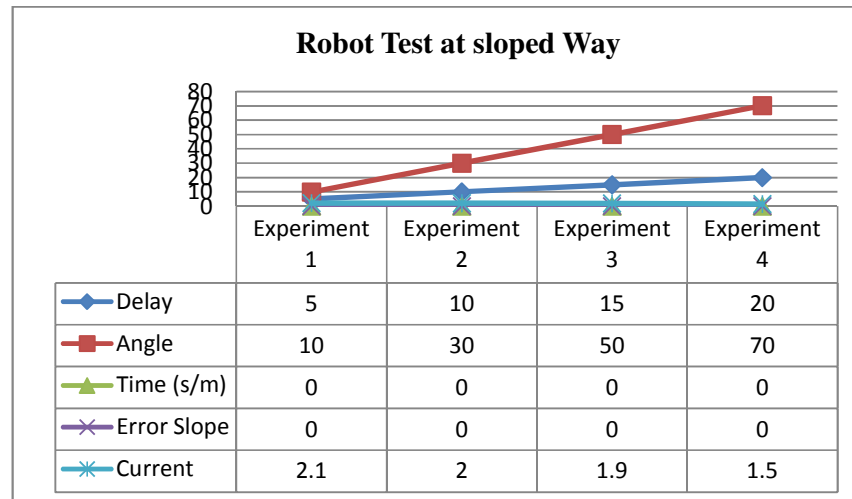


Figure 9. Comparison of parameter at sloped street

CONCLUSION

Conclusions are found after carried out tests and analysis on reinforced learning based 5 legs robot.. At flat street, the best performance is found if robot walks at delay 20ms and angle 70^0 (not too fast). At bumpy street, the best performance is found if robot walks at delay 40ms and angle 80^0 (slow). At sloped street, the best performance is found if robot walks at delay 50ms and angle 70^0 (very slow). The performance of robot's speed is caused by delay (the bigger delay, speed decreased). The performance of robot's slope error is caused by motor speed (the faster motor, the bigger error found) and the angle degree of hip (smallest angle, the bigger error). The current consumption of robot is caused by motor's speed (the faster motor, current consumption is bigger) and the load supported by motor (the bigger load, the bigger current consumption).

REFERENCES

1. Dusko M. Katic, Aleksandar D.Rodic, abd Miomir K.Vukobratovic. *Reinforcement Learning Control Algorithm for Humanoid Robot Walking*. International Journal of Information and Systems Science Volume 4, Number 2, (2008) Pages 256-267.
2. Ernest J P Earon, Tim D Barfoot, and Gabriele M T D'Eleuterio. From the Sea to the Sidewalk: *The Evolution of Hexapod Walking Gaits by a Genetic Algorithm*. Proceedings of the Third ICES International Conference on Evolvable Systems: From Biology to Hardware (2000), LNCS 1801, pp. 51–60.
3. G. Clark Haynes and Alfred A. Rizzi. *Gait Regulation and Feedback on a Robotic Climbing Hexapod*. Proceedings of Robotics: Science and Systems, August, (2006).
4. Hajime Kimura, Toru Yamashita, Shigenobu Kobayashi. *Reinforcement Learning of Walking Behavior for a Four-Legged Robot*. Proceedings of the 40th IEEE, Conference on Decision and Control Orlando, Florida USA, December (2001).
5. Hataitap Wongsuwarn, and Djitt Laowattana. *Neuro-Fuzzy Algorithm for a Biped Robotic System* International Journal of Applied Mathematics and Computer Sciences Volume 3 Number 4, (2006) pp.195-201.

6. Inagaki, K. *Gait study for hexapod walking with disabled leg. Intelligent Robot and Systems*, 1997. IROS '97. Proceedings of the 1997 IEEE/RSJ International Conference on Volume 1, 7-11 Sept (1997). pp: 408-413.
7. Inagaki, K.; Kobayashi, H. *Adaptive wave gait for hexapod synchronized walking*. Robotics and Automation. Proceedings IEEE International Conference on 8-13 May 1994 vol.2 (1994). pp: 1326 – 1331.
8. Jun Morimoto, Gordon Cheng, Christopher G. Atkeson, and Garth Zeglin. *A Simple Reinforcement Learning Algorithm For Biped Walking*. Proceedings of the 2004 IEEE, International Conference on Robotics & Automation, New Orleans, LA, April (2004) pp.3030-3035.
9. KangKang Yin, Kevin Loken, Michiel van de Panne, *SIMBICON: Simple Biped Locomotion Control*, Proceedings of the 2007 SIGGRAPH conference Volume 26 , Issue 3, July (2007).
10. M.A. Lewis, G.A. Bekey. *Gait Adaptation in a Quadruped Robot*. Journal Autonomous Robot, Volume 12, Number 3, May (2002), pp. 301-312.
11. Masaki Ogino; Yutaka Katoh; Masahiro Aono; Minoru Asada; Koh Hosoda. *Reinforcement Learning of Humanoid Rhythmic Walking Parameters based on Visual Information*. Journal of Advanced Robotics, Volume 18, Number 7, (2004) , pp. 677-697.
12. Mustafa Suphi Erden, Kemal Leblebicioglu. *Free gait generation with reinforcement learning for a six-legged robot*. Robotics and Autonomous Systems 56, (2008). pp.199–212.
13. Nate Kohl and Peter Stone. *Policy Gradient Reinforcement Learning for Fast. Quadruped Locomotion*. In Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), New Orleans, LA, May (2004). pp. 2619-2624
14. Richard S. Sutton, Andrew G. Barto. *Reinforcement Learning: An Introduction*. MIT Press, ISBN 0262193981, (1998).
15. Sonia Chernova, Manuela Veloso. *An Evolutionary Approach To Gait Learning For Four-Legged Robot*. In Proceedings of IROS'04 (International Conference on Intelligent Robot and Systems 2004), Sendai, Japan, September (2004).
16. T.D. Barfoot, E.J.P. Earon, G.M.T. D'Eleuterio. *Experiments in learning distributed control for a hexapod robot*. Journal of Robotics and Autonomous Systems 54, (2006). pp. 864-872.
17. Tak Fai Yik and Claude Sammut. *Trial-and-Error Learning of a Biped Gait Constrained by Qualitative Reasoning*. In M. Srinivasan & M. Dunbabin (Eds.), Australasian Conference on Robotics and Automation, Brisbane. (2007).
18. Teruya Makoto, Yamada Koji, Endo Satoshi. *Studies on Forward Motion of Five Legs Robot (Nippon Kikai Gakkai Robotikusu, Mekatoronikusu Koenkai Koen Ronbunshu)* . Journal Code: L0318B VOL.2005; NO.; PAGE. 2P1-S-065 (2005).
19. W. Salatian, Keon Young Yi, Yuan F. Zheng. *Reinforcement Learning for a Biped Robot to Climb Sloping Surfaces*, Journal of Robotic Systems 14(4), 283–296 (1997).
20. Youcef Zennir, Pierre Couturier. *Multiactor approach and hexapod robot learning*. Proceedings 2005 IEEE International Symposium on Computational Intelligence in Journal of Robotics and Automation June 27-30, (2005), Espoo, Finland. pp.665-671.
21. Zennir Y., Couturier P., Bétemps M. *Distributed Reinforcement Learning of Six-Legged Robot to Walk*. The Fourth International Conference on Control and Automation (ICCA'03), 10-12 June, (2003), Montreal, Canada
22. Zhiying Wang, Xilun Ding, Alberto Rovetta. *Structure Design and Locomotion Analysis of a Novel Robot for Lunar Exploration*. 12th IFToMM World Congress, Besançon (France), June 18-21 (2007).

FLORA OF TIGEM ALPARSLAN FARM AND SURROUNDINGS (MUŞ)

Cihat ÖLÇÜÇÜ
Department of Biology,
Yüzüncü Yıl University, Van
TURKEY
cihat652002@yahoo.com

Dr. Fazlı ÖZTÜRK
Department of Biology,
Yüzüncü Yıl University, Van
TURKEY
fazlioz65@yahoo.com

ABSTRACT

This study was aimed to determine the Flora of Tigem Alparslan Farm and Surroundings, being situated in the city borders of Muş. The study carried out between 2004-2007, 1209 plant specimens were collected. At the end of the identifications of the specimens, 213 genera and 377 specific and infraspecific taxa, belonging to 65 families were found. 10 taxa are endemic for Turkey (2,65 %). The distribution of the taxa in the phytogeographical regions are as follows: Irano-Turanian 81 (21,48 %), Euro-Siberian 14 (3,71 %), Mediterranean 6 (1,59 %), unknown and cosmopolites 276 (73,20 %).

Key words: Flora, Muş, Tigem

INTRODUCTION

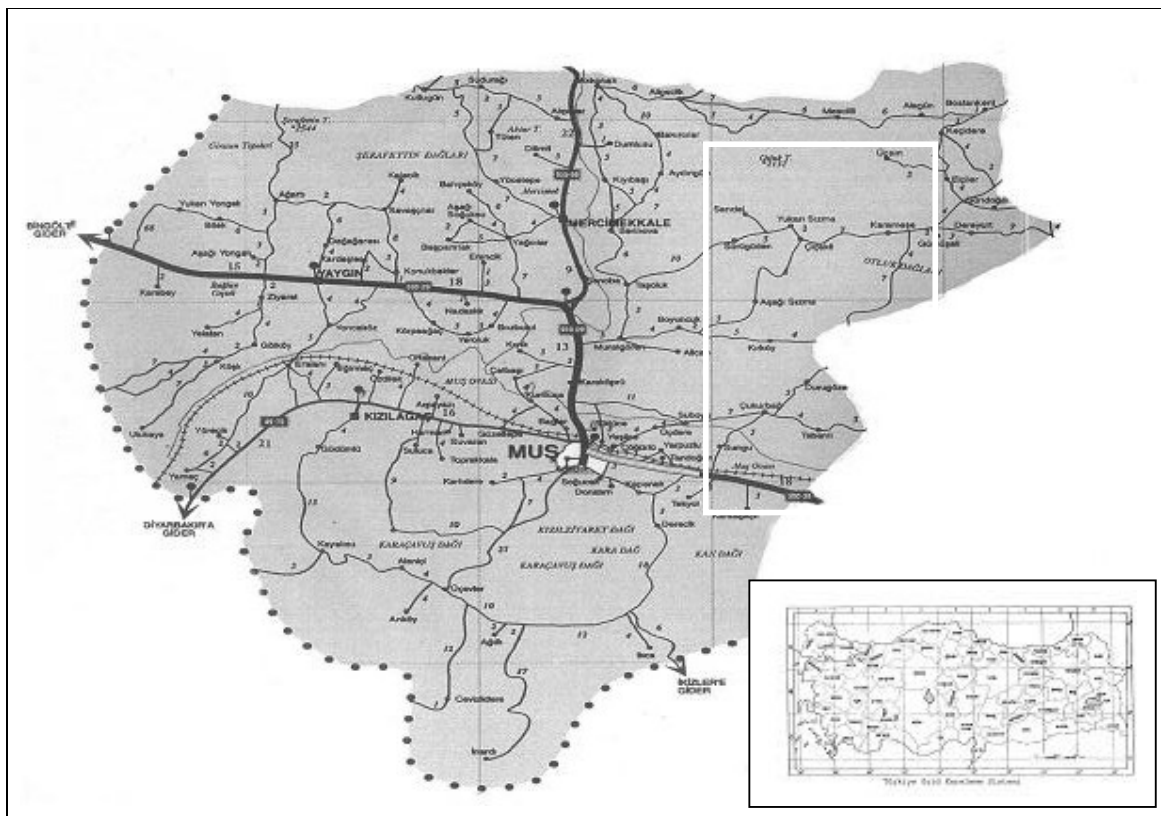
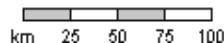
The Research area is located geographically in the eastern Anatolia. Turkey and East Anatolia Region phytogeographically is located in the Irano-Turanian region. The area is the richest phytogeographic field in terms of species and endemism. In addition, Turkey is the largest area of the three phytogeographical region (Davis, 1965). The region is offering a great potential in terms of beekeeping (Öztürk ve Erkan, 2004). Our research area is a region of Turkey has been less work. (Davis ve Hedge, 1975; Çırpıcı, 1987). The area is stated in the B8 square according to the grid system adopted in the Flora of Turkey (Davis, 1965).

The research area is composed of Tigem Alparslan farm, Mecimekkale Hill, Arıncı Dam surroundings in the province borders of Muş and some small area of Mus-Bingöl and Mus-Varto provinces. Research area is approximately 100,000 hectares and 1300 - 1400 meters high from sea level. The floristic composition of the area is composed of herbaceous formation with xerofitic step character. Formation is also found rarely shrubs. Tigem Alparslan Farm located in the research area is protected since 60 years. There are wetland compositions in research and some minor topographic roughness in the area.

In addition, topography and the main substance of the province of Muş far as time-dependent research area because of the various major soil groups formed. The majority of this land are limeless brown soils and alluvial soils.

The revival of vegetation in the research area are appeared to be *Crocus biflorus* subsp. *tauri*, *Colchicum szovitsii*, *Gagea gageoides*, *Ceratocephalus falcatus*, *Ranunculus kochii*, *Muscari armeniacum* respectively.

In the edges of streams and damp places, *Equisetum arvense*, *E. ramosissimum*, *Trifolium pratense* var. *pratense*, *Medicago sativa* subsp. *sativa*, *Salix alba*, *Tamarix tetrandra*, *Thypha latifolia*, *Phragmites australis*, *Juncus inflexus* show the prevalence of such taxa.



The climatic data of the research was provided from the meteorology station in Muş (DMİGM,1975-2005). According to Emberger's precipitation-temperature quotient (1955), the area is described bioclimatically glacial type of Mediterranean climate (Table 1).

Station	h	P	M	m	Q	PE	PE/M	Precip. regime	Bioclimate
Muş	1284	778,1	33,2	-11	61,9	40,9	1,231	Sp.W.A.Sm.	Few rainy

Copyright © 2011 SAVAP International
www.savap.org.pk

P/M2-m2; PE: Summer rainfall; PE/M - Emberger's index of xericity; A - Autumn; Sp - Spring; W - Winter; Sm - Summer

MATERIAL AND METHOD

The materials of the study consisting of 1209 vascular plant specimens were collected between 2005 and 2007. These specimens were identified basically with the help of the Flora of Turkey (Davis, 1965-1985; Davis et al., 1988; Guner et al., 2000) and the other floras (Komarov & Shishkin, 1933-1964; Tutin et al., 1964-1981; Rechinger et al., 1965-1977; Townsend & Evan, 1966-1985; Zohary, 1966-1986), some revisions (Aytac, 1997; Ekici & Ekim, 2004), and an article (Sutory, 2005).

Identified specimens were listed according to Flora of Turkey in the phylogenetic system. In the floristic list, locality, habitat, altitude, collection dates, collectors' names, number, endemism, and the phytogeographical region of the specimens were given respectively. The floristic list includes cultivated plants in the area as well. Cultivated plants are indicated by an asterisk (*). The symbol (►) in front of a plant name indicates a new record for the B8 square. The abbreviations used in the text and the floristic list are as follows: Ir.-Tur.: Irano-Turanian; Medit.: Mediterranean; Euro-Sib.: Euro-Siberian; En.: Endemic; CÖ: Cihat ÖLÇÜCÜ; FÖ: Fazlı ÖZTÜRK; OK: Osman KARABACAK; LB: Lutfi BEHCET.

DISCUSSION

At the end of the study, 1209 vascular plant specimens were collected from the area 377 taxa and 214 genera belonging to 65 families were identified. Seven species belong to *Gymnospermae*, while the other 368 were *Angiospermae*. *Dicotyledones* and *Monocotyledones* are consisted 287 and 81 species respectively. A summary of the numerical data is presented in Table 2.

Table 2. The dispersion of taxa into the large taxonomical groups.

Plant Group	Number of families	Number of genera	Number of taxa
Pteridophyta	1	1	2
Spermatophyta	64	213	375
Gymnospermae	2	5	7
Angiospermae	62	208	368
Dicotyledones	52	166	287
Monocotyledones	10	42	81
Total	65	214	377

The number of endemic taxa in the area is 10 and endemism rate is 2,71%. The endemism rate is low and below the average in Turkey (34%) (Ekim, 2005). The families of endemics are two *Asteraceae*, one *Boraginaceae*, one *Convolvulaceae*, one *Fabaceae*, *Fagaceae*, two *Liliaceae*, one *Ranunculaceae* and one *Solanaceae*.

In the research area, the number of identified taxa and the distribution to phytogeographic region and percentage rates are; Irano- Turanian 81 (21,84%), Euro-Siberian 14 (3,71 %) , Mediterranean 6 (1,59%) and cosmopolitan or of unknown phytogeographical origin 276 (73,20%).

In the Research area, most species and subspecies taxa having 10 family are; *Fabaceae* 48 (%12,73) *Poaceae* 43 (%11,40), *Asteraceae* 34 (%9,01), *Brassicaceae* 21 (%8,22) *Liliaceae* 21 (%8,22), *Ranunculaceae* 17 (%4,50), *Rosaceae* 15 (%3,97), *Caryophyllaceae* 13 (%3,44), *Boraginaceae* 13 (%3,44) ve *Polygonaceae* 10, (%2,65).

The richest genera in terms of the number of taxa are *Asteraceae* 23 (%10,79) familyasıdır. Bu familyayı *Poaceae* 22 (%10,33), *Brassicaceae* 16 (%7,51), *Fabaceae* 15 (%7,04), *Boraginaceae* 11 (%5,16), *Caryophyllaceae* 9 (%4,22), *Rosaceae* 9 (%4,22), *Liliaceae* 8 (%3,75), *Ranunculaceae* 7 (%3,28) ve *Lamiaceae* 7 (%3,28) respectively.

The genera with the largest number of species in the research area are *Bromus* 10 (%2,65), *Ranunculus* 9 (%2,38), *Lathyrus* 8 (%2,12), *Polygonum* 8 (%2,12), *Trifolium* 8 (%2,12), *Astargalus* 7 (%1,85), *Veronica* 7 (%1,85), *Muscari* 6 (%1,59), *Vicia* 6 (%1,59) ve *Gagea* 5 (%1,32).

Some morphological characters different from those given in the Flora of Turkey (Davis, 1965-1985) were observed in some specimens. These properties are given in Table 3.

Table 3. Some of the taxa different from those in the Flora of Turkey

Taxa	Flora of Turkey	Flora of Tigem Alparslan farm and Surroundings
<i>Aegilops speltoides</i> var. <i>ligustica</i>	Plant Hairy	Plant glabrous
<i>Arenaria cucubaloides</i>	Leaf length up to 12 cm	Leaf length up to 18 cm
<i>Psilurus incurvus</i>	Awn terminal	Awn subterminal
<i>Rorippa amphibia</i>	Plant Hairy	Plant glabrous
<i>Sinapis arvensis</i>	Seeds number 5 and up	Seeds number 3

Furthermore, in the research area interesting two taxa are spread.

Hyacinthus orientalis L. subsp. *chionophilus* Wendelboe. endemic plants are spread between 1600 m and 2500 m in elevation. But in our research, the distribution of endemic plant was determined to be 1310 m and expanded to B8 square.

Although *Amphibia Rorippa* (L.) Bess usually found in the Mediterranean region, this taxa have been identified in our study area.

The less studied regions of Turkey within B8 square and located Tigem farm and surroundings were examined. Some taxa in the research area have exposed.

ACKNOWLEDGEMENTS

We would like to thank Lütü Behçet (Yüzüncü Yıl University), Murat Ünal (Yüzüncü Yıl University), Osman Karabacak (Siirt University) for identifying some of the samples and Mr. Uğur Bilge Çınar for excursion. This study was funded by the Yuzuncu Yıl University Scientific Research Projects Unit (Project Number 2006 FBE-YL49).

APPENDIX

The Floristic List

PTERIDOPHYTA

1. EQUISETACEAE

1. EQUISETUM L.

1- E. ramosissimum Desf.Muş: Near Hünan Hill , riverside , humid places
,1320 m, 23.06.2006, CÖ, 620.*2- E. arvense* L.Muş: Near Hünan Hill , riverside , humid places,
1320 m, 23.06.2006,CÖ, 621.

SPERMATOPHYTA

GYMNOSPERMAE

1. PINACEAE

1. PICEA Dietr.

** 1- P. orientalis* (L.) LinkMuş: Tigem loding around, garden, 1310 m,
12.05.2006, CÖ, 130.

2. PINUS L.

** 1- P. sylvestris* L.Muş: Tigem loding around, garden, 1310 m,
12.05.2006, CÖ, 131.** 2- P. nigra* Arn. subsp. *pallasiana*
(Lamb.) Holmboe.
Muş: Tigem loding around, garden, 1310 m,
12.05.2006, CÖ, 132.

2. CUPRESSACEAE

1. CUPRESSUS L.

** 1- C. sempervirens* L.Muş: Varto road, garden, 1310 m, 28.08.2006, CÖ,
705.

2. JUNIPERUS L.

** 1- J. chinensis* L.Muş: Tigem loding around, garden, 1310 m,
12.05.2006 , CÖ, 135.**2- J. exelsa* Bieb.Muş: Varto road, garden, 1330 m, 05.05.2006, CÖ,
102.

3. THUJA L.

** 1- T. orientalis* L. "Compacta"Muş: Tigem loding around, garden, 1310 m, CÖ,
136.

ANGIOSPERMAE

DICOTYLEDONEAE

1. RANUNCULACEAE

1. NIGELLA L.

► 1- N. orientalis L.Muş: Alican village surroundings, steppe, 1320 m,
23.06.2006, CÖ, 622.

2. CONSILIDA L.

1- C. orientalis (Gay) SchrödMuş: MYO surroundings , steppe, 1300 m,
23.06.2006, CÖ, 623 , Ir-Tur elm.*2- C. oliveriana* (DC.) Schröd.Muş: In Tigem farm, roadside, steppe, 1310 m,
23.06.2006, OK, 624, Ir-Tur elm.

3. CLEMANTIS L.

1- C. orientalis L.Muş: Mercimekkale, DSİ picnic area, steppe, 1350
m, 31.08.2006, CÖ, 1002.

4. ADONIS L.

1- A. aestivalis L. subsp. *aestivalis*

Muş: In Tigem farm, steppe, 1310 m, 23.06.2006, CÖ, 625.

2- *A. aestivalis* L. subsp. *parviflora* (Fisch. Ex DC.) Busch.

Muş: Tigem loding around, steppe, 1310 m, 23.06.2006, CÖ, 626.

5. RANUNCULUS L.

1- *R. fenzlii* Boiss.

Muş: Taksih creek surroundings, steppe, 1320 m, 28.05.2006, CÖ, 359, Ir-Tur elm. Endemic.

2- *R. kotschy* Boiss.

Muş: Taksih creek surroundings, steppe, 1300m, 28.05.2006, CÖ, 362.

3- *R. constantinopolitanus* (DC.) D'URV.

Muş: Tigem loding around, humid places, 1310 m, 23.06.2006, CÖ, 628.

►4- *R. damascenus* Boiss & Gaill.

Muş: Hartuaz creek surroundings, humid places, 1300 m, 05.05.2006, OK det., 107, Ir.-Tur. elm.

5- *R. illyricus* L. subsp. *illyricus*

Muş: Taksih creek surroundings, humid places, 1300 m, 23.06.2006, OK det., 629.

►6- *R. cornutus* DC.

Muş: In Tigem farm, riverside, 1310 m, 23.06.2006, CÖ, 730.

7- *R. arvensis* L.

Muş. In Tigem farm, humid places, 1310 m, 28.05.2006, OK det., 360.

8- *R. kochii*

Ledep.

Muş: In Tigem farm, garden, 1310 m, 16.04.2006, CÖ, 6, Ir.-Tur. elm.

9- *R. trichophyllus* Chaix.

Muş: Tigem farm surroundings, wet places, 1310m, 14.05.2006, CÖ, 140.

6. CERATOCEPHALUS Moench.

►1. *C. falcatus* (L.) Pers.

Muş: Tigem farm surroundings, humid places, 1310 m, 16.04.2006, CÖ, 4.

7. THALICTRUM L.

1- *T. minus* L. var. *majus* (Crantz.) Crep.

Muş: MYO surroundings, steppe, 1300 m, 28.05.2006, CÖ, 365.

2. BERBERIDACEAE

1. BONGARDIA C. A. Mey.

► 1- *B. chrysogonum* (L.) Spach.

Muş : Tigem farm surroundings, field, 1310 m, 20.05.2006, CÖ, 280, Ir.-Tur elm.

3. PAPAVERACEAE

1. GLAUCIUM Adans.

1- *G. grandiflorum* Boiss. & Huet var.

grandiflorum

Muş : Varto road 18 km ,roadside, 09.06.2006, CÖ, 473, Ir-Tur elm.

2. PAPAVER L.

►1- *P. glaucum* Boiss & Hausskn.

Muş: Kağnıreş village surroundings, steppe, 1300 m, 11.06.2006, CÖ, 475, Ir-Tur elm.

2-*P. macrostemon* Boiss. & E.Huet ex

Boiss.

Muş: Şeyh Yusuf village surroundings, steppe, 1320 m, 11.06.2006, CÖ, 476.

4. FUMARIACEAE

1. FUMARIA L.

1- *F. microcarpa* Boiss & Hausskn.

Muş: Muş - Bingöl road- 8 km, 1310 m, 28.05.2006, FÖ det., 370.

5. BRASSICACEAE (CRUCIFERAE)

1. BRASSICA L.

*** 1- *B. oleraceae* L.**

Muş: Tigem farm surroundings, garden, 1310 m, 06.06.2006, CÖ, 466.

►2- *B. deflexa* Boiss.

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 387.

2. SINAPIS L.**1- *S. arvensis* L.**

Muş: Karasu surroundings, steppe, 1290 m,
28.05.2006, CÖ, 378.

3. CRAMBE L.**1- *C. orientalis* L. var. *orientalis***

Muş: Tigem farm surroundings, field, 1310 m,
23.06.2006, CÖ, 631, Ir-Tur elm.

4. LEPIDIUM L.**1- *L. perfoliatum* L.**

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 380.

5. CARDARIA Desv.**1- *C. draba* (L.) Devs. subsp. *draba***

Muş: Tigem farm surroundings, steppe, 1310m ,
28.05.2006, CÖ, 372.

6. THLASPI L.**1- *T. perfoliatum* L.**

Muş: Tigem loding around, steppe, 1310 m,
05.05.2006, CÖ, 110.

7. CAPSELLA Medik.**1- *C. bursa-pastoris* (L.) Medik.**

Muş: Tigem farm surroundings, steppe, 1310 m ,
16.04.2006, CÖ, 7.

8. BOREAVA Jaub. & Spach.**►1- *B. orientalis* Jaub. Et. Spach.**

Muş: Tigem farm surroundings, field, 1310 m,
21.05.2006, CÖ, 285, Ir- Tur elm.

9. ALYSSUM L.**1- *A. desertorum* Stapf. var. *desertorum***

Muş: Muş-Bingöl road 6. km, field, 1310 m,
28.05.2006, CÖ, 379.

2- *A. stapfii* Vierh.

Muş: Hacı creek surroundings , steppe, 1320 m,
11.06.2006, CÖ, 478, Ir-Tur elm.

10. EROPHILA DC.**1- *E. verna* (L.) Chevall. subsp. *verna***

Muş: Tigem farm surroundings, steppe, 1310m,
16.04.2006, CÖ, 12.

11. NASTURTIUM R. BR.**1- *N. officinale* R. Br.**

Muş: Muş-Bingöl road, humid places, 1300 m,
23.06.2006, CÖ, 633.

12. RORIPPA Scop.**►1- *R. amphibia* (L.) Bess.**

Muş: Tigem farm surroundings, humid places, 1310
m, 28.05.2006, CÖ, 384.

13. BARBAREA R. Braga**1- *B. vulgaris* R.Braga**

Muş: Tigem farm surroundings, humid places, 1310
m, 16.04.2006, CÖ, 17.

14. ERYSIMUM L.**1- *E. cuspidatum* (Bieb.) DC.**

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 386.

2- *E. passgalense* Boiss.

Muş: Karasu surroundings, humid places, 1290 m,
28.05.2006, CÖ, 375.

3- *E. repandum* L.

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 376.

15. SISYMBRIUM L.**1- *S. altissimum* L.**

Muş: Muş- Bingöl road 7. km, humid places, 1300 m, 28.05.2006, CÖ, 383.

2- *S. loselii* L.

Muş: Aican village surroundings, steppe, 1350 m, 30.08.2006, CÖ, 750.

16. DESCURAINIA Webb & Berth.

1- *D. sophia* (L.) Webb ex Prantl.

Muş: Tigem farm surroundings, steppe, 1310 m, 28.05.2006, CÖ, 381.

6. CARYOPHYLLACEAE

1. ARENARIA L.

1- *A. cucubaloides* Smith.

Muş: Hünan hill surroundings, steppe, 1320 m, 30.08.2006, CÖ, 755, Ir-Tur elm.

2. STELLARIA L.

1- *S. media* (L.) Vill. subsp. *media*

Muş: Tigem farm surroundings, meadow, 1310 m, 05.05.2006, CÖ, 111.

►2- *S. media* (L.) Vill. subsp. *pallida*

(Dumort.) Asch. & Graebn.

Muş: Tigem farm surroundings, meadow, 1310 m, 14.05.2006, CÖ, 142.

3. CERASTIUM L.

1- *C. dichotomum* L. subsp. *dichotomum*

Muş: Tigem farm surroundings, meadow, 1310 m, 23.06.2006, CÖ, 634.

2- *C. glomeratum* Thuill.

Muş: Tigem farm surroundings, steppe, 1310 m, 16.04.2006, CÖ, 21.

4. HOLOSTEUM L.

►1- *H. umbellatum* L. var. *umbellatum*

Muş: Tigem farm surroundings, steppe, 1310 m, 14.05.2006, CÖ, 143.

5. BUFONIA L.

1- *B. tenuifolia* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 14.05.2006, CÖ, 146.

6. DIANTHUS L.

1- *D. strictus* Banks & Sol. var. *gracilior*

(Boiss.) Reveal.

Muş: Muş – Bingöl road 8. km, steppe, 1320 m, 23.06.2006, CÖ, 635.

2- *D. masmenaeus* Boiss. var.

masmenaeus

Muş: Mercimekkale surroundings, steppe, 1320 m, 30.08.2006, CÖ, 772.

7. GYPSOPHYLLA L.

1- *G. venusta* Fenzl.

Muş: Şehpirin village surroundings, steppe, 1320 m, 23.06.2006, CÖ, 636, Ir-Tur elm.

8. VACCARIA Medik.

►1- *V. pyramidata* Medik. var.

pyramidata

Muş: Sirönk village surroundings, 1300 m, steppe, 30.08.2006, CÖ, 790.

9. SILENE L.

1- *S. cappadocica* Boiss. & Heldr.

Muş: Şeyhpirin village surroundings, steppe, 1320 m, 23.06.2006, CÖ, Ir.- Tur. elm.

2- *S. vulgaris* (Moench) Garcke var.

vulgaris

Muş. Aican village surroundings, humid places, 1320 m, 28.05.2006, CÖ, 389.

7. POLYGONACEAE

1. POLYGONUM L.

*** 1- *P. baldschuanicum* Regel.**

Muş : Varto road, garden, 1320 m, 19.05.2006, CÖ, 205.

2- *P. amphibium* L.

Muş : DSİ Arıncı Dam surroundings, marsh, 1330 m, 30.08.2006, CÖ, 803.

3- *P. lapathifolium* L.

Muş : marsh, marsh, 1310 m, 30.08.2006, CÖ, 810.

4- *P. cognatum* Meissn.

Muş : Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 827.

5- *P. arenastrum* Bor.

Muş : Tigem farm surroundings, steppe, 1310 m, 23.06.2006, CÖ, 736.

6- *P. aviculare* L.

Muş : Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 834.

7- *P. polycnemoides* Jaub& Spach.

Muş : Tigem farm surroundings, steppe, 1310m, 30.08.2006, CÖ, 841, Ir-Tur elm.

8- *P. bellardii* All.

Muş : Mercimekkale surroundings, steppe, 1320 m, 30.08.2006, CÖ, 853.

2. RUMEX L.

1- *R. tuberosus* L. subsp. *horizontalis* (Koch.) Rech.

Muş: Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 481.

2- *R. alpinus* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 28.05.2006, CÖ, 391.

8. CHENOPODIACEAE

1. BETA L.

1- *B. vulgaris* L. var. *altissima* (Doell.) Helm.

Muş: Muş-Bingöl road 12. km, field, 1320 m, 28.08.2006, CÖ, 700, cv.

*** 2- *B. vulgaris* L. var. *cicla* (L.) Moq.**

Muş: Muş- Bingöl road 12. km, field, 1320 m, 28.08.2006, CÖ, 702.

2. CHENOPODIUM L.

1- *C. botrys* L.

Muş: Tigem farm surroundings, roadside, 1310 m, 28.05.2006, CÖ, 390.

2- *C. foliosum* (Moench) Aschers

Muş: Tigem farm surroundings, steppe, 1310 m, 06.06.2006, CÖ, 468.

3. NOAEA Moq.

1- *N. mucronata* (Forssk.) Aschers & Schweinf. subsp. *mucronata*

Muş: Hacı creek surroundings, steppe, 1320 m, 30.08.2006, CÖ, 965.

9. AMARANTHACEAE

1. AMARANTHUS L.

1- *A. retroflexus* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 967.

2- *A. chlorostachys* Willd.

Muş: Mercimekkale surroundings, steppe, 1340 m, 30.08.2006, CÖ, 880.

10. PHYTOLACCACEAE

1. PHYTOLACCA

► 1- *P. americana* L.

Muş: Şenova village surroundings, roadside, 1320 m, 30.08.2006, CÖ, 887.

11. TAMARICACEAE

1. TAMARIX L.

► 1- *T. tetrandra* Palas & Bieb.

Muş: Tigem farm surroundings, steppe, 1310 m, 14.05.2006, CÖ, 149.

12. HYPERICACEAE (GUTTIFERAE)

1. HYPERICUM L.

1- *H. helianthemoides* (Spach.) Boiss.

Muş: MYO surroundings, steppe, 1310 m,
23.06.2006, CÖ, 637, Ir.-Tur elm.

2- *H. venustum* Fenzl.

Muş: Tigem farm surroundings, steppe, 1310 m,
30.08.2006, CÖ, 968.

13. MALVACEAE**1. MALVA L.****1- *M. sylvestris* L.**

Muş: Muş- Bingöl road 5. km, steppe, 1300 m,
28.05.2006, CÖ, 393.

2. ALCEA L.**1- *A. apterocarpa* (Fenzl.) Boiss.**

Muş: Şeyhpirin village surroundings, steppe, 1320
m, 30.08.2006, CÖ, 969.

14. GERANIACEAE**1. GERANIUM L.****► 1- *G. rotundifolium* L.**

Muş: Tigem farm surroundings, steppe, 1310 m,
05.05.2006, CÖ, 113.

2- *G. stepporum* Davis.

Muş: Tigem farm surroundings, steppe, 1310 m,
05.05.2006, CÖ, 114, Ir-Tur elm.

2. ERODIUM L'Hér.

**1- *E. cicutarium* (L.) L'Hér. subsp.
*cicutarium***

Muş: Tigem farm surroundings, steppe, 1310m,
05.05.2006, CÖ, 115.

15. ZYGOPHYLLACEAE**PEGANUM L.****1- *P. harmala* L.**

Muş: Muş – Varto road 13 km , steppe, 1320 m,
25.06.2006, CÖ, 638.

16. RUTACEAE**1. HAPLOPHYLLUM A. Juss.****1- *H. schelkovnikovii* Grossh.**

Muş: Mercimekkale surroundings, steppe, 1330 m,
30.08.2006, CÖ, 971, Ir-Tur elm.

17. ACERACEAE**1. ACER L.***** 1- *A. pseudoplatanus* L.**

Muş: DSİ Arıncı Dam picnic area, steppe, 1350 m,
30.08.2006, CÖ, 986.

*** 2- *A. platanoides* L.**

Muş: DSİ Arıncı Dam picnic area, steppe, 1350 m,
30.08.2006, CÖ, 977.

*** 3- *A. negundo* L.**

Muş: DSİ Arıncı Dam picnic area, steppe, 1350 m,
30.08.2006, CÖ, 973.

18. VITACEAE**1. VITIS L.***** 1- *V. vinifera* L.**

Muş : Alican village surroundings , garden, 1330
m, 16.06.2006, CÖ, 550.

19. RHAMNACEAE**1. RHAMNUS L.****1- *R. catharticus* L.**

Muş: Taşkale surroundings, steppe, 1340 m,
30.08.2006, CÖ, 974, Euro-Sib elm.

20. FABACEAE (LEGUMINOSAE)**1. SOPHORA L.****1- *S. alopecuroides* L.**

Muş: Varto road, steppe, 1320, 11.06.2006, CÖ,
483.

2. ROBINIA L.*** 1- *R. pseudoacacia* L.**

Muş: Tigem farm surroundings, garden, 1310 m, 18.06.2006, CÖ, 591.

3. ASTRAGALUS L.

1- *A. mollis* Bieb.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 351, Ir-Tur elm.

2- *A. ambleolepis* Fischer.

Muş: Hünan Hill surroundings, steppe, 1350 m, 30.08.2006, CÖ, 890, Ir-Tur elm.

3- *A. lagurus* Willd.

Muş: Mercimekkale surroundings, steppe, 1330 m, 11.06.2006, CÖ, 487.

4- *A. microcephalus* Willd.

Muş: Mercimekkale surroundings, steppe, 1330 m, 11.06.2006, CÖ, 486.

5- *A. odoratus* Lam.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 352.

6- *A. onobrychis* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 18.06.2006, CÖ, 593.

7- *A. campylosema* Boiss. subsp. *nigripilis*
Hub-Mor & Chamb

Muş: Tigem farm surroundings, steppe, 1310 m, 14.05.2006, CÖ, 151, Ir-Tur elm., Endemic.

4. GLYCYRRHIZA L.

1- *G. glabra* L. var. *glabra*

Muş: Mercimekkale surroundings, steppe, 29.08.2006, CÖ, 730.

5. VICIA L.

1- *V. cracca* L. subsp. *stenophylla* Vel.

Muş: Muş- Bingöl road 5. km, field, 1300 m, 28.05.2006, CÖ, 354.

2- *V. noeana* Reuter ex. Bois. var. *noeana*

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 353.

3- *V. anatolica* Turrill.

Muş: Tigem farm surroundings, field 1310 m, 05.05.2006, CÖ, 116, Ir-Tur elm.

►4- *V. hybrida* L.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 350.

5- *V. sativa* L. subsp. *sativa*

Muş: Tigem farm surroundings, field, 1310 m, 19.05.2006, CÖ, 216, cv.

6- *V. sativa* L. subsp. *nigra* (L.) Rhyh. var.

nigra

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 367.

6. LENS Miller.

1- *L. orientalis* (Boiss.) Hand-Mazz.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 368.

7. LATHYRUS L.

1- *L. pratensis* L.

Muş: Tigem farm surroundings, field, 1310 m, 11.06.2006, CÖ, 490.

►2- *L. laxiflorus* (Defs.) O.Kuntze.

subsp. *laxiflorus*

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 369.

3- *L. sphaericus* Retz.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 395.

4- *L. inconspicuus* L.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 396.

►5- *L. setifolius* L.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 398.

6- *L. cicera* L.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 400.

7- *L. nissolia* L.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 402.

►8- *L. aphaca* L. var. *modestus* P.H.

Davis.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 403.

8. PISUM L.*** 1- *P. sativum* L.**

Muş: Tigem farm surroundings, field, 1310 m, 16.06.2006, CÖ, 570.

9. ONONIS L.**1- *O. spinosa* L. subsp. *leiosperma***

(Boiss.) Širj.

Muş: Alican village surroundings, humid places, 1320 m, 10.09.2006, CÖ, 1065.

10. TRIFOLIUM L.**1- *T. repens* L. var. *repens***

Muş: Tigem farm surroundings, humid places, 1310 m, 11.06.2006, CÖ, 495.

2- *T. montanum* L. subsp.

***humboldtianum* (A. Br. & Ascher.) Hossain**

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 404.

3- *T. ambiguum* Bieb.

Muş: Tigem farm surroundings, humid places, 1310 m, 11.06.2006, CÖ, 477.

4- *T. campestre* Schreb.

Muş: Tigem farm surroundings, humid places, 1310 m, 11.06.2006, CÖ, 479

5- *T. physodes* Stev. Ex. Bieb. var.

physodes

Muş: Tigem farm surroundings, humid places, 1310 m, 28.05.2006, CÖ, 405, Medit elm.

6- *T. pratense* L. var. *pratense*

Muş: Tigem farm surroundings, humid places, 1310 m, 28.05.2006, CÖ, 406.

►7- *T. lucanicum* Gasp.

Muş: Tigem farm surroundings, humid places, 1310 m, 28.05.2006, CÖ, 407, Medit elm?.

►8- *T. hirtum* All.

Muş: Tigem farm surroundings, humid places, 1310 m, 11.06.2006, CÖ, 496.

11. MELILOTUS L.**1- *M. officinalis* (L.) Desr.**

Muş: Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 500.

2- *M. alba* Desr.

Muş: Tigem farm surroundings, steppe, 1310 m, 23.06.2006, CÖ, 639.

12. MEDICAGO L.**1- *M. lupulina* L.**

Muş: MYO surroundings, steppe, 1300 m, 23.06.2006, CÖ, 640.

2- *M. sativa* L. subsp *sativa*

Muş: Şeyh Yusuf village surroundings, field, 1320 m, 28.08.2006, CÖ, 707.

3- *M. sativa* L. subsp. *cocrulea* (Less. Ex..

Ledep.) Schmalh.

Muş: Hünan Hill surroundings, steppe, 1340 m, 30.08.2006, CÖ, 831.

4- *M. x-varia* Martyn.

Muş: MYO surroundings, steppe, 1300 m, 23.06.2006, CÖ, 641.

13. LOTUS L.**1- *L. corniculatus* L. var. *corniculatus***

Muş: Tigem Farm picnic area, rocky, 1310 m, 21.06.2006, CÖ, 616.

2- *L. corniculatus* L var. *tennifolius* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 28.05.2006, CÖ, 408.

14. CORONILLA L.**1- *C. orientalis* Miller. var. *orientalis***

Muş: Tigem farm surroundings, steppe, 1310 m, 14.05.2006, CÖ, 153.

2- *C. varia* L. subsp. *varia*

Muş: Sirönk village surroundings, steppe, 1320 m, 26.05.2006, CÖ, 310.

15. ONOBRYCHIS Adans.

1- *O. cornuta* (L.) Devs.

Muş: Arınç village surroundings, steppe, 1330 m, 12.05.2006, CÖ, 138, Ir-Tur elm.

*** 2- *O. viciifolia* Spoc.**

Muş: Tigem farm surroundings, field, 1310 m, 19.05.2006, CÖ, 233.

► 3- *O. altissima* Grossh.

Muş: Karasu surrounddings, steppe, 1300 m, 23.06.2006, CÖ, 642.

21. ROSACEAE

1. PRUNUS L.

*** 1- *P. cerasifera* Ehrh.**

Muş : Tigem farm surroundings, garden, 1310 m, 21.05.2006, CÖ, 287.

*** 2- *P. x domestica* L.**

Muş : Tigem farm surroundings, garden, 13010 m, 21.05.2006, CÖ, 289.

*** 3- *P. divaricata* Ledep. subsp. *divaricata***

Ledep.

Muş : Tigem farm surroundings, garden, 1310 m, 21.05.2006, CÖ, 290.

2. CERASUS Duhamel.

*** 1- *C. avium* L.**

Muş : Tigem farm surroundings, garden, 1310 m, 19.05.2006, CÖ, 240.

*** 2- *C. vulgaris* L.**

Muş : Tigem farm surroundings, garden, 1310 m, 19.05.2006, CÖ, 242.

3. ARMENIACA Duhamel.

*** 1- *A. vulgaris* Lam.**

Muş : Tigem farm surroundings, garden, 1310 m, 19.05.2006, CÖ, 250.

4. RUBUS

1- *R. canescens* DC. var. *canescens*

Muş : DSİ Arıncı Dam surroundings, garden, 1350 m, 26.05.2006, CÖ, 321.

5. POTENTILLA L.

1- *P. anatolica* Peşmen

Muş: DSİ Arıncı Dam picnic area, humid places, 1350 m, 30.08.2006, CÖ, 833, Ir-Tur elm.

2- *P. geranioides* Willd.

Muş: DSİ Arıncı Dam pinic area, humid places, 1350 m, 30.08.2006, CÖ, 834, Ir-Tur. elm.

6. ROSA L.

1- *R. foetida* J. Herrm.

Muş : DSİ Arıncı Dam surroundings , garden, 1350 m, 26.05.2006, CÖ, 325, Ir-Tur elm.

2- *R. canina* L.

Muş : Karasu surroundings, roadside, 1300 m, 11.06.2006, CÖ, 503.

7. CRATAEGUS L.

*** 1- *C. orientalis* Pallas ex Bieb. var.**

orientalis Pallas ex Bieb.

Muş : Tigem farm surroundings, garden, 1300 m, 26.05.2006, CÖ, 336.

8. CYDONIA Miller.

► * 1- *C. oblonga* Miller.

Muş : Tigem farm surroundings, garden, 1310 m, 07.05.2006, CÖ, 128.

9. MALUS Miller.

*** 1- *M. sylvestris* Miller.**

Muş : Tigem farm surroundings, garden, 1300 m, 26.05.2006, CÖ, 338.

*** 2- *M. x-purpurea* Rehd.**

Muş : Tigem farm surroundings, garden, 1300 m,
26.05.2006, CÖ, 339.

22. CUCURBITACEAE**1. CITRULLUS** Eckl. et Zeyh.

*** 1- *C. lanatus* (Thunb.) Matsum. et Nakai.**

Muş : Muş – Bingöl road 15 km, field, 1320 m,
18.06.2006, CÖ, 610.

2. ECBALLIUM A. Rich.**1- *E. elaterium* (L.) A. Rich**

Muş: Muş- Bingöl road 10 km, 1320 m, yol kenarı,
18.06.2006, CÖ, 607, Medit elm.

3. BRYONIA L.**1. *B. multiflora* Boiss. & Heldr**

Muş: Mercimekkale surroundings, rocky ,1350,
30.08.2006, CÖ, 836, Ir-Tur elm.

4. CUCURBITA L.*** 1- *C. pepo* L.**

Muş : Muş - Bingöl road 9 km, field, 1320 m,
16.06.2006, CÖ, 555.

*** 2- *C. maxima* Duch.**

Muş: Tigem loding around, garden, 1310 m,
16.06.2006, CÖ, 568.

5. CUCUMIS L.*** 1- *C. sativus* L.**

Muş: Muş- Bingöl road 9 km., field, 1320 m,
18.06.2006, CÖ, 605.

*** 2- *C. melo* L.**

Muş: Muş- Bingöl road 9 km., field, 1320 m,
18.06.2006, CÖ, 604.

23. CRASSULACEAE**1. SEDUM** L.**1- *S. album* L.**

Muş: Mercimekkale surroundings, rocky, 1350 m,
30.08.2006, CÖ, 838.

24. APIACEAE (UMBELLIFERAE)**1. ERYNGIUM** L.**1- *E. billardieri* Delar.**

Muş: Muş-Varto road 15. km.,steppe, 1320 m,
30.08.2006, CÖ, 839, Ir-Tur. elm.

2. CHAEROPHYLLA L.**1- *C. crinitum* Boiss.**

Muş: Tigem farm surroundings, steppe, 1310 m,
11.06.2006, CÖ, 510, Ir-Tur elm.

3. GRAMMOSCIADIUM DC.**1- *G. daucoides* DC.**

Muş: Tigem farm surroundings, steppe, 1310 m,
14.05.2006, CÖ, 156, Ir-Tur. elm.

► 2- *G. macrodon* Boiss.

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 409, Ir-Tur elm.

► 3- *G. cornotum* (Náb) Townsend

Muş: surroundings, steppe, 1310 m, 28.05.2006,
CÖ, 410, Ir-Tur elm.

4. BIFORA Hoffm**1- *B. radians* Bieb**

Muş: Tigem farm surroundings, steppe, 1310 m,
23.06.2006, CÖ, 645.

5. LISAEA Boiss.**1- *L. strigosa* (Bunk & Sol.) Eig**

Muş: Tigem farm surroundings, steppe, 1310 m,
25.06.2006, CÖ, 646, Ir-Tur elm.

25. CAPRIFOLIACEAE**1. LONICERA** L.*** 1- *L. periclynanum* L.**

Muş : Tigem loding around, garden, 1310 m,
16.06.2006, CÖ, 566.

26. VALERIANACEAE

1. VALERIANELLA

1- V. corinata Lois.

Muş: Tigem farm surroundings, garden, 1310 m,
28.05.2006, CÖ, 411.

2- V. coronata (L.) DC.

Muş: Tigem farm surroundings, garden, 1310 m,
28.05.2006, CÖ, 412.

27. DIPSACACEAE

1. DIPSACUS L.

1- D. lacinatus L.

Muş : Muş –Varto road 15 km, roadside,
21.05.2006, CÖ, 293.

2. SCABIOSA

1- S. calocephala Boiss.

Muş: Tigem farm surroundings, garden, 1310 m,
28.05.2006, CÖ, 413, Ir-Tur elm.

► *2- S. rotata* Bieb.

Muş: Tigem farm surroundings, garden, 1310 m,
28.05.2006, CÖ, 414, Ir-Tur elm.

28. ASTERACEAE (COMPOSITAE)

1. XANTHIUM L.

1- X. spinosum L.

Muş: Tigem farm surroundings, field, 1310 m,
30.08.2006, CÖ, 840.

2- X. strumarium L. subsp. *cavanillesii*
(Schouw) D.Löve and P. Dansereaur.

Muş: Tigem farm surroundings, steppe ,1310 m,
30.08.2006, CÖ, 842.

2. INULA L.

1- I. helenium L. subsp. *orgyalis* (Boiss.)

Grierson

Muş : Muş- Varto road 15 km , steppe, 1320 m,
30.08.2006, CÖ, 843.

3. PULICARIA Gaertner

1- P. armena Boiss. & Kotschy.

Muş: Hünan Hill surroundings, field, 1310 m,
30.08.2006, CÖ, 844, Ir-Tur elm. Endemic.

4. HELICHRYSUM Gaertner.

1- H. plicatum D.C. subsp. *plicatum*

Muş: Tigem farm surroundings, roadside, 1300 m,
30.08.2006, CÖ, 845.

5. EVAX Gaertn.

1- E. anatolica Boiss. & Heldr.

Muş : Hünan Hill surroundings, steppe, 21.06.2006,
CÖ, 618, Ir- Tur elm.

6. SENECIO L.

1- S. vernalis Waldst. et. Kit

Muş: Tigem farm surroundings, roadside, 1310 m,
28.05.2006, 416.

7. ANTHEMIS L.

► *1- A. cotula* L.

Muş: Tigem farm surroundings, roadside, 1310 m,
26.05.2006, CÖ, 340.

2- A. tinctoria L. var *tinctoria*

Muş: Tigem farm surroundings, steppe, 11.06.2006,
CÖ, 512.

8. ACHILLEA L.

1- A. millefolium L. subsp. *millefolium*

Muş: Tigem farm surroundings, steppe, 1310 m,
11.06.2006, CÖ, 517.

2- *A. biebersteinii* Afan.

Muş: MYO surroundings, steppe, 1310 m, 28.05.2006, CÖ, 417.

9. TANECETUM L. (Emend. Briq.)

* **1- *T. coccineum* (Willd.) Grierson subsp. *chamaemelifolium* (Somm. et Lev.) Grierson**
Muş: Tigem farm surroundings, garden, 1310 m, 23.06.2006, CÖ, 647.

2- *T. argyrophyllum* (C.Koch.) Tvetzel var. *argyrophyllum*

Muş: Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 895.

10. MATRICARIA L.**► 1- *M. chamomilla* L. subsp. *chamomilla***

Muş: Muş-Bingöl road, roadside, 1310 m, 26.05.2006, CÖ, 343.

11. GUNDELIA L.**1- *G. tournefortii* L. var. *tournefortii***

Muş: Tigem farm surroundings, roadside, 1310 m, 28.05.2006, CÖ, 418.

12. PICNOMON Adans.**1- *P. acarna* (L.) Cass.**

Muş: Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 850.

13. CENTAUREA L.**1- *C. balsamita* Lam**

Muş: Hünan Hill surroundings, steppe, 1340 m, 30.08.2006, CÖ, 851, Ir-Tur elm.

2- *C. fenzlii* Reichardt

Muş: Alican village surroundings, roadside, 1320 m, 28.05.2006, CÖ, 419, Ir-Tur elm. Endemic.

3- *C. iberica* Trev. ex. Sprengel.

Muş: Tigem farm surroundings, steppe, 1310 m, 23.06.2006, CÖ, 648.

4- *C. depresa* Bieb.

Muş: Tigem farm surroundings, roadside, 1310 m, 30.08.2006, CÖ, 852.

14. XERANTHEMUM L.**1- *X. annuum* L.**

Muş: Mercimekkale surroundings, steppe, 1340 m, 30.08.2006, CÖ, 860.

15. CHARDINA Desf.**1- *C. orientalis* (L.) O.Kuntze.**

Muş: Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 515.

16. ECHINOPS L.**1- *E. pungens* Trautv. var. *pungens***

Trautv.

Muş: Hünan Hill surroundings, steppe, 1350 m, 30.08.2006, CÖ, 861, Ir-Tur elm.

17. CICHORIUM L.**1- *C. intibus* L.**

Muş: Tigem farm surroundings, steppe, 1310 m, 23.06.2006, CÖ, 649.

18. SCORZONERA L.**1- *S. cana* (C.A.Meyer.) Hoffm var.**

jocquiniona (W. Koch.) Chamberlain

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 420.

2- *S. parviflora* Jack.

Muş: Tigem farm surroundings, steppe, 1310 m, 14.05.2006, CÖ, 157.

19. LACTUCA L.**1- *L. serriola* L.**

Muş: Muş-Varto road 15. km., roadside, 1320 m, 30.08.2006, CÖ, 862, Euro-Sib elm

► **2- *L. aculeata*** Boiss. & Kotschy. Ex. Boiss.
Muş: Mercimekkale surroundings, roadside, 1340 m, 30.08.2006, CÖ, 863, Ir-Tur elm.

20. SCARIOLO F. W. Schmidt.

1- *S. orientalis* (Boiss.) Soják
Muş: Tigem farm surroundings, roadside, 1310 m, 30.08.2006, CÖ, 864, Ir-Tur elm.

21. TARAXACUM Wiggers.

1- *T. montanum* (C.A. Meyer) DC.
Muş: Hünan Hill surroundings, steppe, 1350 m, 30.08.2006, CÖ, 867, Ir-Tur elm.
2- *T. androssovii* Schischkin.
Muş: Tigem farm surroundings, humid places, 1310 m, 16.04.2006, CÖ, 26.

22. CREPIS L.

1- *C. foetida* L. subsp. *rhocadifolia* (Bieb.) Celak.
Muş: Karasu surroundings, steppe, 1300 m, 28.05.2006, CÖ, 421.
2- *C. sancta* Babcock.
Muş: Karasu surroundings, roadside, 1300 m, 28.05.2006, CÖ, 422.

23. HELIANTHUS L.

*** 1- *H. annuus*** L.
Muş: Tigem farm surroundings, field, 1310 m, 30.08.2006, CÖ, 870.

29. PRIMULACEAE

1. ANDROSACE L.

1- *A. maxima* L.
Muş : Tigem farm surroundings, rocky, 1320 m, 05.05.2006, CÖ, 118.

2. ANAGALLIS L.

► 1- *A. arvensis* L. var. *caerulea* (L.)

Gouan
Muş: Tigem farm surroundings, field, 1310 m, 19.05.2006, CÖ, 261.

30. OLEACEAE

1. SYRINGA L.

*** 1- *S. vulgaris*** L.
Muş: Tigem farm surroundings, garden, 1310 m, 14.05.2006, CÖ, 158.

2. FRAXINUS

1- *F. angustifolia* Vahl. subsp. *angustifolia*
Muş: DSİ Arıncı Dam picnic area, garden, 1350 m, 30.08.2006, CÖ, 871.
1- *F. angustifolia* Vahl. subsp. *syriaca* (Boiss.) Yalt.
Muş: DSİ Arıncı barajı mesire alanı , bahçe, 1350 m, 30.08.2006, CÖ, 872, Ir-Tur elm.

31. CONVULVULACEAE

CONVOLVULUS

1- *C. galaticus* Rotsan ex Choisy
Muş: MYO surroundings, steppe, 1300 m, 28.05.2006, CÖ, 423, Ir-Tur elm., Endemic.
2- *C. arvensis* L.
Muş: MYO surroundings, steppe, 1300 m, 28.05.2006, CÖ, 424.
► 3- *C. betonicifolius* Miller subsp. *betonicifolius*
Muş: Tigem farm surroundings, field, 1310 m, 11.06.2006, CÖ, 521.
4- *C. betonicifolius* Miller subsp. *pendularis* (Boiss.) Paris
Muş: Tigem farm surroundings, field, 1310 m, 11.06.2006, CÖ, 520, Ir-Tur elm.

32. CUSCUTACEAE

1. CUSCUTA L.

1- *C. kurdica* Engelmann

Muş : Muş – Varto road 15 km, garden, 1320 m,
30.08.2006, CÖ, 873, Ir - Tur elm.

2- *C. planiflora* Ten.

Muş : Tigem farm surroundings, garden, 1310 m,
23.06.2006, CÖ, 689.

33. BORAGINACEAE**1. ASPERUGO L.****1- *A. procumbens* L.**

Muş: Tigem farm surroundings, steppe, 1310 m,
14.05.2006, CÖ, 159.

2. PARACARYUM

**1- *P. cristatum* (Schreber) Boiss. Subsp.
cardochorum R. Mill.**
Muş: Tigem farm surroundings, steppe, 1310 m,
23.06.2006, CÖ, 651.

3. RINDERA Palas

**1- *Rindera lanata* (Lam.) Bunge var.
canescens (A. DC.) Kusn.**
Muş: Muş-Bingöl road 10. km, roadside, 1320 m,
17.06.2006, CÖ, 571, Ir-Tur elm.

4. LITHOSPERMUM L.**1- *L. officinale* L.**

Muş: Muş-Bingöl road 10. km, roadside, 1320 m,
17.06.2006, CÖ, 572, Euro-Sib elm.

5. NEATOSTEMA Johnston**► 1- *N. apulum* (L.) Johnston.**

Muş: Hünan Tepesi surroundings, steppe, 1350m,
30.08.2006, CÖ, 967, Medit. elm.

6. ECHIU M L.**1- *E. vulgare* L.**

Muş: Muş-Bingöl road 10. km, roadside, 1320 m,
17.06.2006, CÖ, 573, Euro-Sib. Elm

7. MOLTAKIA Helm.**1- *M. coerulea* (Willd.)Lehm.**

Muş: Muş-Bingöl road 10. km, field ,1320 m,
17.06.2006, CÖ, 574, Ir- Tur elm.

8. ONOSMA L.**1- *O. bracteosum* Hausskn. et Bornm.**

Muş: MYO surroundings, steppe, 1300 m,
28.05.2006, CÖ, 425, Ir-Tur elm., Endemic.

2- *O. albo-roseum* Fisch. et Mey. subsp.

albo-roseum* Fisch. et Mey. var. *albo-roseum
Fisch. et Mey.

Muş: MYO surroundings, steppe, 1300 m,
28.05.2006, CÖ, 426, Ir-Tur elm.

► 3- *O. auriculatum* Aucher ex DC.

Muş: MYO surroundings, steppe, 1300 m,
28.05.2006, CÖ, 427, Ir-Tur elm.

9. CERINTHE L.**1- *C. minor* L. *auriculata* (Ten.) Domac**

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 428.

10. ANCHUSA L.**1- *A. azurea* Miller var. *azurea***

Muş: Mercimekkale surroundings, steppe, 1350 m,
30.08.2006, CÖ, 874.

11. ALKANNA L.**1- *A. orientalis* (L.) Boiss. var. *orientalis***

Muş: Muş-Bingöl road 10. km, roadside, 1320 m,
17.06.2006, CÖ, 589, Ir-Tur elm.

34. SOLANACEAE**1. SOLANUM L.****1- *S. dulcamara* L.**

Muş: DSİ Arıncı Dam picnic area, under wooded,
1350 m, 16.06.2006, CÖ, 557, Euro-Sib elm.

2. LYCIUM L.**1- *L. anatolicum*** A. Baytop et R. Mill

Muş: Mercimekkale surroundings, steppe, 1350 m, 16.06.2006, CÖ, 558, Ir- Tur elm. Endemic.

3. DATURA L.**►1- *D. stramonium*** L.

Muş: Muş- Varto road 15 km, roadside, 1320 m, 30.08.2006, CÖ, 875.

4. HYOSCYAMUS**1- *H. niger*** L.

Muş : Muş – Varto Road 13 km, roadisde, 18.06.2006, CÖ, 595.

2- *H. reticulatus* L.

Muş : Hünan Hill surroundings , field, 18.06.2006, CÖ, 596, Ir – Tur elm.

5. NICOTIANA L.**►* 1- *N. rustica*** L.

Muş: Varto road, field, 1320 m, 17.06.2006 CÖ, 590.

►* 2- *N. tabacum* L.

Muş: Varto road, field, 1320 m, 17.06.2006 CÖ, 588.

35. SCROPHULARIACEAE**1. VERONICA L.****1- *V. verna*** L.

Muş: Tigem farm surroundings, steppe, 1310 m, 05.05.2006, CÖ, 119.

2- *V. persica* Poiret

Muş: Tigem farm surroundings, humid places, 1310 m, 28.05.2006, CÖ, 429.

3- *V. biloba* Schreber.

Muş: DSİ Arıncı Dam picnic area, humid places, 1350 m, 29.08.2006, CÖ, 736.

4- *V. anagallis-aquatica* L. subsp. *michauxii* (Lam.) A. Jelen.

Muş: DSİ Arıncı Dam picnic area, humid places, 1350 m, 29.08.2006, CÖ, 740.

5- *V. lysimachioides* (Boiss.) M.A. Fischer.

Muş: DSİ Arıncı Dam picnic area, humid places, 1350 m, 29.08.2006, CÖ, 743.

6- *V. microcarpa* Boiss.

Muş: Hünan Hill surroundings, humid places, 1310 m, 09.06.2006, CÖ, 470.

7- *V. orientalis* Miller. subsp. *orientalis*

Muş: Tigem farm surroundings, steppe, 1310 m, 16.06.2006, CÖ, 559.

2. LAGOSTIS Gaertner**1- *L. stolonifera*** (C.Koch.) Maxim.

Muş: Hünan Hill surroundings, humid places, 1310 m, 09.06.2006, CÖ, 471, Ir- Tur elm.

36. OROBANCHACEAE**1. OROBANCHE****1- *O. alba*** Stephan

Muş: MYO surroundings, steppe, 1300 m, 28.05.2006, CÖ, 430.

37. LAMIACEAE (LABIATAE)**1. AJUGA L.****►1- *A. orientalis*** L.

Muş : Tigem farm surroundings, stepe, 1310 m, 04.06.2006, CÖ, 463.

2. PHLOMIS L.**1- *P. tuberosa*** L.

Muş : Muş- Bingöl road 5 km , field, 1320 m, 11.06.2006, CÖ, 524.

3. LAMIUM L.**1- *L. garganicum*** L. subsp. *reniforme* (Montbret & Aucher ex Benth.) R.R.Mill

Muş: DSİ Arıncı Dam surroundings, garden, 1350 m, 30.08.2006, CÖ, 876.

2- *L. amplexicaule* L.

Muş: Tigem farm surroundings, steppe, 1310 m,
05.05.2006, CÖ, 101, Euro- Sib elm.

4. STACHYS L.

**1- *S. annua* (L.) L. subsp. *annua* (L.) L.
var. *annua* (L.) L.**

Muş : Muş- Bingöl road 10 km , field, 19.05.2006,
CÖ, 266, Ir-Tur elm.

5. MENTHA L.

**1- *M. longifolia* (L.) Huds. subsp.
typhoides (Briq.) Harley var. *typhoides***

Muş: Varto road 12 km., humid places, 1320 m,
30.08.2006, CÖ, 877.

6. ZIZIPHORA L.**1. *Z. capitata* L.**

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 431, Ir-Tur elm.

7. SALVIA L.**1. *S. brachyantha* (Bordz.) Pobed.**

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 432, Ir-Tur elm.

2. *S. virgata* Jacq.

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 433, Ir-Tur elm.

38. PLUMBAGINACEAE**1. PLUMBAGO****1- *P. europaea* L.**

Muş: DSİ Arıncı Dam surroundings, garden, 1350
m, 30.08.2006, CÖ, 878, Euro-Sib elm.

39. PLANTAGINACEAE**1. PLANTAGO L.****1- *P. major* L. subsp. *major* L.**

Muş: DSİ Arıncı Dam surroundings, garden, 1350
m, 30.08.2006, CÖ, 879.

2- *P. major* L. subsp. *intermedia* (Gilib)

Lange

Muş: DSİ Arıncı Dam surroundings, garden, 1350
m, 30.08.2006, CÖ, 880.

3- *P. lanceolata* L.

Muş: Tigem farm surroundings, humid places, 1310
m, 28.05.2006, CÖ, 434.

40. SANTALACEAE**1. THESIIUM L.****1- *T. billardieri* Boiss.**

Muş: Tigem farm surroundings, steppe, 1310m,
28.05.2006, CÖ, 435.

41. LORANTHACEAE**1. VISCUM L.****►1- *V. album* L. subsp. *austriacum***

(Wiesb.) Vollman

Muş : Şenova village surroundings, riverside,
30.08.2006, CÖ, 881.

42. EUPHORBIACEAE**1. EUPHORBIA L.****1- *E. orientalis* L.**

Muş : Mercimekkale surroundings, steppe, 1350 m,
23.06.2006, CÖ, 653.

**2- *E. falcata* L. subsp. *falcata* L. var.
falcata L.**

Muş : Mercimekkale surroundings, steppe, 1350 m,
23.06.2006, CÖ, 654.

3- *E. virgata* Waldst. et Kit.

Muş : Mercimekkale surroundings, steppe, 1350 m,
23.06.2006, CÖ, 655.

43. BUXACEAE**1. BUXUS L.****►* 1- *B. sempervirens* L.**

Muş : Tigem farm surroundings, garden, 1310 m,
16.06.2006, CÖ, 569.

44. URTICACEAE**1. URTICA L.***1- U. dioica* L.

Muş. Varto road , humis places, 1320 m,
30.08.2006, CÖ, 882, Euro-Sib elm.

45 . MORACEAE**1. MORUS L.**** 1- M . alba* L.

Muş: Mercimekkale surroundings, garden, 1310 m,
21.05.2006, CÖ, 295.

▶ ** 2- M. nigra* L.

Muş: Tigem farm surroundings, garden, 1310 m,
26.05.2006, CÖ, 345.

2. FISCUS L.** 1- F. carica* L.

Muş: Tigem farm surroundings, roadside, 1310 m,
26.05.2006, CÖ, 346.

46. ULMACEAE**1. ULMUS L.***1- U. minor* Miller. subsp. *minor*

Muş: DSİ Arıncı Dam surroundings, garden, 1350
m, 30.08.2006, CÖ, 883.

47. JUGLANDACEAE**1. JUGLANS L.**** 1- J. regia* L.

Muş: Kağnıreş village surroundings, garden, 1320
m, 12.05.2006, CÖ, 139.

48. PLATANACEAE**1. PLATANUS L.**** 1- P. orientalis* L.

Muş: Muş - Tigem, roadside, 1310 m, 15.09.2006,
CÖ, 1075.

49. FAGACEAE**1. QUERCUS L.***1- Q. robur* L. subsp. *pedunculiflora* (C.

Koch.) Menitsky

Muş: Varto road, steppe, 1310 m, 28.08.2006, CÖ,
710, Ir-Tur elm.

2- Q. petraea (Mattuschka) Liebl. subsp.*pinnatiloba* (C.Koch.) Menitsky

Muş: Varto road, steppe, 1310 m, 28.08.2006, CÖ,
711, Endemic.

3- Q. libani Oliver.

Muş: Varto road, steppe, 1310 m, 28.08.2006, CÖ,
712, Ir-Tur elm.

50. BETULACEAE**BETULA L.***1- B. pendula* Roth.

Muş : Mercimekkale surroundings, rocky, 1350 m,
23.06.2006, CÖ, 656.

** 2- B. pendula* Roth. "lacinata"

Muş : Tigem loding around, garden, 19.06.2006,
CÖ, 612.

51. SALICACEAE**1. SALIX L.**** 1- S. alba* L.

Muş: Tigem farm surroundings, garden, 1310 m,
05.05.2006, CÖ, 103.

▶ ** 2- S. babylonica* L.

Muş: Tigem farm surroundings, garden, 1310 m,
05.05.2006, CÖ, 104.

** 3- S. caprea* L.

Muş: Muş- Bingöl road 5. km., garden, 1310 m,
28.05.2006 , 438.

4- S. armenorossica A. Skv.

Muş: Muş- Varto road 10. km, roadside, 1310 m,
05.05.2006, CÖ, 109.

2. POPULUS L.▶ ** 1- P. euphratica* Oliv.

Muş: Tigem farm surroundings, roadside , 1310 m,
05.05.2006, CÖ, 122.

► * **2- *P. alba* L.**

Muş: Tigem farm surroundings, roadside, 1310 m,
05.05.2006, CÖ, 123.

* **3- *P. usbekistanica* Kom. subsp. *usbekistanica***

Muş: Muş- Bingöl road 9. km, roadside, 1310 m,
05.05.2006, CÖ, 124.

52. RUBIACEAE

1. GALIUM L.

1- *G. verum* L. subsp. *verum*

Muş : Tigem farm surroundings, field, 1310 m,
11.09.2006, CÖ, 528, Euro-Sib elm.

2. RUBIA L.

1- *R. tinctorum* L.

Muş: DSİ Arıncı Dam surroundings, field,
11.09.2006, CÖ, 529, Ir-Tur elm.

MONOCOTYLEDONEAE

53. BUTOMACEAE

2. BUTOMUS L.

1- *B. umbellatus* L.

Muş: Karasu surroundings, humid places, 1300 m,
11.06.2006, CÖ, 532.

54. LEMNACEAE

LEMNA L.

1- *L. minor* L.

Muş : Tigem farm surroundings, marsh, 1310 m,
18.06.2006, CÖ, 598.

55. LILIACEAE

1. ASPARAGUS L.

1- *A. persicus* Baker.

Muş: Tigem farm surroundings, steppe, 1310 m,
28.05.2006, CÖ, 436, Ir-Tur elm.

2. ALLIUM L.

*** 1- *A. cepa* L.**

Muş: Tigem farm surroundings, garden, 1310 m,
28.05.2006, CÖ, 437.

2- *A. scorodoprasum* L. subsp. *rotundum* (L.) Stearn.

Muş: Alican village surroundings , steppe 1320 m,
23.06.2006, CÖ, 658.

3- *A. kharputense* Freyn et Sint.

Muş: Tigem farm surroundings, steppe, 1310 m,
05.05.2006, CÖ, 125, Ir-Tur elm.

3. MUSCARI Miller

1- *M. comosum* (L.) Miller.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 35.

2- *M. tenuiflorum* Tausch.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 38.

3- *M. longipes* Boiss.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 40.

► 4- *M. armeniacum* Leichtlin. Ex. Baker.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 41.

5- *M. neglectum* Guss

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 45.

► 6- *M. azureum* Fenzl.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 46.

4. HYACINTHUS L.

► 1- *H. orientalis* L. subsp. *chionophilus*

Wendelbo.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 55, Ir-Tur. elm. Endemic.

5. BELLEVALIA Lapeyr.**►1- *B. longipes*** (Palas ex Georgi)

Woronow

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 62.

►2- *B. paradoxa* (Fisch. Et Mey.) Boiss.

Muş: Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 65, Ir-Tur elm.

6. TULIPA L.***1- T. sintenesii*** Baker.

Muş: Tigem farm surroundings, field, 1310 m,
28.05.2006, CÖ, 439, Ir-Tur elm., Endemic.

7. GAGEA Salisb.***1- G. gageoides*** (Zucc.) Vucd.

Muş: Hünan Hill surroundings, steppe, 1320 m,
16.04.2006, CÖ, 78.

►2- *G. fibrosa* (Defs.) Schultes &

Schultes Fil.

Muş: Muş-Bingöl road 7 km, roadside, 1310 m,
16.04.2006, CÖ, 83.

►3- *G. reticulata* (Pallas) Schultter

Muş: Hünan Hill surroundings, steppe, 1320 m,
16.04.2006, CÖ, 80.

4- G. taurica Steven.

Muş: Muş-Bingöl road 7 km, roadside, 1310 m,
16.04.2006, CÖ, 84, Ir.-Tur. elm.

5- G. helenae Grossh.

Muş: : Tigem farm surroundings, steppe, 1310 m,
16.04.2006, CÖ, 88, Ir.-Tur. elm.

8. COLCHICUM L.***1- C. szovitsii*** Fisch. et. Mey.

Muş: Hünan Hill surroundings, humid places, 1350
m, 16.04.2006, CÖ, 92.

2- C. kotschy Boiss.

Muş: Hünan Hill surroundings, steppe, 1350 m,
30.08.2006, CÖ, 884, Ir.-Tur elm.

56. AMARYLLIDACEAE**1. IXIOLIRION** Fischer ex. Herbert***1- I. tataricum*** (Pallas) Herbert subsp.***montanum*** (Labill.) Takht.

Muş: Tigem farm surroundings, roadside, 1310 m,
14.05.2006, CÖ, 144, Ir-Tur elm.

57. IRIDACEAE**1. CROCUS** L.***1- C. biflocus*** Miller. subsp. ***tauri*** (Mow)

Mathew.

Muş : Tigem farm surroundings, humid places,
1310 m, 02.04.2006, CÖ, 2, Ir-Tur elm.

2. GLADIOLUS L.***1- G. kotschyanus*** Boiss.

Muş : Mercimekkale surroundings, humid places,
1350 m, 19.05.2006, CÖ, 275, Ir- Tur elm.

2- G. atrovioleaceus Boiss.

Muş: Tigem farm surroundings, humid places,
1300 m, 14.05.2006, CÖ, 145, Ir-Tur elm.

58. ORCHIDACEAE**1. DACTYLORHIZA** Necker ex Nevski***1- D. iberica*** (Bieb.) Soo.

Muş: Haçlı creek surroundings, humid places, 1330
m, 16.05.2006, CÖ, 163, Medit elm.

2- D. umbrosa (Kar. Et. Kir.) Nevski

Muş: DSİ Arıncı Dam , wet places, 1350 m,
16.05.2006, CÖ, 166, Ir- Tur elm.

59. TYPHACEAE**1. THYPA** L.***1- T. latifolia*** L.

Muş: Tigem farm surroundings, marsh, 1310 m,
30.08.2006, CÖ, 885.

60. JUNCACEAE

1. JUNCUS L.**1- *J. inflexus* L.**

Muş: Muş-Bingöl road 4 km, humid places, 1300 m, 23.06.2006, CÖ, 661.

2- *J. bufonius* L.

Muş: Muş-Bingöl road 4 km, humid places, 1300 m, 23.06.2006, CÖ, 662.

61. CYPERACEAE**1. CYPERUS L.****1- *C. longus* L.**

Muş: Tigem farm surroundings, humid places, 1310 m, 11.06.2006, CÖ, 536.

2- *C. fuscus* L.

Muş: Tigem farm surroundings, humid places, 1300 m, 30.08.2006, CÖ, 968, Euro-Sib elm.

2. ELEOCHARIS R. Br.**1- *E. palustris* (L.) Roemer & Schultes.**

Muş: Hünan Hill surroundings, humid places, 1300 m, 23.06.2006, CÖ, 665.

2- *E. mitracarpa* Steudel.

Muş: Tigem farm surroundings, humid places, 1310 m, 14.05.2006, CÖ, 160.

3. BOLBOSCHOENUS Ascherson ex Palla**1- *B. maritimus* (L.) Palla var. *maritimus***

Muş: Tigem farm surroundings, humid places, 1300 m, 30.08.2006, CÖ, 970.

4. CAREX L.**1- *C. spicata* Hudson.**

Muş: Hünan Hill surroundings, humid places, 1300 m, 30.08.2006, CÖ, 972.
Euro-Sib elm.

2- *C. flacca* Schreber. Subsp. *flacca*

Muş: MYO surroundings, humid places, 1300 m, 28.05.2006, CÖ, 440, Euro-Sib elm.

62. POACEAE (GRAMINEAE)**1. TRACHYNIA Link****1- *T. distachya* (L.) Link.**

Muş: Tigem farm surroundings, steppe, 1310 m, 28.05.2006, CÖ, 441, Medit elm.

2. ELYMUS L.**1- *E. elongatus* (Host.) Runemark. subsp.*****elongatus***

Muş: DSİ Arıncı Dam picnic area, steppe, 1350 m, 30.08.2006, CÖ, 975.

2- *E. hispidus* (Opiz.) Melderis. subsp.***hispidus***

Muş: DSİ Arıncı Dam picnic area, steppe, 1350 m, 30.08.2006, CÖ, 976.

3. AEGILOPS L.**1- *A. speltoides* Tausch. var. *ligustica***

(Savignone) Bornm.

Muş: Tigem farm surroundings, steppe, 1310 m, 23.06.2006, LB det., 668.

2- *A. cylindrica* Host.

Muş: Muş-Bingöl road 10 km, steppe, 1300 m, 23.06.2006, CÖ, 669.

4. TRITICUM L.*** 1- *T. sativum* L.**

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 670.

*** 2- *T. dicocon* L.**

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 672.

3- *T. aestivum* L.

Muş: Muş-Varto road, field, 1300 m, 30.08.2006, CÖ, 978.

5. SECALE L.**1- *S. montanum* Guss.**

Muş: Tigem farm surroundings, steppe, 1310m, 28.05.2006, CÖ, 442.

2- *S. cereale* L. var. *cereale*

Muş : Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 538.

3- *S. sylvestre* Host.

Muş : Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 539.

6. HORDEUM L.**1- *H. geniculatum* All.**

Muş: Muş-Varto road, field, 11.06.2006, CÖ, 541, Euro-Sib elm.

2- *H. bulbosum* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 28.05.2006, CÖ, 443.

*** 3- *H. vulgare* L.**

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 674.

7. TAENIATHERUM Nevski

1- *T. caput-medusae* (L.) Nevski subsp. *crinitum* (Schreber.) Melderis.

Muş: Aican village surroundings, steppe 1320 m, 23.06.2006, CÖ, 675.

8. BROMUS L.**1- *B. hordeaceus* L. subsp. *hordeaceus***

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 676.

2- *B. intermedius* Guss.

Muş: Tigem farm surroundings, steppe, 1350 m, 28.05.2006, CÖ, 444.

3- *B. japonicus* Thunb. subsp. *japonicus*

Thunb.

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 677.

4- *B. japonicus* Thunb. subsp. *anatolicus*

(Boiss. & Heldr.) Pézes.

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 678.

5- *B. scoparius* L.

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 679.

6- *B. lanceolatus* Roth.

Muş: Aican village surroundings, steppe, 1310 m, 23.06.2006, CÖ, 680.

7- *B. danthoniae* Trin.

Muş: Varto road 15 km, field, 1300 m, 30.08.2006, CÖ, 980.

8- *B. tectorum* L.

Muş: Tigem farm surroundings, steppe, 1300 m, 30.08.2006, CÖ, 981.

9- *B. sterilis* L.

Muş: Tigem farm surroundings, steppe, 1310 m, 28.05.2006, CÖ, 445.

10- *B. tomentellus* Boiss.

Muş: Muş-Bingöl road 10 km, field, 1320 m, 23.06.2006, CÖ, 683, Ir –Tur elm.

9. AVENA L.*** 1- *A. sativa* L.**

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 685.

10. ALOPECURUS L.**1- *A. arundinaceus* Poir.**

Muş: Tigem farm surroundings, riverside, 1310 m, 28.05.2006, CÖ, 446.

2- *A. myosuroides* Hudson. var.

myosuroides Hudson.

Muş: MYO surroundings, riverside, 1310 m, 28.05.2006, CÖ, 447, Euro-Sib elm.

11. PHELOM L.**1- *P. pratense* L.**

Muş: Tigem farm surroundings, riverside, 1310 m, 28.05.2006, CÖ, 448, Euro-Sib elm.

12. LOLIUM L.

1- *L. perene* L.

Muş: Mercimekkale DSİ Dam picnic area, steppe, 1350 m, 30.08.2006, CÖ, 983.

2- *L. multiflorum* Lam.

Muş: Mercimekkale DSİ Dam picnic area, steppe, 1350 m, 30.08.2006, CÖ, 984.

3- *L. persicum* Boiss. & Hohen.

Muş: Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 546, Ir-Tur elm.

13. VULPIA C. C. Gmelin

1- *V. unilateralis* (L.) Stace.

Muş: Tigem farm surroundings, steppe, 1310 m, 11.06.2006, CÖ, 547.

14. PSILURUS Trin.

1- *P. incurvus* (Gouan.) Schinz & Thell.

Muş: Kağnıreş village surroundings, steppe, 1350 m, 28.05.2006, CÖ, 449.

15. POA L.

1- *P. bulbosa* L.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 450.

16. EREMOPOA Roshev.

1- *E. persica* (Trin.) Roshev.

Muş: Tigem farm surroundings, field, 1310 m, 28.05.2006, CÖ, 452, Ir-Tur elm.

2- *E. songarica* (Schrenk.) Roshev.

Muş: MYO surroundings, roadside 1300 m, 28.05.2006, CÖ, 454, Ir-Tur elm.

17. DACTYLIS L.

1- *D. glomerata* L. subsp. *hispanica*

(Roth.) Nyman.

Muş: Alican village surroundings, 1350 m, steppe, 11.06.2006, CÖ, 548.

18. STIPA L.

1- *S. ehrenbergiana* Trin. et Rupr.

Muş : Mercimekkale surroundings, steppe, 1350 m, 23.06.2006, CÖ, 690, Ir-Tur elm

19. PHRAGMITES L.

1- *P. australis* (Cav.) Trin. & Steudel.

Muş: Kağnıreş village surroundings, marsh, 1350 m, 30.08.2006, CÖ, 987.

20. CYNODON L. C. M. Richard

1- *C. dactylon* (L.) Pers. var. *villosus*

Regel.

Muş: Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 988.

21. ECHINOCHLOA P. Beauv.

1- *E. crus-galli* (L.) P.Beauv.

Muş: Tigem farm surroundings, steppe, 1310 m, 30.08.2006, CÖ, 990.

22. ZEA L.

* 1- *Z. mays* L.

Muş: Tigem farm surroundings, field, 1310 m, 23.06.2006, CÖ, 688.

REFERENCES

- Akman, Y., 1993. *Biyocoğrafya*. Palme Yayınları, Ankara 380 s.
- Altan, Y., Behçet, L., 1995. Hizan (Bitlis) florası. *Doğa Tr J of Botany*, **19** (1):331-344.
- Altan, Y., Uğurlu, E., 2000. Contribution to the flora of Çavuştepe (Van, Turkey). *Bulletin of Pure & Applied Sciences*, **19B**(2), 117-128, India.
- Anonymus., 2005. *Muş İl Çevre Durum Raporu*. Muş Valiliği İl Çevre Orman Müdürlüğü Yayınları, Muş.
- Aktoklu, E., 1992. C6 karesinden (Erkenek-MALATYA) yeni floristik kayıtlar. *Doğa Tr. J. Of Bot.*, **16**, 71-84.
- Anşin, R., 1981. *Orman Botaniği*. K.T.Ü., Oraman Fak. Yay., No:50, Trabzon, 512 s.
- Anşin, R., 1985. *Orman Botaniği II*. K.T.Ü., Oraman Fak. Yay., No:99, Trabzon, 452 s.
- Anşin, R., 1993. *Tohumlu Bitkiler (Spermatophyta), Odunsu Taksonlar*. K.T.Ü., Orman Fak. Yay., no:19, Trabzon, 512 s.
- Aucher-Eloy, P. M., 1843. *Realtions de Voyages en Orient de 1830 à 1838*. Paris.
- Baytop, T., 1984. *Türkiye’de Bitkiler ile Tedavi*. İstanbul Üniv. Yay., No: 3255, S.4, İstanbul 520 s.
- Behçet, L., 1992. Süphan Dağı (Bitlis) florası. *YYÜ Fen Bil. Enst. Dergisi*, **1** (1):29–38.
- Behçet, L., Altan, Y., 1993. Flora of Adır, Akdamar, Çarpanak and Kuzu Islands (Lake Van). *J of Fac. of Sc. Ege Univ. Series B*, **15** (1):43–54.
- Behçet, L., Altan, Y., 1994. Van, Erçek, Turna ve Bostaniçi göllerinin sucul florası. *Tr J of Botany*, **18** (2):91–98.
- Behçet, L., 1998. A New species of *Fritillaria* L. (*Liliaceae*) from East Anatolia-Turkey, *Bulletin of Pure and Applied Sciences*, **17 B**, 1, 35-38,
- Behçet, L., 2001. A New species of *Ribes* L. (*Grossulariaceae*) from East Anatolia-Turkey *Doğa Tr. J. of Botany*. **25**: 103?105,
- Beyazoglu, O., 1987. *Tohumlu Bitkiler Sitematiği*. K.T.Ü. Yayınları Yay. No: 17, Trabzon.
- Blackwell, M., 1990. *Poisonous and Medicinal Plants*. Published by Prentice-Hall. Inc., S.69, New Jersey.
- Boissier, E., 1879. *Flora Orientalis*. Vol. I-V, 434–469, Geneve et Basel.
- Boynukara, Z., Öztürk, A., 1992. Artos (Çadır) Dağı (Van) florası. *YYÜ Fen Bil. Enst. Dergisi*, **1** (2):68-89.
- Çetik, A. R., 1985. *Tügrkiye Vejetasyonu I. İç Anadolu’nun Vejetasyonu ve Ekolojisi*. Selçuk Üniv. Yay., Konya.
- Çırpıcı, A., 1987. Türkiye'nin flora ve vejetasyonu üzerine çalışmalar. *Doğa Türk Botanik Dergisi*, **11** (2):217–232.
- Davis, P.H., 1961. Distribution Patterns in Anatolia with Particular Referance to Endemism. In P. H. Davis, P. C. Harper and T. C. Hedge, ed.: *Plant Life of South-West Asia*, P. 15-27, Univ Press., Edinburgh.
- Davis, P.H., (ed.) 1965-1988. *Flora of Turkey and the East Aegean Islands. Vol 1-9 and Suplement* Edinburgh Univ. Press, Edinburgh.

- Davis, P.H., 1975. Turkey: Present State of Floristic Knowledge. *Colloques Internationaux du C. N. R. S.*, No:235.
- Davis, P. H., Hedge, I. C., 1975. *The Flora of Turkey: Past Present and Future*, 30:331-351, Cancellia.
- Davis, P. H., Heywood, V. H., 1963. *Principles Of Angiosperm Taxonomy*. P. 33, Oliver Boyd, Edinburg and London.
- Davis, P. H., Turkey: Present State of Floristic Knowledge, Lamina Flor edu Bassin Mediterranean. *Essaie Systematique Synthetique*. 235: 93-115
- Davis, P.H., Mill, R.R., Tan, K., (eds.) 1988. *Flora of Turkey and the East Aegean Islands*. Vol. 10. Edinburgh Univ. Press, Edinburgh.
- Demirkuş, N., Koyuncu, M., Gül, M., 2001, The Endemik plants of Van *Province, oceedings of The 2nd Balkan Botanical Congress*, s. 163-169 , İstanbul.
- Ekim,T., 1997. Ülkemizdeki Floristik Çalışmaların Kronolojisi ve Son Gelişmeler, Taksonomi Yaz Okulu Ders Notları. Antalya.
- Ekim, T., Koyuncu, M., Vural, M., Duman, H., Aytaç, Z., Adıgüzel, N., 2000. *Türkiye Bitkileri Kırmızı Kitabı*. Türkiye Tabiatını Koruma Derneği, Yayın no: 18, Ankara, 246 s.
- Erik, S. ve Tarkahya, B., 2004. *Türkiye Florası Üzerine*. Kebikeç 17., S. 139-193, Ankara.
- Fırat, M., Demirkuş, N., 2002. *Bahcesaray (Van) ve Çevresi Florası Üzerine Bir Araştırma*. (Yüksek Lisans Tezi), Yüzüncü Yıl Üniv. Fen Bil. Enst.
- Gümüş, İ., 1992. Çakmak dağları (B9-Ağrı) florasına giriş. *Doğa Tr J of Botany*,16(1):54-70.
- Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C. (eds.) 2000. *Flora of Turkey and the East Aegean Island*. Vol. 11. Edinburgh Univ. Press, Edinburgh.
- İlarslan, R., 2000. Türkiye’de *Thymus* L. (*Lamiaceae*) taksonlarının yayılış alanları. *S.,Ü., Fen Ed. Fak., Fen Derg.*, S 17, 165-186, Konya.
- Karabacak, O., Koyuncu, M., 2002. *Akçadağ (Erciş-Van) Florası*. (Yüksek Lisans Tezi), Yüzüncü Yıl Üniv. Fen Bil. Enst.
- Kaya, Y., Gümüş, İ., 1990. Ağrı Dağı ve çevresinin florasına katkılar. *X. Ulusal Biyoloji Kongresi* 18-20 Temmuz 1990, Erzurum. 101-110.
- Kışlalhoğlu, M. & Berkes, F., (1987). *Biyolojik Çeşitlilik. Türkiye Çevre Sorunları Vakfı yay.*, Ankara.
- Komarov, V.L., (ed.) 1934-1964. *Flora of the USSR*. Vol. 1-30. Moskova.
- Koyuncu, M., Demirkuş, N., Kaya, A., Aziret, A., 1999. Van ve çevresi geofitleri üzerinde floristik bir araştırma, *Y.Y. Üniv. Araştırma Fonu Başk. (97 EF 030), Proje kesin raporu*, Van..
- Küçet, A. İ., Kesercioğlu, T., 1989. *İzmir İli ve Çevresindeki Bazı Endemik Türler Üzerinde Anatomik, Morfolojik ve Sitotaksonomik Araştırmalar* (yüksek lisans tezi). Dokuz Eylül Üniv., Fen Bil. Enst., İzmir.
- Küçük, M. & Var, M. (1995). Doğu Karadeniz yöresinin doğal herdem yeşil odunsu taksonlarının floristik, ekolojik ve ekonomik önemleri. *OT Sistemantik Botanik Dergisi* 2 (1): 167-173.
- Oğuz, M. G., 1976. *Batı Anadolu’nun Bazı Endemik Bitki Türleri Üzerinde Sitotaksonomik Araştırmalar* (doktora tezi). Ege Üniv., Fen Fak., İzmir.
- Öğün, E., Altan, Y., 1992. Toprakkale (Van) florası. *YYÜ Fen Bil. Enst, Dergisi*, 1(2):201-211.

- Özçelik, H., 1987. *Erek Dağı (Van) Florası* (yüksek lisans tezi, basılmamış). YYÜ, Fen Bilimleri Enstitüsü, Van.
- Özçelik, H., Öztürk, M., 1991. *Doğu Anadolu'nun Faydalı Bitkileri*. SİSKAV Vakfı Adına Semih Yay., Ankara
- Özçelik, H., Babaç, M.T., 1993. Erek Dağı (Van) florası üzerinde çalışmalar (III). *YYÜ Fen Bilimleri Enst. Dergisi*, 2 (1):18–37.
- Özgökçe, F., 1999. *Özalp (Van) 'm Flora ve Vegetasyonu* (doktora tezi, basılmamış). YYÜ, Fen Bilimleri Enstitüsü, Van.
- Özhatay, N., Byfield, A., Atay, S., 2000. Türkiye'nin önemli bitki alanları. **XV. Ulusal Biyoloji Kong.**, 5-9 Eylül, Ankara.
- Özhatay, N., Kültür, Ş., 2002, Towards the Third Supplement of "Flora of Turkey and the East Aegean Islands", *VIth Plant Life of Southwest Asia Symposium*, 10-14 June, Van, Turkey, s. 106.
- Zeyrek, Y., Öztürk, A., 1993. Van Kalesi florası, *Y.Y.Ü. Fen Bilimleri Enstitüsü Dergisi*, 2 (2),4-26.
- Öztürk, F., Behçet, L., 1998. Kurubaş Geçidi (Van) florası. *Ot Sistematik Botanik Dergisi*, 6 (1):39–57.
- Öztürk, F., Öztürk, A., 1999. A8,B7,B8,B9,B10,C10, kareleri ve Türkiye için *Veronica* (*Scrophulariaceae*) cinsine ait yeni floristik kayıtlar. *Y.Y.Ü. Fen Bilimleri Dergisi*, Cilt 6, Sayı 1, 25-28, Van.
- Öztürk, F., Öztürk, A., 2000. *Veronica* L. (*Scrophulariaceae*) cinsinin Beccabunga Dum. Seksiyonuna ait taksonlar üzerinde ekolojik bir araştırma. **XV. Ulusal Biyoloji Kongresi**, 5-9 Eylül, Ankara.
- Öztürk, F., 2000. New *Veronica* L. subsp. (*Scrophulariaceae*) of Turkey. *Bulletin of Pure and Applied Sciencens*, Vol. 19B, (2): 137-139.
- Öztürk, F., Öztürk, A., 2002, Doğu Anadolu'da yayılış göstren *Veronica* L. (*Scrophulariaceae*) cinsine ait Beccabunga Dum. Seksiyon üyelerinin revizyonu. *Ot Sistematik Botanik Dergisi*, 7 (2): 7-17.
- Öztürk, F., Tugay, O., 2003. Doğu ve Güneydoğu Anadolu florasına katkılar. *Selçuk Üniversitesi Fen Ed. Fak. Dergisi*, 22 (2003): 7–17.
- Öztürk, F., 2004. Taxonomical list of woody plants in Van Lake basin. *Bulletin of Pure and Applied Sciencens*, Vol. 23B, (2): Delphi. India.
- Öztürk, F., Erkan, C., 2004. Van Gölü havzasındaki floristik yapının arıcılık açısından önemi. **XVII. Ulusal Biyoloji Kong.**, 21-24 Haziran, Adana.
- Parrot, F., 1840. *Reise zum Ararat*. Berlin
- Peşmen, H.A., 1973. A Study on the flora of Nemrut Dağı (Bitlis), *İst. Üniv. Orman Fak. Derg.* 209, 271-287.
- Rechinger, K.H., (ed.) 1965-1977. *Flora of Iranica*. Academiische Druck-u. Verlagsanstalt Graz-Austria.
- Redde, G., 1899. *Grundzüge der Pflanzenverbreitung in deer Kaukasusländern. Flora der Ararat, Engler-Drude*. Die Vegetation der Erde, 3, 373.
- Regel, V., 1963. *Türkiye'nin Flora ve Vegetasyonuna Genel Bir Bakış*. Ege Univ., Fen Fak. Monografiler Serisi L, İzmir.
- Stace, A. C., 1980. *Plant Taxonomy and Biosystematics*. Edward Arnold Ltd., p.113-176, London.
- Tchihatchef, P., 1857. Etuoles Sur lamina Vegetation des Hautes Mountagnes de L'Asie-Mineure et de L'Armenie. *Societe Botanique de France*, 883–894, France.

- Temur, A., 1993. *Çavuştepe (Van) florası* (yüksek lisans tezi, basılmamış). YYÜ, Fen Bilimleri Enstitüsü, Van.
- Terzioğlu, E., 1994. Ülkemizin biyolojik çeşitliliği. *Çevre Bakanlığı, Çevre ve İnsan Derg.* Yıl 5, Sayı 18, Ankara.
- Tournefort, J. P., 1717. Relation d'un voyage du Levant. *Fait par l'ordre du rai*, vol. 2, Paris.
- Townsend, C.C., Guest, E., (eds.) 1966–1985. *Flora of Iraq. Vol. 1–9*, Ministry of Agriculture and Agrarian Reform Republic of Iraq.
- Tutin, H.G., Heywood, V.H., et al., 1964-1980, *Flora Europaea*, Vol. 1-5, Press Cambridge Univ., London.
- Ünal, M., Behçet, L., 1999. *Pirreşit Dağı (Van-Muradiye) Florası*. (Yüksek Lisans Tezi), Yüzüncü Yıl Üniv. Fen Bil. Enst.
- Valentine, D. H., and Löve, A., 1958. *Taxonomic and Biosystematic Categories*. Brittonia, 10, 153–166.
- Zohary, M., 1973. *Geobotanical Foundations of the Middle East. Vol. 2*, Stuttgart.

HOW CHAN CAN BE RELEVANT IN MODERN SOCIETY: A SCIENTIFIC VIEW

Hong Lin

Department of Computer
and Mathematical Sciences,
University of Houston-Downtown
Houston, Texas,
USA
LinH@uhd.edu

ABSTRACT

Chan is a superior mental training methodology derived from Buddhism and absorbed wisdom of religious practitioners, philosophers, and scholars around Eastern Asia through thousands of years. As the primary way of Chan, meditation has clear effects in bringing practitioners' mind into a tranquil state and promoting both the mental and the physical health. The effect of Chan is measurable. We propose to establish a Chan science by applying modern experimental sciences to various models that have been used in traditional medicine and philosophical studies. We also give a brief introduction to some online Chan communities and discusses establishing a Chan based e-health community. Through these studies, we believe we will be able to make Chan a beneficial practice to promote human's life in modern society.

Key words: Chan, Meditation, Psychology, e-Community.

INTRODUCTION

Chan (Zen), originated as a methodology of spiritual meditation, has played an important role in the history of Eastern countries. In recent centuries, with the fusion of various cultures in modern society, Chan has drawn attention of various ethnic groups for its focus on practice and direct effect on human's lifestyles and health conditions. While people still use traditional practices --- meditation in Chan (Zen) centers and/or in religious groups, more and more web based Chan communities have formed that accommodate people from various ethnic and religious population. Chan itself has shown its religion neutral nature in the modern society.

The objective of this paper is:

1. Introduce Chan without any religious biases and discuss its effect on human's health system.
2. Propose a "Chan science", i.e., using scientific methods to measure the effectiveness of Chan practice and therefore develop a system to guide Chan practice.
3. Survey the current web based Chan communities and discuss the formation of web based health systems that focus on proactive therapy.

Although Chan is not a typical scientific topic, but it is clearly a philosophy that impacts human's view about the essence of science and relates scientific study to the contemplation of its performer --- human. In recent years, term "life science" has been used to denote studies related to the understanding of human's nature and seeking ways to harmonize human's life with the environments. Applying Chan methodology to health sciences is not only important but urgent. As a side note, the writing of this chapter is further inspired by the following view points:

- It will help clarify misunderstandings about Chan around the world, especially in Western countries. For the historic reason, Chan is regarded as a religious practice of a sect of Buddhists and its philosophy concords with Buddhism only. As a matter of fact, Chan is the result of a reflection on various philosophies including Buddhism and Taoism (Taoism is a system of Chinese philosophy) and became a practice oriented life philosophy (Nan, Huaijin, 1993). It is independent from any religions and customizable to any religious and cultural ground. For example, Confucianism adopted Chan and became a system that includes not only ethical teachings but spiritual exercises.
- Introducing Chan to Western countries will help promote interaction between Western religions and philosophies and Eastern ones. For example, throughout the last century, both Western and Eastern Christian ministries put great effort in contextualizing Christianity in Oriental culture in order to dissolve cultural resistance of Christianity from eastern people (Li, Ling, 2006). It can be clearly seen that a major obstacle of the dissemination of Christian faith is the obstinate repelling of different thinking from the fundamentalisms of the believers of both the western and the eastern religions. By complicating religious teachings, a lot of arguments between sects not only are unnecessary, but hinder the effort of bringing to people the virtue of our ancestors' philosophical thinking, even against the will of the establishers of religions. Discussions about this culture issue have been presented in a very limited scope, mainly in Chinese media.
- A deep understanding of Chan will help Westerners develop a correct view about Oriental methodology and practices so that they don't either reject Oriental thoughts arbitrarily, as what is seen among conservative theologian, or accept or imitate Oriental methods without understanding their ultimate goals, as what is seen among churches that emphasize on spiritual experiences and Qigong practitioners.

The presentation will be organized as follows. Firstly, in the background section, we will give a brief historic account of Chan, its methodology, and its practice. Then, in the main focus section, we will present meditation and its therapeutic effects and discuss establishing models to describe its effects and possible ways for quantitative studies. We will also survey existing web based Chan communities and discuss the establishment of a Chan based e-health system. We will give projections on future research directions and concluding remarks in the end.

BACKGROUND

Chan (or Ch'an), also known as Zen in Japanese, was named "Dhyāna" in Sanskrit, the ancient holly language of India. The Wikipedia definition of Chan is: Chan is a school of Mahāyāna Buddhism, Chan is itself derived from the Sanskrit Dhyāna, which means "meditation". (<http://en.wikipedia.org/wiki/ZenH>) The literal meaning of Chinese character Chan (禪) is transfer of the sovereign power, derived from the story of the three patriarch emperors Yao, Shun, and Yu. In Chan Buddhism, Chan means the transfer of insightful wisdom.

While a lot of spiritual exercises involve meditation, for example, Yoga, Chan meditation differs from the others in that it emphasizes the acquisition of the insight to one's life so as to be out of the control of any earthly desires and emotions such as anger. In other words, the acquisition of such wisdom (prajna) entails a life of total freedom. Such experience has the following 7 elements (Latifas):

- Energy (Red Latifa): One gains energy because his capability, bravery, and endurance have been unleashed.
- Determination (White Latifa): One has the determination to hold his mind state no matter in what circumstances.
- Sense of joyousness (Yellow Latifa): One has no burden in mind, even under great pressure, and has a delightful mind set like that of a child.

- Compassionate kindness (Green Latifa): One views others as one himself. Therefore, he delights in others' delight and suffers in others' suffering.
- Peacefulness (Black Latifa): One has got rid of the entangling and meaningless thinking and has subtle observation of the surroundings. He reacts to happenings promptly.
- Capacity to be absorbed in something (Blue Latifa): One is merged into what he is doing. He no longer perceives any distinction between himself and the surroundings.
- Awakening (Transparent Latifa): One is alert in every moment. He is not drowsy or dumb to external stimuli, because he does not stick to any whim.

With the acquisition of this wisdom, one should have the following internal characteristics:

- Calm and stable, awakening and tranquil (Dharma is by itself clean)
- (energy) ever lasting, never exhausting (Dharma is not created, nor destroyable)
- No desires, free and balanced (Dharma is not lacking anything)
- Self-confident and determinate, consistent internally and externally (Dharma is never waving)
- Prompting and adapting, graceful in applications (Dharma can generate all things)

and the following external characteristics:

- Having great influence but exerting no imposition; determinate and stern but not self-conceited.
- Compassionate and graceful but not indulging; rigorous and responsive but not over charging.
- Pursuing excellence but not boasting; persistent but not stubborn.
- Understanding others but not blindly following; Upright and honest but not abrupt in speaking.
- Vigorous but not hyper; overseeing but not forgetful.

(<http://baike.baidu.com/view/1242617.htm>)

Since Chan's goal is the attainment of awakening and enlightenment, it deemphasizes any rational creeds or theoretical reasoning. This is indicated in the beginning story of Chan origination, viz., Flower Sermon. Once Śākyamuni Buddha summoned his disciples for a Dharma talk. When they gathered, he was completely silent and holding up a flower. No bodies understood what Buddha was trying to tell while Mahākāśyapa suddenly broke into smile. Buddha acknowledged this special way of understanding and said:

“I possess the true Dharma eye, the marvelous mind of Nirvana, the true form of the formless, the subtle Dharma Gate that does not rest on words or letters but is a special transmission outside of the scriptures. This I entrust to Mahākāśyapa.”

(Su, Yuanlei, 1984)

Flower Sermon clearly indicates that Dharma nature (tathata) is ineffable. It is understood in a sudden acquisition of the insight to it. Therefore, Chan emphasizes direct experience rather than theoretical conceptualization and reasoning. Buddha also clearly ordered that the transmission of this wisdom is outside scriptures. Mahākāśyapa then became the first patriarch of Chan school.

This subtle Dharma Gate was transmitted from Mahākāśyapa through 28 patriarchs in India with Bodhidharma being the 28th patriarch. In about the 5th century, Bodhidharma brought Chan to China and became the first patriarch in China. After several single transmissions, the 6th patriarch, Hui Neng, revolutionized the propagation of Chan. He abandoned the passing of the bowl and cloak as a sign to certify the transmission (Hui Neng, Tang Dynasty). Since then, Chan began to broadcast widely and a lot of people acquired prajna.

Bodhidharma said that his school used “special transmission outside scriptures” and “did not stand upon words”. Hui Neng summarized his way as “no thoughts, no forms, no anchors”. All other patriarchs expressed the same teachings through generations. Chan views all names and concepts as crafted terms and requires that the practitioners do not linger with them in their pursuit. Even Buddha himself should be casted away. Their concentration is on the very status of their lives and the surroundings at the very moment. Mahayana Buddhism (Big Vehicle Buddhism) asserts that all sentient beings possess Buddha nature and Buddha nature is nothing else than the essential nature of the mind itself. When Master Chong Hui was asked, “Why I do not see Dharma?” he answered: “Because you don’t understand. If you understand, you will see there is not Buddha to pursue.”

Starting in Tang Dynasty, Chan began to spread to Vietnam, Japan, and Korea. In late 19th century and early 20th century, Chan began to establish a notable presence in Europe and North America.

Chan asserted: There is no second truth. It would be interesting to compare Chan principles to teachings in Bible. While a lot of Christian believers assault Buddhism as atheism, there is no close examination about Buddhism ontology and, more importantly, how God is being revealed in Bible. According to Chan, discussions on deity or atheism do not mean anything without experiential perception in lives. The following two verses are hardly being understood by most of “God believers”:

- Johns 1:1: In the beginning was the Word, and the Word was with God, and the Word was God.
- Johns 4:24: God is spirit, and his worshippers must worship in spirit and in truth.

(Chinese-English Bible, 1989)

And, the way to approach God, as Jesus taught:

- Mathew 11:25: ... Jesus said, “I praise you, Father, Lord of heaven and earth, because you have hidden these things from the wise and learned, and revealed them to little children. ...”
- Mathew 18:3: And he said: “I tell you the truth, unless you change and become like little children, you will never enter the kingdom of heaven. ...”
- Johns 4:14: but whoever drinks the water I give him will never thirst. Indeed, the water I gave him will become in him a spring of water welling up to eternal life.

On the other hand, Chan is hardly better understood by Buddhists nowadays, either. Through a long history of evolution, Buddhism has been mixed with native religions. Buddha became God in a lot of believers and a lot of gods were added to the list of idols to worship. As shown above, Chan pursues the middle way and is anti-idolatry. Resumption of Chan practice is urgent.

MEDITATION, SCIENCE, AND COMMUNITY

Meditation

As the meaning of Dhyana indicates, meditation is an essential part of Chan practice. As a matter of fact, meditation is the primary way to achieve Chan state, although meditation itself is not the goal of Chan. Stories in Chan history revealed the distinction between Chan and meditation clearly.

Once one of the most prominent 10 disciples of Śākyamuni Buddha, Sariputra, meditated in woods. Sariputra was regarded as “the best in wisdom”. However, he was rebuked by Vimalakīrti, an early lay Buddhist. Vimalakīrti was a Mahayana Bodhisattva, the second achievement position right next to Buddha.

Another famous story is regarding Patriarch Mazhu Daoyi, who was one of the most significant patriarchs in Chan lineage. One day, Patriarch Nanyue Huairang, one of the disciples of the 6th patriarch Hui Neng, visited Mazhu and found him meditating in a small cabin.

Huairang asked: "What is meditation for?"

"To become a Buddha."

Without saying a word, Huairang backed out and began to rub a brick on a stone. Mazhu asked what Huairang was doing.

Huairang answered: "Make a mirror!"

"How can a brick be made into a mirror?"

"If a brick cannot be made into a mirror, how can Buddha be made by meditation?"

Chan requires that the practitioners watch their thoughts at every moment, which means that meditation should be carried on alone the entire day. As Bodhidharma said in his famous "On Breaking Forms", "The Dharma way of watching minds embraces all Dharma ways." (Bodhidharma, Tang Dynasty) Meditation with no objects, anchors, or content, is the primary form of the Bodhidharma Chan. The meditator strives to be aware of the stream of thoughts, allowing them to arise and pass away without interference. Therefore, sitting meditation is not the essence of Chan.

However, sitting meditation is still the most important part of Chan practice before one acquires the prajna, since it is the most effective way to regulate one's mind.

The Wikipedia definition of sitting meditation is: "core aspect of Zen practice, during which practitioners usually assume a position such as the lotus position." (as shown in Figure 1) Various methods were used to regulate the mind. For example, awareness can be directed towards counting or watching the breath; awareness can be put in the energy center below the navel; awareness can be fixed at a picture such as the image of a Buddha or a scene; awareness can also be directed to muttering a Buddha's name, either in voice or silently; etc.

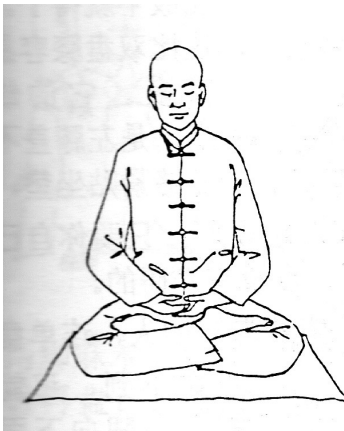


Figure 1. Lotus Position

As Chinese saying goes: Illness comes from heart (mind). The cause of illness is obsessions (desires) in mind, which cause greed, anger, and dumbness, which further cause physical anomaly. Desires in mind are caused by separating oneself from its environment. Buddhism's twelve words of reasons describe the derivation of vexations as a sequence of the following: avidya (无明, obscure) causes progressing (行), progressing causes vijñana (识, memory), then name and beings (名色), six intakes (六入), touches (触), perceptions (受), sentiment (爱), pursuit (取), existence (有), living (生), aging

and death (老死). These twelve words of reasons described how a person begins to identify himself and separates himself from the environment. Words in Bible described this process vividly. When man, Adam, and his wife, Eve, were made, they led a free life in Eden Garden. "The man and his wife were both naked, and they felt no shame." (Genesis 2:25) When Satan, the snake, allured Eve, he began by arousing her desire to become "wise". The record of this event in Bible is:

「The woman said to the serpent, "We may eat fruit from the trees in the garden, but God did say, 'You must not eat fruit from the tree that is in the middle of the garden, and you must not touch it, or you will die.'" "You will not surely die," the serpent said to the woman. "For God knows that when you eat of it your eyes will be opened, and you will be like God, knowing good and evil." When the woman saw that the fruit of the tree was good for food and pleasing to the eye, and also desirable for gaining wisdom, she took some and ate it. She also gave some to her husband, who was with her, and he ate it. Then the eyes of both of them were opened, and they realized they were naked; so they sewed fig leaves together and made coverings for themselves.] (Genesis 3:2-7)

As Mr. Zizhu Dong mentioned in his book "Eastern Interpretation of Bible" (Dong, 2007), this description is an in-parable account of the twelve words of reasons theory.

The meaning of "Adam", the name of the first man, is "man". God made man in his image and gave man a physical body. God is the Word, the perfect original form of life, and man is the "shadow" of God, the image of God made of dust. If God is "clear", then man is "obscure" (This is the first word of reason in the chain), and man's freedom in Eden Garden is progression (the second word of reason). In the following,

The sentence "saw that the fruit of the tree was good for food and pleasing to the eye" indicates *vijnana* and name and beings.

And "saw" is eye intake, one of the six intakes (eye, ear, nose, tongue, body, and thinking).

"pleasing to the eye" implies touches and perceptions.

"desirable" is sentiment.

"gaining wisdom, ... took some and ate it", isn't pursuit?

"the eyes of both of them were opened", they felt existence of themselves and the surroundings.

"realized they were naked", they gained the notion that they were living now.

Of course, Adam and Eve eventually died because living always implies aging and death.

Another interesting matter in Genesis is that the meaning of the name of the first son, Cain, of Adam and Eve is "gain", which is naturally coupled with "pursuit". What did Cain do? He killed his brother Abel. The name "Cain" therefore became a synonym of "killer. According to the words of reasons, isn't it very true that pursuit causes death? And this is what God warned at the beginning "you must not touch it, or you will die".

As such, man's perceptions lead to the recognition of him self and separate himself from the surroundings, and this separation comes with the notion of "good" and "evil". Man began to judge between himself and others and desire for wisdom so that he can judge more "correctly". The essential philosophy of Chan is giving up recognition and distinction. This implies revoking desires, judging, and all entailed sentiments. Buddhism classifies ample sentiments such as lust, anger, and

obsessing as “coarse vexations” and subtle mind activities such as judging, distinction, and thinking as “fine vexations”. In practice, one should get out of coarse vexations first and then get out of fine vexations. The procedure is summarized into three steps: abstaining, dhyana, and prajna. Although these three steps are concurrent instead of in a sequence, abstaining is clearly the starting point since it builds the foundation for the other two steps. We can see this methodology coincides with Jesus teachings:

- Mark 8:34: “If anyone would come after me, he must deny himself and take up his cross and follow me. ...”
- Luke 6:37: “Do not judge, and you will not be judged. Do not condemn, and you will not be condemned. Forgive, and you will be forgiven. ...”
- Luke 12: 22, 25, 26: Then Jesus said to his disciples: “Therefore I tell you, do not worry about your life, what you will eat; or about your body, what you will wear. ... Who of you by worrying can add a single hour to his life? Since you cannot do this very little thing, why do you worry about the rest? ...”

Man’s desires and sentiments block his insight into the surroundings. With Chan practice, one often showed unusual mind power that even performs “miracles”. However, this mind power is not gained but just released when the blocking elements (coarse and fine vexations) are removed. Chan masters always taught that everybody has the same Buddha nature and the same spiritual power and one should never pursue any spiritual powers since such desires themselves are blocking elements.

When Jesus was asked by Pharisees and Sadducees to show them a sign from heaven, he replied: “When evening comes, you say, ‘It will be fair weather, for the sky is red.’ and in the morning, ‘Today it will be stormy, for the sky is red and overcast.’ You know how to interpret the appearance of the sky, but you cannot interpret the signs of the times. ...” (Mathew 16: 2-3) In another occasion, when Jesus was asked to show a miraculous sign, he directly rebuked them: “A wicked and adulterous generation asks for a miraculous sign! But will be given it except the sign of the prophet Jonah. ... The men of Nineveh will stand up at the judgment with this generation and condemn it; for they repented at the preaching of Jonah, ... The Queen of the South will rise at the judgment with this generation and condemn it; for she came from the ends of the earth to listen to Solomon’s wisdom, ...” (Mathew 12: 39-42) What is the sign of Jonah? Repent!

As Bible says: “... faith by itself, if it is not accompanied by action, is dead.” (James 2:17) Can faith be measured by its physical manifestations? Since Chan is a practice of self control in an every-thought level, and its effect is clearly felt, is there a way to measure the effects by scientific means? If the answer is yes, the merit of such measurement is meaningful in many aspects. Firstly, the summarized measurement can verify the teachings of Chan masters. Secondly, it will help regulate Chan practice. Thirdly, it will help build a science for proactive therapy. Lastly but not least, such a science will make religious teachings more tangible and verifiable.

The starting point is measuring meditation.

Science on Chan

Probably the most straightforward way to measure meditation is to apply medical technologies to measure the effects of meditation. Such kind of research is suited into the context of medicine research. Generally, two types of research models can be used: statistics models and micro models.

Statistics models are built by applying statistical analysis to collected data from meditation practitioners. Data analysis is done either in the progress of the practice, e.g., comparing the indexes at different points of time during the process; or between different groups, e.g., comparing a group of meditators to a control group.

Current literatures show that both methods are used in the study of complementary and alternative medicine, which includes meditation as one of the methods. In (Loizzo et al, 2010), a 20-week contemplative self-healing program was studied. Biologic data were analyzed at the beginning and the end of the program. Research results showed that a contemplative self-healing program can be effective in significantly reducing distress and disability among the testers. In (Habermann et al, 2009), a long-term (5-20 years) project was carried out to investigate the use of complementary and alternative medicine and its effects onto the testers' health.

Comparisons across different groups of people are also found. For example, in a 6-week mindfulness-based stress reduction program, subjects assigned to the program demonstrated significant improvements in psychological status and quality of life compared with usual care. (Lengacher et al, 2009) Another comparison is found in (Oh et al, 2008), where a group of Qigong practitioners were compared to a control group and positive indicators were found in the study.

A survey of the literature on cognitive impairment and cancer presented in (Biegler, 2009) suggests that meditation may help to improve cancer-related cognitive dysfunction and alleviate other cancer-related sequelae. Although effects of meditation practice may be more notable among patients, we suggest that more investigations be done in various social groups, e.g., in fitness and sports groups, to fully examine the impact that Chan can bring to modern society.

In the following, we examine some of the models that can be built.

Behavioral Models

The seven Latifas indicate that a Chan practitioner should demonstrate good behaviors and self-control. Measurement of meditation effects can be done by analyzing mental health indicators, e.g., lust, anger, fear, ability of cautioning oneself, balance in personality, etc. Existing psychological measurements can be applied to Chan practitioners against psychological indicators summarized from the seven Latifas. One example of existing metrics that include psychological indexes is Functional Assessment of Cancer Therapy --- General (FACT-G) (Cella et al, 1993), which consists of four subscales assessing physical well-being, social well-being, emotional well-being, and functional well-being. Another metric is Profile of Mood State, which measures mood. (McNair, Lorr, & Droppleman, 1992)

Famous Zen scholar, Daisetz Teitaro Suzuki (铃木大拙), wrote a book (Suzuki, Fromm, & De Martino, 1970) about Zen and psychoanalysis, which gives a Buddhist analysis of the mind, its levels, and the methodology of extending awareness beyond the merely discursive level of thought. In producing this analysis, Suzuki gives a theoretical explanation for many of the swordsmanship teaching stories in "Zen and Japanese Culture" (Suzuki, 1959) that otherwise would seem to involve mental telepathy, extrasensory perception, etc.

A recent work in Zen and psychotherapy can be found in (Mruk & Hartzell, 2003), where the therapeutic value of meditation is analyzed. There are six Zen principles of psychotherapeutic value: acceptance (suffering), fearlessness (courage), truth (enlightenment), compassion (toward self and others), attachment (desire), impermanence (letting go). In addition, Zen is analyzed against the phenomenology of traditional psychotherapy in the biological approach, the learning theories, the cognitive approach, the psychodynamic perspective, and the humanistic approach.

Progression Model

A model can also be built from the procedures of meditation itself. Such a model will no longer be suitable for clinical purposes but aiming to be guidance for meditation practice.

The well known four Dhyanas (catvari-dhyani) theory clearly depicts the procedure of meditation in four series of stages, viz., the first Dhyana through the fourth Dhyana, as described in the following.

- 1) First Dhyana: Bliss Born of Separation
- 2) Second Dhyana: Bliss Born of Samadhi (proper concentration and proper reception)
- 3) Third Dhyana: Wonderful Happiness of Being Apart from Bliss
- 4) Fourth Dhyana: Clear Purity of Casting Away Thought

(http://www.bhaisajyaguru.com/buddhist-ayurveda-encyclopedia/four_dhyanas_sz-chan_sz-jing-chu_catvari-dhyani_jhana.htm)

Each stage has specific state of mind, the realm of sensory perspectives, possible interaction with spiritual beings, and methods to avoid deviations from the right path. In Sui Dynasty of China, Patriarch Zhi Kai (智凱, AC 523-597), the first patriarch of the Tiantai School (one of the eight primary Buddhism schools), specified the detailed methods of Dharma practice for each Dhyana stage (Zhi Kai & Ma, 1995) and his methods have been used as the primary methods and/or guidance for meditation ever since.

Detailed descriptions of the four Dhyanas are:

- In the First Dhyana (The Ground of Bliss Born of Separation), one's pulse stops, but this doesn't mean one is dead. This brings a particular happiness which is unknown to those in the world.
- The Second Dhyana is called the Ground of Bliss Born of Samadhi. . . . In the Second Dhyana, one's breath stops. There is no detectible breathing in and out, but at that time an inner breathing takes over.
- The Third Dhyana is the Ground of the Wonderful Happiness of Being Apart from Bliss. One renounces the *dhyana*-bliss as food and the happiness of the Dharma that occurs in initial samadhi. One goes beyond that kind of happiness and reaches a sense of wonderful joy. It is something that one has never known before, that is inexpressible in its subtlety, and that is inconceivable.
- The Fourth Dhyana is called the Ground of the Clear Purity of Casting Away Thought. In the Third Dhyana thoughts were stopped--held at bay--but they still had not been renounced altogether. In the heavens of the Fourth Dhyana, not only are thoughts stopped, they are done away with completely. There basically are no more cognitive considerations. This state is extremely pure, subtly wonderful, and particularly blissful.

It is easily seen that each Dhyana has specific bodily manifestations. For example, one's pulse stops in the first Dhyana and the breath stops in the second Dhyana, and one can anchor his thoughts in the third Dhyana and totally stop thoughts in the fourth Dhyana. With the advancement of modern technology, we can well go beyond these obvious bodily manifestations and give more detailed accounts of bodily manifestations in terms of modern medical terminologies, such as those used in electrocardiogram, electroencephalogram, and magnetic resonance imaging (MRI).

As a matter of fact, four Dhyanas is actually very high achievement level in meditation practice. In Buddhism, the heaven (in its spiritual definition) has three levels (recall 2 Corinthians 12: 2: I know a man in Christ who fourteen years ago was caught up to the third heaven. Whether it was in the body or out of the body I do not know --- God knows.) The three levels are: the heaven with desires, the heaven with dharma, and the heaven without dharma. The heaven with desires is the lowest and the heaven without dharma is the highest. Buddhism's goal is getting out of the three heavens. Therefore, Buddhism achievers, including Buddha, Bodhisattva, and Arhat, are above three heavens. Each heaven is further divided into three levels. Therefore, there are nine levels of heavens in total. Chan's

realm, Samādhi, does not exist in the heaven with desires. Actually, the heavens of four Dhyanas are the highest levels in the nine level heavens.

There are not so many meditators with such high achievements in the four Dhyana levels. As a matter of fact, most of the meditators are even under the lowest level of heaven with desires. It might be more meaningful and cost-effective to test one's proficiency level of meditation using more direct indicators. For example, fearlessness is one of the important psychological indicators of Chan practitioners. An often cited Chinese idiom describes the brevity as: no eye winking in front of a falling Tai Mountain (Tai Mountain is one of the highest mountains in China). Interesting stories are found in Bible as well:

- Mathew 8: 24-26: Without warning, a furious storm came up on the lake, so that the waves swept over the boat. But Jesus was sleeping. The disciples went and woke him, saying, "Lord, save us! We're going to drown!" He replied, "You of little faith, why are you so afraid?"
- Mathew 14: 29-30: Then Peter got down out of the boat, walked on the water and came toward Jesus. But when he saw the wind, he was afraid and, beginning to sink, cried out, "Lord, save me!" Immediately Jesus reached out his hand and caught him. "You of little faith," he said, "why did you doubt?"

The above stories indicate that fear is linked to doubt. As a matter of fact, one is afraid when he loses confidence in his destiny. A good Chan practitioner should be affirmed of his destiny and can control his way of passing away. As Patriarch Bai Zhang said: "Coming back from and going forth to death is like door's opening." This is attested by the fact that almost all of the Chan masters passed away and entered Nirvana in a sitting position, sometimes while talking and laughing. Doubting is one of the most harmful barriers in spiritual lives as well as Chan practice. As Buddhism scripture says: Belief is the origin of the way and the mother of good deeds, for it constantly fosters all characteristics of virtue.

Would putting testers on a roller coaster be an easy way to find a clue about how good the testers are in Chan?

We can find ways to test other Chan personalities as well.

Chan Fitness

We want to point out that Chan can be cultivated not just in medicine, but in fitness and sports as well. As a matter of fact, the world famous Shaolin martial arts came from Chan. When coming to China, Bodhidharma firstly met Emperor Wu of the southern Liang Dynasty and found that, even Emperor Wu was extremely zealous in Buddhism and had built a lot of temples, he could not understand Chan. Then Bodhidharma went to Shaolin Temple and sat in front of a wall for nine years. After long sitting, a meditator usually needs to exercise his body to resume its functionalities. Bodhidharma developed some forms to exercise his body and these forms became Shaolin martial arts. Shaolin martial arts are still being practiced nowadays in Shaolin Temple as a tradition.

Shaolin martial arts emphasizes on the harmony between one's mentality and his body. The training of the movements is at the same time a training of one's mind. As the Shaolin motto says: Stand like a pine; sit like a bell; sleep like a bow.

There is an old Chinese pet phrase, "World's martial arts come from Shaolin." Shaolin martial arts fostered the origination of other martial art schools in China, which disseminated to the nearby countries such as Japan, Korea and Vietnam and became other martial art schools.

Meditation was an important part of the martial art training in old days. However, this tradition is no longer followed in martial art centers nowadays. To keep the essence of martial art trainings, it is necessary to resume the practice of meditation in martial arts.

Meditation can be used in other fitness programs as well.

Chan Arts

Free style rhyme verses are often used in Buddhism scriptures to enhance expressivity. Rhyme verses were especially frequently used in preaching and arguments in Chan schools. Since Chan endeavors an experiential acquisition of the prajna, and this experience is beyond wording, expressing a meaning directly in words is a taboo in Chan. There are a lot of records of Chan sayings, most of which are in the form of arguments. They are hard to understand because they were about the state of mind and did not follow any logic. Sometimes Chan masters used actions to express what they were saying. They may shout, whip with a stick, smack, snatch nose, do a tumble wheel, or just be silent. Rhyme verses were often used because this form of expression fits well for Chan. When a Chan practitioner suddenly acquired the prajna, he may utter some rhyme verses instantly out of his enlightenment. One story is as follows.

Monk Shuiliào from Hong Zhou visited Ma Zhu and asked: “What is the purpose of Bodhidharma’s coming from the West?” Ma Zhu said: “Show your formality!” When Shuiliào bowed down, Ma Zhu instantly kicked him over by the chest. Shuiliào suddenly understood (the prajna). He stood up, laughing and clapping his hands, and said (in rhyme): “Amazing! Amazing! Countless Samādhi’s and immeasurable senses, all are perceived at the tip of a hair, and the origin of Dharma is captured.” He saluted Ma Zhu and left. He became the abbot of another temple.

In addition to free style rhyme verses, there are a lot of Chan poems, written in strict classic poetry format. Chan poems are brief, clever, and enlightening. They never feed readers with any emotions or unnecessary trivial stuffs. The following is one of them. It revealed the author’s love of a free life and the nature.

摧殘枯木倚寒林，	Living along a cold forest when trees were beaten by the weather,
几度逢春不变心。	My heart has not changed through many years.
樵客遇之犹不顾，	Even a wood hunter would not look at me,
郢人那得苦追寻。	Why did my old friend track me so hard?
一池荷叶衣无尽，	In a pond of the leaves of water lotus, I never worried about clothing,
数树松花食有余。	With the flowers of a few pine trees, my food was abundant.
刚被世人知住处，	Once being detected of my place by people,
又移茅舍入深居。	I further moved my cabin into the depth of the woods.

There are also a lot of Chan drawing pieces along the history of Chan. Similar to Chan poems, Chan drawings are brief and straightforward. They deliver the meaning directly without decorative details. Sometimes the meaning is beyond the domain of language and has to be communicated with extra sensory perception (Huai Li, 1989). Figure 2 is a drawing with Chan flavor.



Figure 2. Bodhidharma crossing the river on reed.

Generally speaking, Buddhism does not encourage the use of music because most of the music pieces are emotional. However, calm and lightening music is used in worships. In recent Yoga, Qigong, and Taichi practices, music is frequently used in meditation to help concentrate the mind. However, there is no record showing that music was used in Chan. As a side note, mythical theory about music existed in China's history in which music was said to have spiritual power. While Western music theory experts think that the Chinese five notes music system is less mature system, compared to the common seven notes system, an alternate view is that the Chinese five music notes are corresponding to the five basic elements of the universe. In Chinese five notes system, the intervals between two adjacent notes are all whole steps. Some advocators of Chinese music believe that music in Chinese system is "wholesome", i.e., without downcast emotions, while music in the Western seven notes system is often grieving because of the use of half steps.

Chan's life is fully down-to-the-earth real life. As the sixth patriarch Hui Neng said: "Buddhism is in the world, awareness of truth is not apart from the world." A life full of Chan should be enlightening, joyful, free of worries, compassionate, and encouraging. Its spirit can be manifested in any form of arts, not limited to certain forms discussed above.

On the other hand, no matter of its incarnation, the art of Chan should reflect the spirit of Chan. With the development of the science on Chan, we can imagine applying scientific scrutiny on art works to determine whether an art work is healthy. There are a lot of art and literature works that are deemed excellent but not helpful to people's lives. Two notable examples are Ernest Hemingway and Yasunari Kawabata. They both are Nobel literature prize winners and they both committed suicide. As a matter of fact, there are a lot of famous writers who committed suicide in the history of many countries, e.g., the most reputable poet Qu Yuan and Li Bai in Chinese history. As an idiom says, "Ability in essay is hatred to one's life." Chan Master Geng Yun said: "Writers should learn Buddhism." (Geng Yun, 1989a)

Chan in Modern Society

One may want to examine how Chan can be suited in the modern society. In the history, Chan's life was often featured by the love of freedom and the nature and a life in isolated places, although there were quite a few counter examples, such as Chan Master Dao Ji, who lived in the cloud of people in downtown areas, drinking and eating meats. He was said to hide his real position as a Bodhisattva by his disobeying monk's caution rules in order to mix among people and help people with his spiritual powers. There are a lot of stories about how he helped poor and oppressed people and persuaded people to do good deeds. Although Chan's practice encourages a simple and isolated living style, a lot of Chan masters lived in noisy areas to train their mind power of self-control. Influenced by monks' lives, a lot of officials and scholars in Chinese history chose to lead a period of isolated life to accomplish a scholarly work or pursue spiritual goals. However, there was an idiom: "Small isolation is in mountain; big isolation is in town."

With the advancement of communication technologies, modern societies are getting more and more cyber-fused. Instantaneous information propagation creates a flow of information around each person. Abundance in material supplies has enriched people's lives. While this abundance allows for more choices for people, it brings hardships in that more and more things must be obtained by effort instead of be given as before. Therefore, people are leading busier and busier lives. Span of attentions is getting shorter. More and more problems have been created because of the exposure to all sorts of media.

Scholar Zizhu Dong used the mesh of Mouni pearls to describe the phenomena of this cyber-fused world. (Dong, 2007) The mesh of Mouni pearls is described in Buddhism scriptures. A Mouni pearl reflects the lights of all other Mouni pearls in the mesh. In the modern society, any individuals are no longer isolable from the group. Dong further suggested that modern communication technologies, such as TV, Internet, and portable phones, are modern incarnation of so-called "miracles" in religions.

While the chaotic modern society makes isolated spiritual training harder, it does help people to get rid of the perplexity about spiritual powers, such as "vision", "miracle", and "sign". Such perplexity was a heavy blocker on the road to Chan and it cost a lot of effort of Chan Masters to remove it from Chan apprentices. Nowadays, people have a much more true view of the cosmic and human themselves. Chan practitioners no longer need sophisticated theory to satisfy their curiosity about the world and remove their persistent pursuit of ontology outside their minds. We can give Chan a psychological definition and use technologies to assist the Chan practice. And we can take the advantages of the modern communication technologies to form e-Health communities in which people can exchange information and help one another. Such advantages were not possible in older days.

Chan ought to revive and benefit the world.

Chan and e-Health communities

Various Chan communities exist nowadays. Generally speaking, there are three types of Chan communities:

- Chan communities formed by a leading Chan master;
- Chan communities formed by an organization or a group;
- Chan communities formed via online communications.

Almost all Chan communities have a web site for discussion and blogging. However, the first two types of communities originate as a group of people sharing the same interest. Their web sites are

either used to advertise their presence or as a communication channel among dispersed group members. In the following, we will give a brief introduction to some of the Chan communities.

An Hsiang Ch'an (<http://eg.anhsiangchan.org/>): An Hsiang Ch'an was started by a Taiwan Chan master Geng Yun. (Geng Yun, 1989b) In his famous essay "Beauty of An Hsiang", Geng Yun defined An Hsiang as the presence of Dharma, the life of Chan, and the right perception of Dharma. In other words, An Hsiang is the state of acquiring the prajna. Literally, "An Hsiang" in Chinese means a stable, calm, and balanced mind state. Geng Yun used An Hsiang to describe the state of mind Chan is achieving.

An Hsiang Ch'an had broad impact to Chan practitioners in Taiwan and mainland China. Geng Yun organized the Foundation of Geng Yun Ch'an, which was very active in 1990's. After Geng Yun passed away in 2000, An Hsiang Ch'an still maintains its organizations in Taiwan. Its disciples are still active in Asia and Pacific areas.

Modern Ch'an: Modern Ch'an was another Chan campaign originated in Taiwan. Chan master Yuansong Li, with over 20 years of Chan practice, started "Modern Ch'an" sect in 1999. He, too, initiated the Culture and Education Foundation of Modern Ch'an. In his book "How people in modern society learn Ch'an.", Yuansong Li tried to convey Chan, its concepts and methods, in modern terminologies. (Li, 1995) Some of the ideas were contradictory to accepted notions. For example, he thought that people can enter Chan with sexual desires and he implied that acquiring prajna is an easy process that everybody can afford. His theory was rejected by a lot of Buddhists and his sect was regarded as a heresy.

In 2003, Yuansong Li contracted cancer and found that his Chan mastery could not help him in fighting against disease. He realized that some of his theory was not correct and wrote a letter of apology to the public, and he persuaded people to turn to the Pure Land school of Buddhism for a blessed destiny after death.

Shaolin Temple Family (<http://www.shaolin.org.cn/en/index.aspx>): with its reputation in Chan and martial arts community, Shaolin Temple leads a community of Chan and martial arts practitioners. Shaolin Temple publishes a Chan magazine "Chan Dews" and hosts a forum among the readers. Shaolin temples in other countries have been built and international cultural exchange activities are promoting Chan practices all around the world.

Zen Centers (http://iriz.hanazono.ac.jp/zen_centers/country_list_e.html): Originated in Japan, Zen centers are now present in 67 countries around the world. In the US, every state has Zen centers. Each Zen center has its own web site and community. Members can subscribe newsletters and join the online forum. Zen centers provide venue for group meditation. Art works, such as greeting cards, are also posted at the web sites. Words from Zen masters often advise practitioners to apply Zen principles to every day lives.

Chan Breeze under the Pine (松下禅风, <http://q.163.com/songxiachanfeng/forum/column/0/>): This is a Chinese online Chan community whose members are mainly lay Chan practitioners. Its free style blogging facility allows for active communication among the members. Topics of conversation include Chan, poetry, arts, charity, story telling, announcements, etc. Experienced members take turn to be the circle leader.

Chinese Study Archives (国学数典, <http://bbs.gxsd.com.cn/>): This is a web site for communication about traditional Chinese studies, including Confucianism, Taoism, Buddhism, philosophy, and history. Members can freely exchange information, literature pieces, and ideas in the blog. Because of the historical liaison among Confucianism, Taoism, and Buddhism in China, Chan is also one of the themes of discussions.

The above listing is only a small portion of Chan communities in the world. Chan may be still a perplexing term to many people, it is like a beautiful story that lingers in the hearts of people, or a magnetic stone that attracts the attention of those who are seeking the ultimate goal of lives. With the advancement of modern communication technologies, it is right time to establish online communities for scientific studies of Chan. Such communities are still rarely seen. Probably the first scientific Chan communities will be on healthcare and medicine, which is also the area where the efficacy of Chan can be clearly verified and the benefits are clearly seen.

FUTURE RESEARCH DIRECTIONS

Although clinic studies of alternative medicines including meditation are present in the literature, more systematic studies are still in need. The ideas presented in this paper have to be refined and incorporated in clinic and/or laboratory procedures to be fully scientific. Interdisciplinary collaborations will be sought to promote science on Chan.

CONCLUSION

Through thousands years of practice, Chan is tested to be a superior mental training methodology and it is religious neutral and middle way. Its effect, however, is beyond the scope of any theoretical studies. Meditation is the primary way of Chan and there are clearly expounded methods for meditation. Chan pursues a mentality of full freedom and enlightenment. With the advancement of modern experimental technologies, the effect of Chan is measurable and meditations have been studies in clinics. However, systematic science on Chan is still yet to be established. Various models exist and can be used in systematic studies of meditation. Modern societies will benefit from Chan practices. In addition to existing Chan communities, networks of scientific studies on Chan and online healthcare systems using Chan should be established.

REFERENCES

- Biegler, K.A., Chaoul, M.A., & Cohen, L. (2009). Cancer, cognitive impairment, and meditation. *Acta Oncol*, 48(1), 18-26.
- Bodhidharma. (Tang Dynasty). *On breaking forms*. Maju Literature and Education Foundation, Co. Ltd.
- Chinese-English Bible. (1989). Hymnody and Bible House.
- Cella, D.F., Tulsky D.S., Gray, G., et al. (1993). The functional assessment of cancer therapy scale: development and validation of the general measure. *J Clin Oncol*, 1993(11), 570-579.
- Dong, Z. (2007). *Eastern Interpretation of Bible*. Wuhan, China: People's Publishing House of Wuhan.
- Geng Yun. (1989a). Tides watching jottings. *Chan*, 1989(3), 34-38. (in Chinese)
- Geng Yun. (1989b). *Collections of An Hsiang --- Chan talks of Mr. Geng Yun*. Beijing, China: Three Joint Publishing House. (in Chinese)
- Habermann, T.M., Thompson, C.A., LaPlant, B.R., Bauer, B.A., Janney, C.A., Clark, M.M., Rummans, T.A., Maurer, M.J., Sloan, J.A., Geyer, S.M., & Cerhan, J.R. (2009). Complementary and alternative medicine use among long-term lymphoma survivors: a pilot study. *Am J Hematol*, 84(12), 795-798.

- Huai Li. (1989). Chan and the art of drawing. *Chan*, 1989(2), 42-43. (in Chinese)
- Hui Neng. (Tang Dynasty). *Tan scriptures of the six patriarch*.
- Lengacher, C.A., Johnson-Mallard, V., Post-White, J., Moscoso, M.S., Jacobsen, P.B., Klein, T.W., Widen, R.H., Fitzgerald, S.G., Shelton, M.M., Barta, M., Goodman, M., Cox, C.E., & Kip, K.E. (2009). Randomized controlled trial of mindfulness-based stress reduction (MBSR) for survivors of breast cancer. *Psychology*, 18(12), 1261-1272.
- Li, L.(2006). Re-thinking about culture and ministry --- a historical view. *Blessings*, 6(2), 1-4.
- Li, Y. (1995). *How people in modern society learn Ch'an*. Beijing, China: China Friendship Publishing Company.
- Loizzo, J.J., Peterson, J.C., Charlson, M.E., Wolf, E.J., Altemus, M., Briggs, W.M., Vahdat, L.T., & Caputo, T.A. (2010). The effect of a contemplative self-healing program on quality of life in women with breast and gynecologic cancers. *Altern Ther Health Med*, 16(3), 30-37.
- McNair, D., Lorr, M., & Droppleman, L. (1992). *Profile of mood status (revised)*. EdITS/Educational and Industrial Testing Services, San Diego, CA.
- Mruk, C.J., & Hartzell, J. (2003). *Zen & Psychotherapy: Integrating Traditional and Nontraditional Approaches*. New York: Springer Publishing Company.
- Nan, H. (1993). *Chan School and Taoism*. Shanghai, China: Fudan University Press.
- Oh, B., Butow, P., Mullan, B., & Clarke, S. (2008). Medical Qigong for cancer patients: pilot study of impact on quality of life, side effects of treatment and inflammation. *Am J Chin Med*, 36(3), 459-472.
- Su, Y. (Ed.). (1984). Pu Ji (Song Dynasty), *Collections from five lamps*. Beijing, China: China Publishing House.
- Suzuki, D.T. (1959). *Zen and Japanese Culture*, New York: Pantheon Books.
- Suzuki, D.T., Fromm, E., & De Martino, R. (1970). 1st Harper Colophon (ed.), *Zen Buddhism and Psychoanalysis*. New York: Harper & Row.
- Zhi Kai (Sui Dynasty). Ma, R. (Translation and Annotation) (1995). *Translation and Annotations of <<Essentials of Meditation>>*. Wang, M. (ed.) Series of Chinese secret archives of life caring. Beijing, China: Beijing Science and Technology Press.

OPTIMIZATION OF ELECTRICAL ENERGY AT BATUTEGI DAM, LAMPUNG PROVINCE OF INDONESIA

Anggara WWS

Department of Water Resources,
Faculty of Engineering,
Brawijaya University, Malang,
INDONESIA

Lily Montarcih

Department of Water Resources,
Faculty of Engineering,
Brawijaya University, Malang,
INDONESIA
lilymont2001@yahoo.com,

ABSTRACT

This paper studied optimization electrical energy. Site of study was at Batutegi Dam, Lampung Province of Indonesia. The methodology consisted of optimization energy using dynamic programming. Mathematically, dynamic programming was used to solve any kinds of non linear constraint and objective function. Results could be used as consideration of operating electrical power in this location.

Keywords: electrical energy, dynamic programming

INTRODUCTION

The issue of water resources estimation and use had long been of particular scientific importance, but now it acquired extremely acute social and political character (Shiklomadov et al., 2011). The issue was especially urgent in the context of considerable economics transformation and changed in river run off. This was due, on the other hand, to the increasing role of anthropogenic factors associated with water consumption by the population, industry, energy, and agriculture, and, on the other hand, to change to global and regional climate. Analysis of changes in the characteristics of water resources and their use with the consideration of possible economic trends in the country and climate conditions was used to forecast water use and water availability.

Droughts influenced the planning and design of water supply infrastructure and inflicted considerable economic and social damage worldwide. Their frequent and irregular occurrence had been a prime reason for the planning and construction of water resources infrastructure intended to increase the reliability of water supply in drought-prone areas. Compounding the task of water planning for drought abatement, present-day climate simulation capabilities did not permit reliable long-range forecasting (Loaiciga, 2005)

Watershed restoration efforts had sought to balance poverty alleviation against conservation, and local governance vs technical expertise. The potential for institutionalized mistakes in water planning by examining common guidelines for watershed managements were released by any government in the world. The daily lives of millions people in the world depended directly on functioning watersheds providing drinking water, irrigation, energy, groundwater recharge, and other usages. Mistakes in watershed prioritization and planning could have serious local ramifications. When such mistakes were institutionalized on a national scale, the results could be tragic (Bhalla et al., 2011).

CONTEXT AND REVIEW OF LITERATURE

Hydro electrical power and energy

Generated power of hydro electrical power was analysis using the formula as follow (Arismunandar and Kuwahara, 1991):

$$P = 9,81 \times Q \times H_{\text{eff}} \times \text{Eff} \dots\dots\dots(1)$$

Note

P = generated power (kW)

H = effective head (m)

H_{eff} = electrical generated discharge (m^3/s)

$$E = P \times 24 \times n \dots\dots\dots(2)$$

Note

E = energy (lWh)

P = power (kW)

n = number of days in a periode (hour)

Weibull Method (Montarcih, 2010)

$$P(X_m) = \frac{m}{N+1} \dots\dots\dots(3)$$

Note

$P(X_m)$ = probability of design rainfall

N = number of rainfall observed data.

m = rank of accident

Dynamic Programming (Soetopo and Montarcih, 2009)

Elements of dynamic programming was descibed as Figure 2

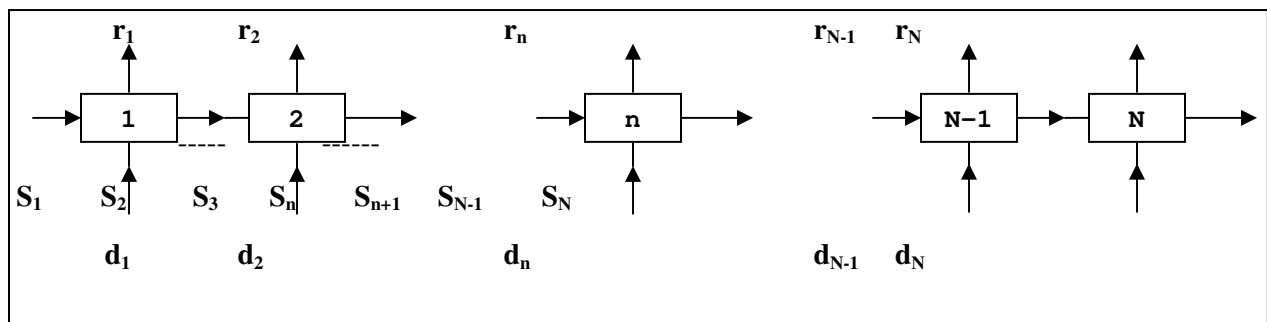


Figure 2 Elements of Dynamic Programming

Formulation of forward recursive:

$$f_n^*(S_n) = \underset{d_n}{\text{opt}} [r_n(S_n, d_n) + \underset{d_{n+1}}{\text{opt}} f_{n+1}^*(S_{n+1})] \dots\dots\dots (4)$$

Formulation of backward recursive:

$$f_n^*(S_n) = \underset{d_n}{\text{opt}} [r_n(S_n, d_n) + \underset{d_{n+1}}{\text{opt}} f_{n+1}^*(S_{n+1})] \dots\dots\dots (5)$$

METHODS

Location of study was at Center Lampung Regency, Lampung Province of Indonesia.. Site of location was as Figure 1. The methodologies were consisted of 1) collection of data (discharge, electrical plant), 2) analysis of dependable discharge; 3) analysis of optimized electrical energy. Technical data of Batutegi Dam Was described as Table 1 below. Initial state of reservoir was as Table 2.

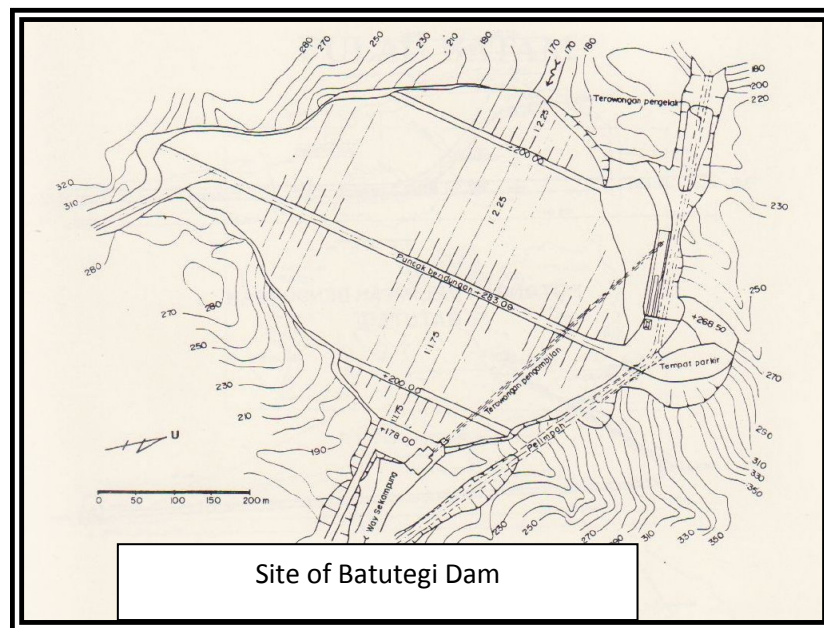


Figure 1 Site of Location Study

Table 1 Technical data of Batutegi Dam

No	Data of Batutegi reservoir	Volume	Unit
1	Area of still water	= 21	Km ²
2	Flood water level	= + 281.5	m
3	Normal water level	= + 274	m
4	The lowest water level	= + 226	m
5	Bruto capacity of reservoir	= 6,900,E+08	m ³
6	Minimum capacity of reservoir	= 9,000,E+07	m ³
7	Effective capacity of reservoir	= 6,000,E+08	m ³
8	Height of dam	= 120	m
9	Capacity of spillway	= 1,93	m ³ /s
10	Capacity of turbine	= 29,76	MW
11	Effective head	= 90	m

Table 2 Initial state of reservoir

0	(0% of effective reservoir)	90.000.000	m ³
1	(20% of effective reservoir)	192.000.000	m ³
2	(40% of effective reservoir)	294.000.000	m ³
3	(60% of effective reservoir)	396.000.000	m ³
4	(80% of effective reservoir)	498.000.000	m ³
5	(100% of effective reservoir)	600.000.000	m ³

FINDINGS AND DISCUSSIONS

Inflow used in this analysis was dependable discharge. Dependable discharge with 80% of probability was described as Table 3 below.

Table 3 Dependable discharge with 80% of probability

Month	Q (m ³ /s)
Jan	7,9925
Feb	12,2995
Mar	15,1035
Apr	12,7735
May	12,97
Jun	6,7205
Jul	4,671
Aug	7,2095
Sep	4,138
Oct	2,9715
Nov	3,757
Dec	5,6575

Stages of dynamic programming in this case were months of the year. The simulation was carried out every month from Januari to December as described as Table 4 to 15 below'

Note for Table 4 to 15:

Tahap = stage

Saktif, Debit PLTA, Efisiensi, Energi = Saktive, hydropower discharge, efficiency, energy

Tamp awal = initial of reservoir, Tamp akhir = end of reservoir

Keputusan = decision

m³/dt = m³/s, sumber: perhitungan = source: analysis

Januari = Jan, Februari = Feb, Maret = Mar, April = Aprm Mei = May, Juni = Jun, Juli = Jul, Agustus =

Aug, September = Sep, Oktober = Oct, Nopember = Nov, desember = Dec

Table 4 Simulation of January

Tahap 1 (Januari) Inflow = 7,99 m³/dtk

Saktif,Debit PLTA, Efisiensi, Energi																									
Tamp.	Tamp. Awal	Tampungan Akhir																							
Awal	+ inflow	90000000				192000000				294000000				396000000				498000000				600000000			
6,000.E+08	6,214.E+08	5,31.E+08	198,405	0,85	148743,99	4,29E+08	160,322	0,85	120193,6	3,27E+08	122,240	0,85	91643,187	2,25E+08	84,157	0,85	63092,784	1,23E+08	46,075	0,85	34542,38048	2,14E+07	7,993	0,85	5991,9773
Maksimum					148743,99				120193,6				91643,187				63092,784				34542,38048				5991,9773
Keputusan					6,00E+08				6,00E+08				6,00E+08				6,00E+08				6,00E+08				6,00E+08

Sumber: Hasil Perhitungan

Table 5 Simulation of February

Tahap 2 (Februari) Inflow = 12,30 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																				
Tamp.	Tamp. Awal	Tampungan Akhir																		
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000			
9,000.E+07	1,229.E+08	3,29.E+07	13,617	0,85	158952,88															148743,99
1,920.E+08	2,249.E+08	1,35.E+08	55,780	0,85	162011,86	3,29E+07	13,617	0,85	10208,89											120193,59
2,940.E+08	3,269.E+08	2,37.E+08	97,943	0,85	165070,83	1,35E+08	55,780	0,85	41818,27	3,29E+07	13,617	0,85	10208,892							91643,19
3,960.E+08	4,289.E+08	3,39.E+08	140,105	0,85	168129,8	2,37E+08	97,943	0,85	73427,64	1,35E+08	55,780	0,85	41818,267	3,29E+07	13,617	0,85	10208,892			63092,78
4,980.E+08	5,309.E+08	4,41.E+08	182,268	0,85	171188,77	3,39E+08	140,105	0,85	105037	2,37E+08	97,943	0,85	73427,642	1,35E+08	55,780	0,85	41818,267	3,29E+07	13,617	34542,38
6,000.E+08	6,329.E+08	5,43.E+08	224,431	0,85	174247,74	4,41E+08	182,268	0,85	136646,4	3,39E+08	140,105	0,85	105037,02	2,37E+08	97,943	0,85	73427,642	1,35E+08	55,780	10208,892
Maksimum					174247,74				136646,4				105037,02				73427,642			41818,26749
Keputusan					6,00E+08				6,00E+08				6,00E+08				6,00E+08			6,00E+08

Sumber: Hasil Perhitungan

Table 6 Simulation of March

Tahap 3 (Maret) Inflow = 15,10 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																				
Tamp.	Tamp. Awal	Tampungan Akhir																		
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000			
9,000.E+07	1,305.E+08	4,05.E+07	15,104	0,85	185570,84															174247,74
1,920.E+08	2,325.E+08	1,42.E+08	53,186	0,85	178519,89	4,05E+07	15,104	0,85	11323,09											136646,39
2,940.E+08	3,345.E+08	2,44.E+08	91,268	0,85	173460,92	1,42E+08	53,186	0,85	39873,5	4,05E+07	15,104	0,85	11323,094							105037,02
3,960.E+08	4,365.E+08	3,46.E+08	129,351	0,85	170401,95	2,44E+08	91,268	0,85	68423,9	1,42E+08	53,186	0,85	39873,497	4,05E+07	15,104	0,85	11323,094			73427,64
4,980.E+08	5,385.E+08	4,48.E+08	167,433	0,85	167342,97	3,46E+08	129,351	0,85	96974,3	2,44E+08	91,268	0,85	68423,9	1,42E+08	53,186	0,85	39873,497	4,05E+07	15,104	41818,27
6,000.E+08	6,405.E+08	5,50.E+08	205,516	0,85	164284	4,48E+08	167,433	0,85	125524,7	3,46E+08	129,351	0,85	96974,304	2,44E+08	91,268	0,85	68423,9	1,42E+08	53,186	11323,094
Maksimum					185570,84				125524,7				96974,304				68423,9			39873,49716
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08			6,00E+08

Table 7 Simulation of April

Tahap 4 (April)

Inflow = 12,77 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																				
Tamp.	Tamp. Awal	Tampungan Akhir																		
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000			
9,000.E+07	1,231.E+08	3,31.E+07	12,774	0,85	195147,13															185570,84
1,920.E+08	2,251.E+08	1,35.E+08	52,125	0,85	164603,08	3,31E+07	12,774	0,85	9576,293											125524,71
2,940.E+08	3,271.E+08	2,37.E+08	91,477	0,85	165554,76	1,35E+08	52,125	0,85	39078,376	3,31E+07	12,774	0,85	9576,293							96974,30
3,960.E+08	4,291.E+08	3,39.E+08	130,829	0,85	166506,44	2,37E+08	91,477	0,85	68580,46	1,35E+08	52,125	0,85	39078,376	3,31E+07	12,774	0,85	9576,293			68423,50
4,980.E+08	5,311.E+08	4,41.E+08	170,181	0,85	167458,12	3,39E+08	130,829	0,85	98082,54	2,37E+08	91,477	0,85	68580,46	1,35E+08	52,125	0,85	39078,376	3,31E+07	12,774	39673,50
6,000.E+08	6,331.E+08	5,43.E+08	209,533	0,85	168409,8	4,41E+08	170,181	0,85	127584,6	3,39E+08	130,829	0,85	98082,54	2,37E+08	91,477	0,85	68580,46	1,35E+08	52,125	11323,09
Maksimum					195147,13				127584,6				98082,54				68580,46			9576,293
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08			6,00E+08

Sumber: Hasil Perhitungan

Table 8 Simulation of May

Tahap 5 (Mei)

Inflow = 12,97 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																				
Tamp.	Tamp. Awal	Tampungan Akhir																		
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000			
9,000.E+07	1,247.E+08	3,47.E+07	12,970	0,85	204870,74															195147,13
1,920.E+08	2,267.E+08	1,37.E+08	51,052	0,85	165858,64	3,47E+07	12,970	0,85	9723,609											127584,63
2,940.E+08	3,287.E+08	2,39.E+08	89,135	0,85	164906,96	1,37E+08	51,052	0,85	38274,01	3,47E+07	12,970	0,85	9723,609							98082,54
3,960.E+08	4,307.E+08	3,41.E+08	127,217	0,85	163955,28	2,39E+08	89,135	0,85	66824,42	1,37E+08	51,052	0,85	38274,01	3,47E+07	12,970	0,85	9723,609			68580,46
4,980.E+08	5,327.E+08	4,43.E+08	165,300	0,85	163003,6	3,41E+08	127,217	0,85	95374,82	2,39E+08	89,135	0,85	66824,415	1,37E+08	51,052	0,85	38274,01	3,47E+07	12,970	39078,38
6,000.E+08	6,347.E+08	5,45.E+08	203,382	0,85	162051,92	4,43E+08	165,300	0,85	123925,2	3,41E+08	127,217	0,85	95374,819	2,39E+08	89,135	0,85	66824,415	1,37E+08	51,052	9576,29
Maksimum					204870,74				123925,2				95374,819				66824,415			9723,609
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08			6,00E+08

Sumber: Hasil Perhitungan

Table 9 Simulation of June

Tahap 6 (Juni)

Inflow = 6,72 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																				
Tamp.	Tamp. Awal	Tampungan Akhir																		
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000			
9,000.E+07	1,074.E+08	1,74.E+07	6,721	0,85	209909,1															204870,74
1,920.E+08	2,094.E+08	1,19.E+08	46,072	0,85	158465,66	1,74E+07	6,721	0,85	5038,359											123925,22
2,940.E+08	3,114.E+08	2,21.E+08	85,424	0,85	159417,34	1,19E+08	46,072	0,85	34540,44	1,74E+07	6,721	0,85	5038,3589							95374,82
3,960.E+08	4,134.E+08	3,23.E+08	124,776	0,85	160369,02	2,21E+08	85,424	0,85	64042,53	1,19E+08	46,072	0,85	34540,442	1,74E+07	6,721	0,85	5038,3589			68824,42
4,980.E+08	5,154.E+08	4,25.E+08	164,128	0,85	161320,7	3,23E+08	124,776	0,85	93544,61	2,21E+08	85,424	0,85	64042,526	1,19E+08	46,072	0,85	34540,442	1,74E+07	6,721	38274,01
6,000.E+08	6,174.E+08	5,27.E+08	203,480	0,85	162272,38	4,25E+08	164,128	0,85	123046,7	3,23E+08	124,776	0,85	93544,609	2,21E+08	85,424	0,85	64042,526	1,19E+08	46,072	9723,61
Maksimum					209909,1				123046,7				93544,609				64042,526			5038,3589
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08			6,00E+08

Sumber: Hasil Perhitungan

Table 10 Simulation of July

Tahap 7 (Juli)

Inflow = 4,67 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																			
Tamp.	Tamp. Awal	Tampungan Akhir																	
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000		
9,000.E+07	1,025.E+08	1,25.E+07	4,671	0,85	213410,95	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671
1,920.E+08	2,045.E+08	1,15.E+08	42,753	0,85	155098,94	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671
2,940.E+08	3,065.E+08	2,17.E+08	80,836	0,85	154147,26	1,15.E+08	42,753	0,85	32052,25	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671
3,960.E+08	4,085.E+08	3,19.E+08	118,918	0,85	153195,58	2,17.E+08	80,836	0,85	60602,66	1,15.E+08	42,753	0,85	32052,252	1,25.E+07	4,671	0,85	3501,849	1,25.E+07	4,671
4,980.E+08	5,105.E+08	4,21.E+08	157,001	0,85	152243,9	3,19.E+08	118,918	0,85	89153,06	2,17.E+08	80,836	0,85	60602,655	1,15.E+08	42,753	0,85	32052,252	1,25.E+07	4,671
6,000.E+08	6,125.E+08	5,23.E+08	195,083	0,85	151292,22	4,21.E+08	157,001	0,85	117703,5	3,19.E+08	118,918	0,85	89153,058	2,17.E+08	80,836	0,85	60602,655	1,15.E+08	42,753
Maksimum					213410,95				117703,5				89153,058				32052,25193		3501,849
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08		6,00E+08

Table 11 Simulation of August

Tahap 8 (Agustus)

Inflow = 7,21 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																			
Tamp.	Tamp. Awal	Tampungan Akhir																	
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000		
9,000.E+07	1,093.E+08	1,93.E+07	7,210	0,85	218815,91	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210
1,920.E+08	2,113.E+08	1,21.E+08	45,292	0,85	247366,31	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210
2,940.E+08	3,133.E+08	2,23.E+08	83,374	0,85	151658,83	1,21.E+08	45,292	0,85	33955,37	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210
3,960.E+08	4,153.E+08	3,25.E+08	121,457	0,85	151658,83	2,23.E+08	83,374	0,85	62505,77	1,21.E+08	45,292	0,85	33955,365	1,93.E+07	7,210	0,85	5404,962	1,93.E+07	7,210
4,980.E+08	5,173.E+08	4,27.E+08	159,539	0,85	151658,83	3,25.E+08	121,457	0,85	91056,17	2,23.E+08	83,374	0,85	62505,769	1,21.E+08	45,292	0,85	33955,365	1,93.E+07	7,210
6,000.E+08	6,193.E+08	5,29.E+08	197,622	0,85	151658,83	4,27.E+08	159,539	0,85	119606,6	3,25.E+08	121,457	0,85	91056,172	2,23.E+08	83,374	0,85	62505,769	1,21.E+08	45,292
Maksimum					247366,31				119606,6				91056,172				33955,36538		5404,9621
Keputusan					1,92E+08				6,00E+08				6,00E+08				6,00E+08		6,00E+08

Sumber: Hasil Perhitungan

Table 12 Simulation of September

Tahap 9 (September)

Inflow = 4,14 m³/dtk

Saktif, Debit PLTA, Efisiensi, Energi																			
Tamp.	Tamp. Awal	Tampungan Akhir																	
Awal	+ inflow	90000000			192000000			294000000			396000000			498000000			600000000		
9,000.E+07	1,007.E+08	1,07.E+07	4,138	0,85	250468,57	1,07.E+07	4,138	0,85	3102,259	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138
1,920.E+08	2,027.E+08	1,13.E+08	43,490	0,85	152210,92	1,07.E+07	4,138	0,85	3102,259	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138
2,940.E+08	3,047.E+08	2,15.E+08	82,842	0,85	153162,6	1,13.E+08	43,490	0,85	32604,34	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138
3,960.E+08	4,067.E+08	3,17.E+08	122,194	0,85	154114,28	2,15.E+08	82,842	0,85	62106,43	1,13.E+08	43,490	0,85	32604,342	1,07.E+07	4,138	0,85	3102,2586	1,07.E+07	4,138
4,980.E+08	5,087.E+08	4,19.E+08	161,545	0,85	155065,96	3,17.E+08	122,194	0,85	91608,51	2,15.E+08	82,842	0,85	62106,425	1,13.E+08	43,490	0,85	32604,342	1,07.E+07	4,138
6,000.E+08	6,107.E+08	5,21.E+08	200,897	0,85	156017,64	4,19.E+08	161,545	0,85	121110,6	3,17.E+08	122,194	0,85	91608,509	2,15.E+08	82,842	0,85	62106,425	1,13.E+08	43,490
Maksimum					250468,57				121110,6				91608,509				32604,34193		3102,259
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08		6,00E+08

Sumber: Hasil Perhitungan

Table 13 Simulation of October

Tahap 10 (Oktober)

Inflow = 2,97 m³/dtk

Saktif,Debit PLTA, Efisiensi, Energi																										
Tamp.	Tamp. Awal	Tampungan Akhir																								
Awal	+ inflow	90000000				192000000				294000000				396000000				498000000				600000000				
9,000.E+07	9,796.E+07	7,96.E+06	2,972	0,85	252696,31																				250468,57	
1,920.E+08	2,000.E+08	1,10.E+08	41,054	0,85	151888,73	7,96E+06	2,972	0,85	2227,734																	121110,59
2,940.E+08	3,020.E+08	2,12.E+08	79,136	0,85	150937,05	1,10E+08	41,054	0,85	30778,14	7,96E+06	2,972	0,85	2227,736													91608,51
3,960.E+08	4,040.E+08	3,14.E+08	117,219	0,85	149895,37	2,12E+08	79,136	0,85	59328,54	1,10E+08	41,054	0,85	30778,137	7,96E+06	2,972	0,85	2227,736									62106,43
4,980.E+08	5,060.E+08	4,16.E+08	155,301	0,85	149033,69	3,14E+08	117,219	0,85	87878,94	2,12E+08	79,136	0,85	59328,54	1,10E+08	41,054	0,85	30778,137	7,96E+06	2,972	0,85	2227,73355					32604,34
6,000.E+08	6,080.E+08	5,18.E+08	193,384	0,85	148082,01	4,16E+08	155,301	0,85	116429,3	3,14E+08	117,219	0,85	87878,943	2,12E+08	79,136	0,85	59328,54	1,10E+08	41,054	0,85	30778,13678	7,96E+06	2,972	0,85	2227,7336	3102,28
Maksimum					252696,31				116429,3				87878,943				59328,54				30778,13678				2227,734	
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08				6,00E+08				6,00E+08	

Sumber: Hasil Perhitungan

Table 14 Simulation of November

Tahap 11 (November)

Inflow = 3,76 m³/dtk

Saktif,Debit PLTA, Efisiensi, Energi																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
Tamp.	Tamp. Awal	Tampungan Akhir																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Awal	+ inflow	90000000					192000000					294000000					396000000					498000000					600000000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
9,000.E+07	9,974.E+07	9,74.E+06	3,757	0,85	255512,93																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			

Sumber: Hasil Perhitungan

Table 15 Simulation of December

Tahap 12 (Desember)

Inflow = 5,66 m³/dtk

Saktif,Debit PLTA, Efisiensi, Energi																															
Tamp.	Tamp. Awal	Tampungan Akhir																													
Awal	+ inflow	90000000					192000000					294000000					396000000					498000000					600000000				
9.000.E+07	1,052.E+08	1,52.E+07	5,658	0,85	259754,36																							255512,93			
1.920.E+08	2,072.E+08	1,17.E+08	43,740	0,85	153616,79	1,52E+07	5,658	0,85	4241,428																				120824,96		
2.940.E+08	3,092.E+08	2,19.E+08	81,822	0,85	152665,11	1,17E+08	43,740	0,85	32791,83	1,52E+07	5,658	0,85	4241,4278																91322,87		
3.960.E+08	4,112.E+08	3,21.E+08	119,905	0,85	151713,43	2,19E+08	81,822	0,85	61342,23	1,17E+08	43,740	0,85	32791,831	1,52E+07	5,658	0,85	4241,4278												61820,79		
4.980.E+08	5,132.E+08	4,23.E+08	157,987	0,85	150761,75	3,21E+08	119,905	0,85	89892,64	2,19E+08	81,822	0,85	61342,234	1,17E+08	43,740	0,85	32791,831	1,52E+07	5,658	0,85	4241,42775								32318,71		
6.000.E+08	6,152.E+08	5,25.E+08	196,070	0,85	149810,07	4,23E+08	157,987	0,85	118443	3,21E+08	119,905	0,85	89892,637	2,19E+08	81,822	0,85	61342,234	1,17E+08	43,740	0,85	32791,83098	1,52E+07	5,658	0,85	4241,4278				2816,62		
Maksimum					259754,36				118443				89892,637				61342,234				32791,83098							4241,4278			
Keputusan					9,00E+07				6,00E+08				6,00E+08				6,00E+08				6,00E+08							6,00E+08			

Sumber: Hasil Perhitungan

Electrical energy from January to December at each initial level of reservoir was described as Table 16 below

Table 16 Electrical energy at each initial level of reservoir

No	Month	Initial level of reservoir (m³)					
		90000000	19200000	294000000	396000000	498000000	600000000
		Electrical energy (kWh)					
1	Jani	148743,99	120193,5902	91643,1869	63092,7837	34542,38048	5991,97725
2	Feb	174247,7447	136646,3925	105037,017	73427,6425	41818,26749	10208,89249
3	Mar	185570,8387	125524,7069	96974,3036	68423,9004	39873,49718	11323,09395
4	Apr	195147,1316	127584,6263	98082,543	68580,4596	39078,37628	9576,29295
5	May	204870,7406	123925,2219	95374,8187	66824,4155	38274,01223	9723,609
6	Jun	209909,0995	123046,6922	93544,6089	64042,5255	34540,44218	5038,35885
7	Jul	213410,9482	117703,4616	89153,0584	60602,6552	32052,25193	3501,8487
8	Aug	247366,3136	119606,5751	91056,1718	62505,7686	33955,36538	5404,96215
9	Sep	250468,5722	121110,5919	91608,5086	62106,4253	32604,34193	3102,2586
10	Oct	252696,3057	116429,3465	87878,9432	59328,54	30778,13678	2227,73355
11	Nov	255512,9286	120824,9562	91322,8729	61820,7896	32318,70623	2816,6229
12	Dec	259754,3564	118443,0407	89892,6374	61342,2342	32791,83098	4241,42775
Max Energiy		259754,3564	136646,3925	105037,017	73427,6425	41818,26749	11323,09395

CONCLUSION

Based on analysis as aboved, it was concluded that maximum electrical energy was as follow:

1. At initial level of 90,000,000 m³ = 259,754.3564 kWh (December)
2. At initial level of 19,200,000 m³ = 136,646.3925 kWh (February)
3. At initial level of 294,000,000 m³ = 105,037.0170 kWh (February)
4. At initial level of 396,000,000 m³ = 73,427.6425 kWh (February)
5. At initial level of 498,000,000 m³ = 41,818.6279 kWh (February)
6. At initial level of 600,000,000 m³ = 11,323.09395 kWh (March)

REFERENCES

- Shiklomadov, I.A.; Babkiu, V.I.; and Balouishu;kov, Zh.A. (2011) Water Resources, Their Use, and Water Availability in Rusia: Current Estimates and Forecasts. *Journal of Water Resources* (38) no. 2, p 139-148
- Loaiciga, Hugo A (2005) On the Probability of Droughts: The Compound Renewal Model. *Journal of Water Resources Research*, Vol. 41, p 1-8
- Bhalla, R.S.; Pelkey, N.W.; and Prasad, K.V.D. (2011) Application of GIS for Evaluation and Design of Watershed Guidelines, *Journal of Water Resource Manage*, 25: 113-140
- Arismunandar, A and Kuwahara, A (1991) *Teknik Tenaga Listrik, Jilid I*, cetakan keenam. PT Pradnya Paramita, Jakarta.
- Montarcih, Lily. 2010. *Hidrologi Praktis*. CV Lubuk Agung. Bandung
- Soetopo, Widandi & Montarcih, Lily. 2009. *Manajemen Air Lanjut*. CV Citra Malang. Indonesia. 111 pages

H₂S EMISSIONS CONTROL IN INDUSTRIAL EXHAUSTS USING TiO₂ NANOPARTICLES

Naeem Shahzad
Institute of Environmental
Sciences and Engineering
(IESE), NUST,
PAKISTAN
naeem5251@hotmail.com

Dr. Syed Tajammul Hussain
National Centre for Physics,
Quaid-i-Azam University,
Islamabad,
PAKISTAN
dr_tajammul@yahoo.ca

Muhammad Anwar Baig
Institute of Environmental
Sciences and Engineering
(IESE), NUST,
PAKISTAN
ma_baig@lycos.com

ABSTRACT

The response from the industrialists in Pakistan towards environmental laws and regulations regarding air pollution is very poor. This study focuses on developing a technique for in-situ treatment of H₂S gas at high temperatures by using TiO₂ nanoparticles, so that simultaneous destruction of H₂S gas could be investigated for power generation and gasification processes and brick kilns, which are carried out at high temperatures. Initial experimental results at lab scale have shown a decrease of 95-99% in the H₂S gas concentrations. This technique is likely to help in the in-situ treatment of this malodourous toxic gas resulting in considerable abatement of air pollution in Pakistan without installing any new device or changing the existing practices of exhaust gases by the industrialists making it easy for them to comply with the environmental laws and regulations.

Keywords: TiO₂ nanoparticles, gas destruction, high temperatures, fixed bed catalyst systems

INTRODUCTION

Awareness regarding the harmful effects of air pollution is minimal in Pakistan. The industrialists and factory owners are adding to air pollution every day as they have no control on their industrial emissions which is the main cause of deteriorating air quality in our country. The magnitude of industrial air pollution cannot be assessed since there is hardly any air pollution data available in Pakistan and that too is also limited to provincial capitals only. Our country has responded well to these environmental problems by establishing environmental protection institutions, passing laws and developing human resources and technical capabilities through local and foreign assistance, but despite of all these measures many aspects of the environmental degradation have remained under regulated and uncontrolled.

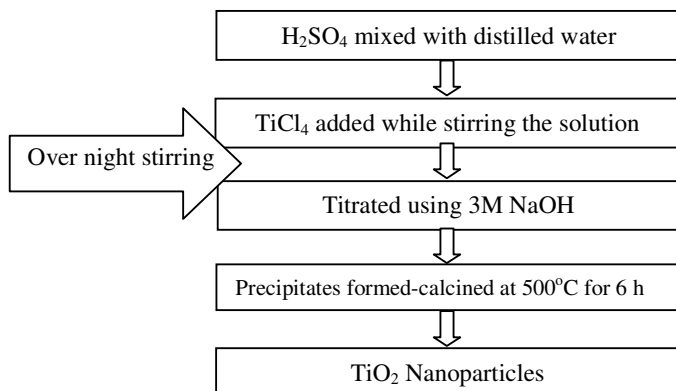
It is well known that NO_x and SO_x are the major air pollutants. A lot of research is underway for the abatement of these pollutants through out the world. Another pollutant gas that requires attention and is also of a great environmental concern is H₂S gas because of its characteristic rotten egg smell, extremely low odour threshold (0.0004 ppm) and high toxicity (Mills, 1995). 300 ppm concentrations of H₂S in air can result in death for long term exposures and concentrations upto 2000 ppm for few minutes only, may be fatal for humans (Tomar and Abdullah, 1994). H₂S levels have been found to exceed 300 ppm in 1360 wells out of the 10,652 producible oil wells in Michigan, USA (H₂S Q&A, DEQ, Michigan). If this could be the state in USA, where there are very stringent environmental protection regulations, the H₂S gas concentrations in our country near such wells could be well imagined.

Quite a number of techniques are in use for the destruction and control of H_2S gas. Some authors have investigated the photocatalytic potential of TiO_2 nanoparticles for carrying out H_2S gas phase destruction (Jardim and Huang, 1996; Maria et al., 1998). This study encompasses exploring the catalytic potential of pure and doped TiO_2 nanoparticles. The nanoparticles have been synthesized using co-precipitation method (Tajammul et al., 2009). These nanoparticles were characterized using XRD and EDX techniques and the gas samples were analyzed using GC-MS.

MATERIALS AND METHODS

Synthesis of nanoparticles

Pure and doped TiO_2 nanoparticles (sulphur doped) were synthesized using co-precipitation method (Tajammul et al., 2009) using standard chemicals and reagents. The flow chart for the synthesis process is as follows:



Characterization of nanoparticles

X-ray diffraction (XRD)

XRD patterns of the nanoparticles were recorded using Scintag XDS 2000 diffractometer having a wavelength of 1.54056 \AA . XRD analysis was carried out from 0° to 70° with a step size of 2 seconds.

Energy dispersive X-ray spectroscopy (EDX)

XRF spectra of the nanoparticles were obtained through JEOL Model JSX-3202 M energy dispersive x-ray fluorescence spectrometer.

Experiments

The catalytic reactions were carried out using fixed bed catalyst system for evaluating the H_2S gas destruction. Ar gas was used to flush the whole system before running the experiments so that residuals if any may be removed. The experimental arrangement is as shown in figure 1. The nanocatalysts (0.5 gm) were loaded in the center of the quartz tube and placed in the furnace alongwith the thermocouple. The 1st sample was taken immediately after connecting the H_2S gas cylinder, later to be used as reference.

The temperature of the furnace was gradually raised to 450°C and after one hour, another sample was taken in gas sampling tubes, which was followed by two more samples after every hour. These samples were then analysed using GC-MS. By calculating the difference in peak areas of the reference and the other three gas samples, the percentage destruction of H_2S gas is calculated.

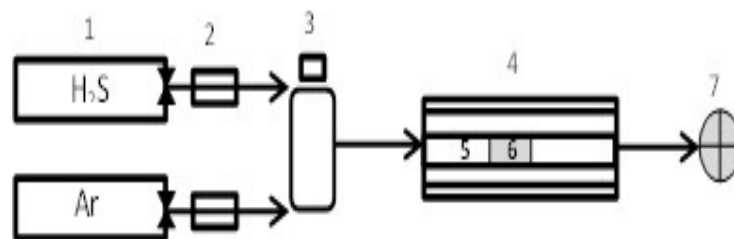


Figure 1. Experimental Set up. 1. Gas Cylinders, 2. Flow meters, 3. Wash bottle, 4. Furnace, 5. Quartz tube, 6. Catalyst, 7. Sampling port

RESULTS AND DISCUSSIONS

XRD analysis

XRD spectra of the pure and doped nanoparticles showed presence of anatase phase after confirming from the JCPDS standard files no. 21-1272. The size of the nanoparticles was found out to be 5-11 nm using Scherrer's equation.

EDX analysis

EDX analysis showed that sulphur had been adsorbed on the surface of the doped TiO_2 nanoparticles and sulphur concentration increased from 0.1-3.5% showing sulphur adsorption of 2.5% on the doped nanoparticles surface but it was negligible in the case of pure TiO_2 nanoparticles as shown in table 1 below.

Table 1. Elemental analysis

Element	Ti (ms%)	S (ms%)
Pure TiO_2 nanoparticles	100	0
Spent Sample	99.81	0.19
Doped TiO_2 nanoparticles	99.0	0.1
Spent Sample	96.5	3.5

GC-MS analysis

The destruction of H_2S gas was found out by comparing the peak areas which correspond to the gas concentrations present in the gas sampling tubes. By calculating the difference in peak areas of the reference and subsequent three gas samples for each experiment, the net destruction of H_2S gas was calculated. The H_2S gas concentrations decreased upto 95-99% in the case of the doped TiO_2 nanoparticles but it was otherwise in the case of pure nanoparticles. This was also shown by the negligible sulphur adsorption on the surface of the pure nanoparticles as well, which was not the case for doped TiO_2 nanoparticles.

The increase in H_2S peak areas in the case of pure nanoparticles could be explained as a result of catalyst deactivation. Considerable decrease in the gas peak areas for doped TiO_2 nanoparticles may have resulted due to affinity of the dopant for sulphur, which in our case was sulphur as well.

CONCLUSIONS

This study shows that there is a great potential for the destruction of H₂S gas by using doped TiO₂ nanoparticles. 95-99% destruction of H₂S gas was observed in this study, but further studies need to be carried out by varying the temperature and dopant concentrations to find out the maximum degradation efficiency using optimum dopant concentration of sulphur doped TiO₂ nanoparticles at a particular temperature. In addition, other dopants having large diameters for better adsorption of sulphur should also be explored. This study can provide a viable option for in-situ destruction of H₂S gas in the processes which are carried out at high temperatures and also, it does not require any UV or special arrangements for its reactions to proceed as explored by some of the authors for photocatalytic gas phase destruction of H₂S gas.

ACKNOWLEDGEMENT

The author gratefully acknowledges the cooperation and access to fixed bed catalyst system provided by the nanoscience and catalysis division labs of National Centre for Physics, Islamabad, Pakistan.

REFERENCES

1. H₂S Q&A, department of environmental quality, Michigan USA. http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231-9162--00.html#3. How does H₂S occur in oil and gas well (accessed 6 July 2011)
2. Jardim, W. F., Huang, C.P. (1996). *Gas phase destruction of VOCs by Heterogeneous Photocatalysis*, Proceedings of the 6th International Symposium of Chemical Oxidation, Technology for the Nineties, Vanderbilt University, Nashville, USA.
3. Maria, C. C., Rosana, M. A., Jardim, W. F. (1998). Gas-phase destruction of H₂S using TiO₂/UV-VIS. *Journal of Photochemistry and Photobiology A: Chemistry*, 112, 73-80.
4. Mills B. (1995). Review of methods of odour control. *J. Filtration and Separation*, 32(02), 147-152.
5. Tajammul, H., Khaiber, K., and Hussain, R. (2009). Size control synthesis of sulfur doped titanium dioxide (anatase) nanoparticles, its optical property and its photo catalytic reactivity for CO₂ + H₂O conversion and phenol degradation. *Journal of Natural Gas Chemistry*, 18, 383-391.
6. Tomar M., Abdullah T.H.A. (1994). Evaluation of chemicals to control the generation of malodorous hydrogen sulfide in waste water. *J. Water Res.*, 28(12), 2545-2552

ISOLATION AND CHARACTERIZATION OF INDIGENOUS LUMINESCENT MARINE BACTERIA FROM KARACHI COAST

Aisha Nawaz

Center for Molecular Genetics,
University of Karachi
PAKISTAN
ashnawaz2002@yahoo.com

Nuzhat Ahmed

Center for Molecular
Genetics, University of
Karachi
PAKISTAN

ABSTRACT

A luminescent bacterial strain was isolated from sea water samples from the shore of the Arabian Sea, Pakistan. The isolate was identified as *Vibrio harveyi* species upon biochemical and 16SrRNA gene analysis and coded N6. The isolated strain was subjected to physical and genetic characterization. Upon study of the genetic markers present in the isolate, it was observed that the bacterium tolerated up to 7% of Sodium chloride in simple nutrient broth medium. Unlike commonly reported luminescent bacteria, the indigenous isolate N6 showed optimum growth at 37°C. Resistance towards low concentrations of Cadmium chloride and Copper sulfate was also recorded in N6. Of the various antibiotics screened for resistance, N6 was highly resistant to Ampicillin. No plasmid DNA was observed in the strain. The best carbon source supplemented in minimal medium was determined to be 0.2% of gluconate which gave the best growth but luminescence was not achieved on minimal medium in presence of carbon sources like glycerol, gluconate, glucose, fructose, sucrose, starch nannitol, lactose, galactose and maltose. Presence of the lux operon was determined by performing PCR for the luxAB genes, the PCR product obtained was sequenced to reveal major similarities with previously reported luxAB genes.

Keywords: 16S rRNA PCR identification, Characterization, Growth optimization, Isolation, *Vibrio harveyi*, luxAB genes PCR.

INTRODUCTION

Luminous bacteria are the most widely distributed light-emitting organisms, most of which are found in sea water and the remainder living in the terrestrial or fresh water environment. These luminescent bacteria are usually found in symbiotic association with a host organism but are also capable of living free. The most common habitats are as free-living species in the ocean, as saprophytes growing on dead fish or meat, as gut symbionts in the digestive tracts of marine fish, as parasites in crustacean and insects and as light organ symbionts in teleost fishes and squid (Hastings, 1986). These bacteria are all Gram negative rods and can function as facultative anaerobes (Baumann et al, 1983 & Nealson and Hastings, 1979)). Almost all luminous bacteria have been classified into three genera *Vibrio*, *Photobacterium* and *Xenorhabdus*, with most of the species being marine in nature (Baumann et al, 1983 & Campbell, 1989). The light emitting bacteria that have been investigated in most detail are *Vibrio harveyi*, *V. fischeri*, *Photobacterium phosphoreum*, *P. leognathi* and *Xenorhabdus luminescens*. The *Vibrio harveyi* strains have not yet been found as symbionts, although they are readily isolated from varying marine habitats (Meighen, 1991), these species may also be found on the surface of marine animals or in their gut (Baumann et al, 1973 & Ruby and Morin, 1979).

The luminescence of these bacteria is attributed to the presence of an intricately working group of genes of the lux operon basically containing the genes luxICDABEG (Meighen, 1991). This luminescent system is self contained as the substrate and the enzyme for the luminescent reaction is made by the lux system itself. The enzyme working in this reaction is known as luciferase which is a heterodimer comprising of an α and a β subunit, the substrate is a long chain fatty aldehyde specific for each specie of the luminescent bacterium. In case of *Vibrio harveyi*, this aldehyde is either a

nonanal or a decanal. The lux system is induced by an inducer molecule which is also produced by the lux gene cluster itself. These inducer molecules are homoserine lactones and are specific for each bacterial species as well. *Vibrio harveyi* lux operon is induced by the inducer α -hydroxybutyrylhomoserine lactone (Meighen, 1991). The luminescent reaction involves the oxidation of reduced riboflavin phosphate (FMNH₂) and a long chain fatty aldehyde with the emission of blue-green light.

A number of strains of luminescent bacteria have been isolated from ocean and sea samples from around the world. Both temperate and tropical sea environments support the inhabitation of marine luminous bacteria (Ruby and Lee, 1998). Abiotic factors such as patterns of temperature, salinity, nutrient concentration or solar irradiation (O'Brien and Sizemore, 1979; Ruby and Nealson, 1978; Shilo and Yetinson, 1979; Yetinson and Shilo, 1979) play a major part in determining the presence of luminous bacteria in a certain marine environment. Luminous bacteria have previously been isolated from coastal marine samples of Hawaii, Alaska, Manzanita OR, Pacific Ocean, Mexico, Uruguay, North Atlantic, Oslo Harbor, Norway, France, Israel, South Africa, Philippines, Taiwan and Japan (Urbanczyk, 2008). The present study reports the isolation of luminescent bacterial isolate of *Vibrio harveyi* from the Arabian Sea shore and general characterization of the bacterial isolate was performed to identify the genetic markers present on the bacteria.

MATERIALS AND METHODS

Isolation and identification of bacterial isolates

Sea water samples were collected from a jetty located at the Boating Basin area of Karachi. Water samples were collected by submerging autoclaved dark bottles under water and then opening their caps. The bottles were sealed under water and then kept in dark at 4°C until processed for isolation of bacterial strains.

300 μ L of the water samples were spread onto 4% agar plates of 25mL LSW-70 (Ast and Dunlap, 2004) and incubated overnight at 25°C. Agar percentage was kept high initially i.e. at 4% so as to restrict overgrowth of any spreading forms of non-luminescent bacteria present in the sample. The brightest bacterial colonies were selected upon observation in a dark TLC viewer. The isolate was purified by re streaking onto 1.8% agar plates of LSW70 and gram stained for cellular characterization. Purified bacterial culture was then coded N6 and employed for further experimentation.

The isolate was also checked for motility under dark field microscope by placing a drop of overnight culture onto a glass slide. Motility was observed in a dark field microscope at 40X magnification.

Biochemical identification

N6 was sent for biochemical identification and was identified using an indigenous system, QTS-24, akin to the API system of bacterial identification.

16SrRNA Gene Analysis

Genomic DNA of the marine isolate was isolated using genomic DNA isolation kit (GENTRA, USA) and 16SrRNA gene analysis was performed. The genomic DNA was used as template DNA in a touchdown PCR reaction (Thermal cycler: Applied Biosystems, GeneAmplification system 2400) using the universal primers **16S-5F** 5'- TGGAGAGTTTGATCCTGGCTCAG -3' and **16S-531** 5'- TACCGCGGCTGCTGGCAC -3', which amplify a sequence of 550 bps (approx.). The reaction consisted of 37 cycles i.e. 94°C for 3min. (1 cycle) 94°C for 1min. 62°C for 30sec, 72°C for 3min. (2 cycles) and then each following cycle after every two cycles had a consecutive decrease of 1°C in the

primer annealing step upto 50°C. A final extension time was given for 5 min at 72°C. (Scott, 2002). GeneAmp® PCR Core Reagents were used for the PCR reaction mixture which composed of: 5µL of 10X PCR buffer, 1µL dNTP mix (200µM), 0.5µL AmpliTaq® DNA polymerase, 2µL of each primer (20pmol), 1µL DNA Template and 38.5µL sterilized distilled water, bringing the total volume up to 50µL.

PCR products were purified using QIAquick PCR purification kit (Qiagen, UK), purified DNA was air dried and commercially sequenced by Microsynth AG, Switzerland. Sequence data obtained were analyzed using BLAST algorithm (<http://www.ncbi.nlm.nih.gov/blast/Blast.cgi>).

Growth curve of N6

Growth curve experiment was performed in LSW 70 medium. 100mL of the LSW 70 broth was inoculated with an overnight grown culture of N6, such that the starter O.D₆₀₀ was 0.075. Observations for growth O.D was taken using a spectrophotometer (Cam spec M302) at 600nm of absorbance after every 15 minutes till the log phase was achieved, after which readings were taken every 30 minutes. Zero reading was calibrated with un-inoculated LSW70 broth. Growth curve was plotted as O.D₆₀₀ readings against time and different phases of growth were hence determined.

Growth optimization in minimal medium

Minimal medium used for the study was ASW (Artificial Sea Water) (Macleod, 1968) which was supplemented with 0.3mM K₂HPO₄ (as phosphate source), 15mM ammonium chloride and 1mL/liter of a 20mg/mL filter sterilized solution of ferric ammonium citrate (as source of iron) (Dunlap, personal communications). Solutions for NH₄Cl and K₂HPO₄ were made as 1M stock solutions and sterilized by autoclaving at 121°C for 20 minutes. To obtain the optimum growth and luminescence in minimal culture, different carbon sources were tested like glycerol, gluconate, glucose, fructose, sucrose, starch, mannitol, lactose, galactose, and maltose. The sugar solutions were made as 10% stock solutions and sterilized by autoclaving at 115°C for 10 minutes. The experiment was carried out in broth as well as solid phase of the medium; 2% agar plates of ASW were prepared with 0.2% of each of the carbon source except glycerol which was added at a concentration of 3mL/Liter. 100µL of overnight culture of N6 grown in LSW70 was inoculated and incubation was given at 25°C with shaking at 120rpm for the broth cultures. Results for growth and luminescence were checked after 24Hrs of incubation.

Also, to induce luminescence in the minimal medium 10% v/v of conditioned medium was also added in the medium (Dunlap et al, 1995). 50mL of spent medium was extracted out of an overnight ASW culture by centrifuging the culture in alcohol sterilized 100mL centrifuge tubes in a cooling ultra centrifuge for 15 minutes at 4°C at 7000rpm. The supernatant (spent medium) was separated and filter sterilized using a 0.2µm Millipore filter. 0.02% of the amino acid Arginine was also added to the ASW broth medium to aid in luminescence induction. 100µL overnight culture was inoculated and then incubated overnight at 25°C with shaking at 120rpm in a cooling incubator.

Maximum tolerable concentration for Sodium Chloride

Maximum tolerable concentration for Sodium Chloride was checked in nutrient agar. The range in the medium was checked from 0% to 15% of NaCl. Overnight cultures of the N6 was streaked onto the NaCl test plates and incubated overnight at room temperature (25°C).

Maximum tolerable concentration for antibiotics

Maximum tolerable concentration of antibiotics for the luminescent isolate was checked in 1% LB. The antibiotics tested for maximum tolerable concentration were Tetracycline, Streptomycin, Kanamycin and Ampicillin. The range of concentrations started from 25µgm/mL to 900µgm/mL. N6

was streaked on the different antibiotic plates and incubated at 25.7°C overnight. Results for growth and luminescence were checked after 24Hrs of incubation.

Maximum tolerable concentration for heavy metal salts

Maximum tolerable concentration for selected heavy metal salts, i.e. Cadmium chloride, Copper sulfate and Hexavalent chromium, was checked on 1.8% agar plates of LSW70. Growth in presence of these heavy metal salts was also checked in minimal medium as well, the selected medium for this purpose was Artificial Sea Water (ASW) supplemented with 0.8% gluconate. 100µL of overnight cultures of N6 was inoculated in the ASW broths in 50mL flasks with 0.5mM of each of the selected heavy metal salt added individually. The flasks were incubated at 25°C with continuous shaking at 120rpm. The isolates were also streaked onto 1.8% agar plates of LSW70 with heavy metal. The concentrations of each heavy metal salt checked were 0.5mM, 1.0mM, 1.5mM and 2.0mM. These plates were incubated at 25.7°C in a cooling incubator. Results for growth and luminescence were checked after 24Hrs and 72Hrs of incubation.

Plasmid isolation

Plasmid isolation was attempted using the method described by Brinboim and Doly (Brinboim and Doly, 1979) and also by using the plasmid isolation kit by QIAGEN. Plasmid isolation was performed with an overnight culture grown in LSW70 of which 1.5mL was pelleted at 13000g. The plasmid DNA was visualized by gel electrophoresis and staining the gel with ethidium bromide.

LuxAB PCR amplification

Partial gene amplification of the *luxAB* genes was performed to determine whether the genetic element responsible for luminescence in N6 is similar to the reported *lux* system. The isolated genomic DNA was used as template DNA in a PCR reaction (Thermal cycler: Eppendorf AG thermal cycler, No. 5345) using the primers **LuxAB-F** 5'- CGG GAT CCA ACA AAT AAG GAA ATG TTA TG -3' and **LuxAB-R** 5'- CCA GAT CTT CCA TAT AAA TGC CTC TAT TAG -3', which amplify a sequence of 2179 bps (approx.). The reaction consisted of 33 cycles i.e. 94°C for 3min. (1 cycle) 94°C for 1min. 55°C for 30sec, 72°C for 3min. (30 cycles). A final extension time was given for 5 min at 72°C (1 cycle) and a hold of 4.0°C. GeneAmp® PCR Core Reagents were used for the PCR reaction mixture which composed of: 5µL of 10X PCR buffer, 1µL dNTP mix (200µM), 0.5µL AmpliTaq® DNA polymerase, 2µL of each primer (20pmol), 1µL DNA Template and 38.5µL sterilized distilled water, bringing the total volume up to 50µL (Germany), purified DNA was air dried and commercially sequenced at Microsynth AG, Switzerland. Sequence data obtained were analyzed by using BLAST algorithm (<http://www.ncbi.nlm.nih.gov/blast/Blast.cgi>).

RESULTS AND DISCUSSION

Isolation of bacterial isolates

Bright luminescent colonies were observed, in a dark room, spread over the 4% agar plates of LSW70 after 24 hours of incubation (figure 2). The luminescent bacteria give off a bright blue-green light that is easily observed through dark adjusted unaided eyes. Once the choice bacterial colonies were selected and isolated, the agar concentration was brought down to 2.5% and eventually 1.8% with consecutive culturing and purification. Eight of the brightest colonies were selected and streaked onto fresh LSW70 plates for purification, however only five of which remained luminescent after re streaking of which only one strain was selected for study and coded N6. Such loss of luminescence has been reported before and it appears with high frequency in enriched cultures of continuously cultured luminescent isolates and is termed as dark mutants (Keynan and Hasting, 1961). N6 upon study of cellular morphology revealed scattered short coccobacilli that give a Gram negative reaction.

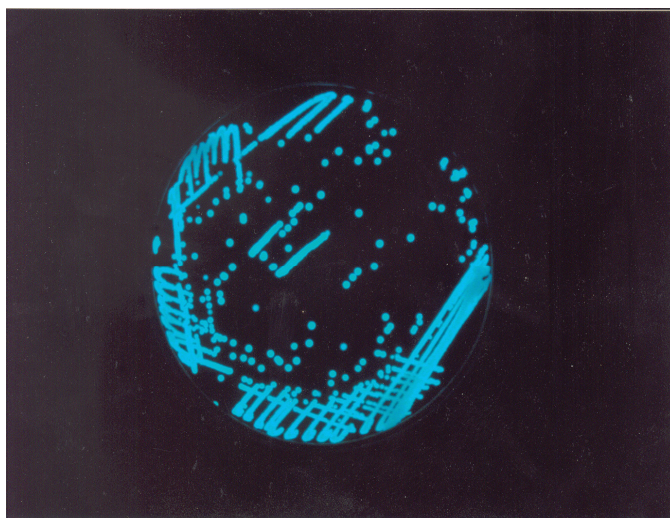


Figure 2: Streaked plate of N6 on LSW70 as observed in dark

N6 showed motility i.e. darting movement characteristic of *Vibrios* when observed on a wet mount. On solid medium it formed small yellowish colonies that were luminescent when observed in dark. The isolate did not give a highly motile growth on the solid medium and hence did not tend to spread on the agar plate.

Broth culture of the isolate gave a pellicle formation when grown at 25°C with slight shaking in a test tube, this pellicle gave luminescence when observed in dark with dark adjusted eyes. The broth was observed to turn slightly yellow after 24Hrs of incubation. Optimum temperature for growth was observed to be 37°C unlike the lower range of temperatures, 20-25°C reported for other luminescent strains. This may be due to the fact that the sea water temperature of the Arabian Sea is higher as compared to the temperature of waters from where previous isolations have been reported (Urbanczyk et al, 2008).

Upon biochemical identification, all the fermentation reactions were identical with *Vibrio cholerae*. Parameters like growth at 4°C and 40°C, luminescence and the ability to ferment the sugars D-Gluconate and Lactate (Boettcher and Ruby, 1990), distinguished N6 from other luminescent *Vibrio* and identified it as *Vibrio harveyi*. A few of the biochemical test results are given in table 1.

Table 1: Biochemical test results for Luminescent *Vibrio harveyi* strain N6

Strain code	ONPG	Citrate	Malonate	H ₂ S	Urea	Indole	VP	Glucose/NO ₃	Maltose	Sucrose	Mannitol	Arabinose	Rhamnose	Motility
N6	+	-	-	-	-	+	-	+/+	+	+	+	-	-	+

The partial 16S rRNA gene sequence data was analyzed using NCBI BLAST algorithm search and the *Vibrio* isolate N6 (Accession # DQ166246) was identified as *Vibrio harveyi* specie.

Performance of growth curve

Growth curve experiments revealed that N6 is a fast growing bacterial isolate that reached its log phase after 30 minutes of incubation (figure 1) at 25.7°C with continuous shaking of 120rpm. The log phase continues up to 7.0Hrs after which the stationary phase seems to start (figure 1).

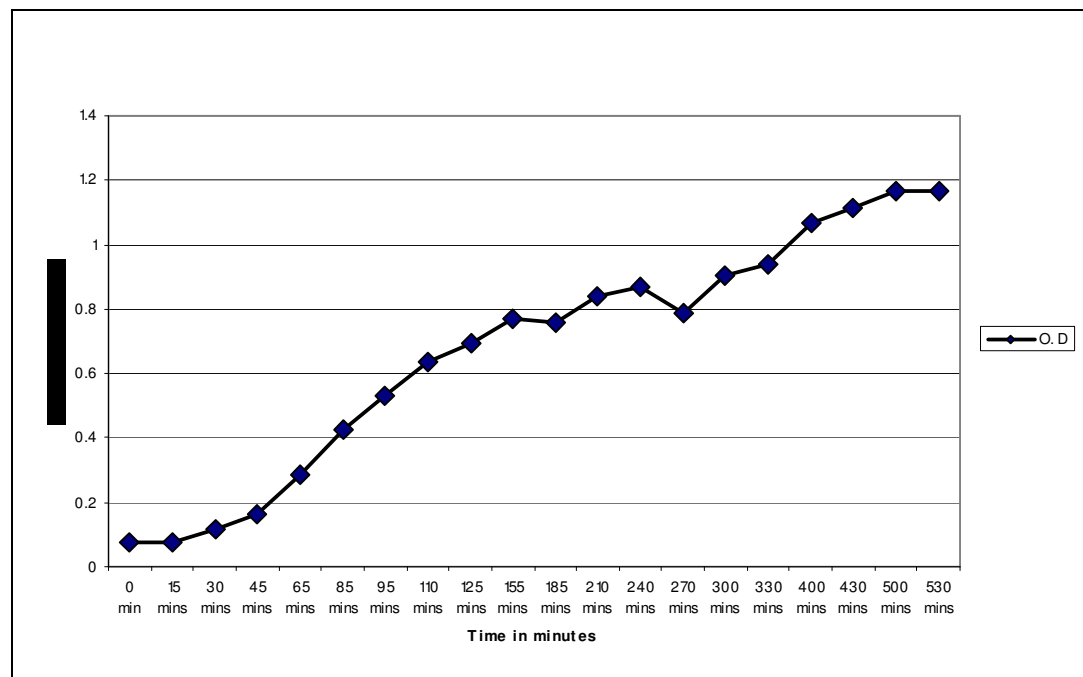


Figure 1

Figure 1: Growth curve of N6 in LSW 70.

Growth optimization in minimal medium

Growth of N6 was optimized for minimal medium so that the luminescent bacteria may be employed in studies with heavy metals. As enriched and complex media chelate the heavy metals in medium, making them less bioavailable hence a minimal medium is choice for such studies. Upon ASW agar plates supplemented with various carbon sources, N6 exhibited exceptionally good growth in presence of 0.2% gluconate with a comparatively slightly less growth in presence of 3mL/Liter of glycerol, but with this growth no visible luminescence has been achieved.. The rest of the carbon supplements did not give an exceptional growth under the conditions tested.

Maximum tolerable concentration for Sodium Chloride

After 24Hrs of incubation at room temperature, N6 showed good growth and maximum luminescence as compared to the other test plates. There was no growth observed with 0% NaCl, indicating the requirement of the salt for growth. This has already been established previously that *Vibrios* have specific growth requirements for sodium ion (Nealson and Hastings, 1979). After 48Hrs of incubation the nutrient agar plates with 1% and 3% NaCl showed the maximum and the most persistent luminescence as compared to other salt concentrations. At this point however the 2% NaCl plate gave diminished luminescence. It is hence suggested that at 2% NaCl concentration, N6 grows faster but maximum luminescence is obtained with 3% NaCl in the medium. N6 is also able to tolerate up to

7% of NaCl in their culture medium (table 3). Beyond the concentration of 4% NaCl, N6 gave very low luminescence. It is thought that as luminescence is a character that is expressed under enriched nutrient conditions, hence in presence of high NaCl concentrations that pose as a stress factor, luminescence is diminished.

Table 3: 24Hrs results for the maximum tolerable concentration of Sodium Chloride and the observance of luminescence in presence of different salt concentrations in nutrient agar.

N6	
Control	-
0% NaCl	
1%	+++*
2%	+++*
3%	+++*
4%	+++*
5%	+++*
6%	++*
7%	++*
8%	-
9%	-
10%	-
11%	-
12%	-
13%	-
14%	-
15%	-
+++ High growth	
++ Weak growth	

* Luminescence, observed with naked eye.

Maximum tolerable concentration for antibiotics

N6 showed a very high resistance towards Ampicillin, the tolerable concentration going well above 900µgm/mL of the medium. It was sensitive to Tetracycline and fairly resistant to Kanamycin and Streptomycin. Luminescence in presence of the antibiotics was also checked and it was observed that as the stress of the antibiotic in the medium increased, luminescence decreased. The results are given in table 4. N6 showed its optimum luminescence in presence of Ampicillin at a concentration of up to 900µgm/mL, while luminescence disappeared after a concentration of 25µgm/mL of Kanamycin. No luminescence was observed in presence of Streptomycin. The expression or absence of luminescence in presence of the antibiotics indicates the level of toxicity of each antibiotic towards the luminescent isolate.

Table 4: Maximum tolerable concentration for selected antibiotics in 1% NaCl Luria agar medium.

	Ampicillin	Tetracycline	Streptomycin	Kanamycin
N6	>900µgm/mL	-	50µgm/mL	75µgm/mL

Maximum tolerable concentration for heavy metal salts

After 24Hrs of incubation in ASW broth medium N6 showed good growth in presence of 0.5mM of Cadmium chloride, while growth was observed in 0.5mM of Copper sulfate after 72Hrs of incubation. No luminescence was observed in any of the minimal broths including the control flasks as well.

In case of the heavy metal salts supplemented in the enriched LSW-70 medium, growth was only observed for the Cadmium chloride and Copper sulfate supplemented plates. Luminescence was observed in the culture but it decreased with the increasing concentration of the heavy metal salts. After a lapse of 72Hrs luminescence in presence of all the concentrations of Cadmium chloride and Copper sulfate disappeared. This probably happened as the toxicity of the heavy metal salts increased for the growing culture i.e. toxicity effect increased with longer exposure of the heavy metals to the dividing bacterial isolate. The observation that luminescence decreases with the increasing concentration of cadmium chloride can be employed as an assay for the heavy metal in environmental samples and such a technology has been successfully adopted and marketed as Microtox[®], which is based on the use of the wild type luminescent bacterium *Vibrio fischeri* (Johnson and La Rossa, 1998 & Qureshi et al, 1998).

Plasmid isolation

No plasmid DNA was found to be present in the luminescent isolate N6.

LuxAB PCR amplification

The DNA sequence obtained by *luxAB* PCR amplification was analyzed using NCBI BLAST algorithm search. The sequence data of N6 (Accession # EF141075) showed high homology with the *luxAB* gene sequence data in the gene bank giving up to 98% homology with reported *luxAB* gene sequences of other *Vibrio harveyi* strains in the database.

CONCLUSIONS

The isolation of the luminescent *Vibrio harveyi* strain N6 from the coast of Karachi is an indigenous discovery. Such marine luminescent bacteria have never been reported from this region and hence hold the promise for the development of indigenous biotechnological tools like heavy metal biosensors. The isolation of N6 from Karachi coast also indicates towards the widespread of this specie and its adaptability in all kinds of environments ranging from icy cold oceans to temperate seas like the Arabian Sea.

ACKNOWLEDGEMENTS

We thank Dr. Paul V. Dunlap for his generous guidance for the isolation and basic characterization of the luminescent bacteria. Special thanks to Dr. Edward Meighen for his help in the culturing of the luminous bacteria. We also appreciate the complex biochemical identification performed at DESTO labs, Karachi. The research was supported by the indigenous HEC scholarship awarded to one of the authors.

REFERENCES

1. Hastings JW (1986) Bioluminescence in bacteria and dinoflagellates. In: AJ Govindjee and DC. Fork (eds.) Light emission by plants and bacteria. Academic Press, Inc., New York. 363-398
2. Baumann P, Baumann L, Woolkalis and Bang S. (1983) Evolutionary relationships in *Vibrio* and *Photobacterium*. A basis for a natural classification. Annu Rev Microbiol 37:369-398.
3. Nealson KH and Hastings JW (1979) Bacterial bioluminescence: Its control and ecological significance. Microbiol Rev 43:496-518.
4. Campbell AK (1989) Living light: biochemistry, function and biomedical applications. Essays Biochem 24:41-76.
5. Meighen EA (1991) Molecular biology of bacterial bioluminescence. Microbiol Rev 55:123-142.
6. Baumann P, Baumann L, Reichelt JL (1973) Taxonomy of marine bacteria: *Beneckea parahaemolytica* and *Beneckea alginolytica*. J Bacteriol 113:1144-1155.
7. Ruby EG, Morin JG (1979) Luminous enteric bacteria of marine fishes: a study of their distribution, densities and dispersion. Appl Environ Microbiol 38:406-411.
8. Ruby EG and Lee K (1998) The *Vibrio fischeri*-*Euprymna scolopes* light organ association: current ecological paradigms. Appl Environ Microbiol 64:805-812.
9. O'Brien CH and Sizemore RK (1979) Distribution of the luminous bacterium *Beneckea harveyi* in a semitropical estuarine environment. Appl Environ Microbiol 38:928-933.
10. Ruby EG and Nealson KH (1978) Seasonal changes in the species composition of the luminous bacteria in near shore seawater. Limnol Oceanogr 23:530-533.
11. Shilo M and Yetinson T (1979) Physiological characteristics underlying the distribution patterns of luminous bacteria in the Mediterranean Sea and the Gulf of Elat. Appl Environ Microbiol 38:577-584.

12. Yetinson T and Shilo M (1979) Seasonal and geographical distribution of luminous bacteria in the eastern Mediterranean Sea and the Gulf of Elat. *Appl Environ Microbiol* 37:1230-1238.
13. Ast JC and Dunlap PV (2004) Phylogenetic analysis of the *lux* operon distinguishes two evolutionary distinct clades of *Photobacterium leognathi*. *Arch Microbiol* 181:352-361.
14. Scott Cameron (2002) PhD thesis titled: Phenotypic and Genotypic Investigations into fluoroquinolone resistance in the Genus *Acinetobacter*. University of Dundee, Dundee, Scotland.
15. Macleod RA (1968) On the role of inorganic ions in the physiology of marine bacteria. *Adv Microbiol Sea* 1:95-126.
16. Dunlap PV, Kita-Tsukamoto K, Waterbury JB, Callahan SM. (1995) Isolation and characterization of a visibly luminescent variant of *Vibrio fischeri* isolates ES114 from the sepiolid squid *Euprymna scolopes*. *Arch Microbiol* 164:194-202.
17. Brinboim, HC and Doly J (1979) A rapid alkaline extraction procedure for screening recombinant DNA. *Nuc Acid Res* 7:1513-1523.
18. Keynan A and Hastings JW (1961) The isolation and characterization of dark mutants of luminescent bacteria. *Biol Bull (Woods Hole, Mass.)* 121:375.
19. Boettcher KJ and Ruby EG (1990). Depressed light emission by symbiotic *Vibrio fischeri* of the sepiolid squid *Euprymna scolopes*. *J Bacteriol* 172:7, 3701-3706.
20. Johnson BT, La Rossa RA (ed) (1998) In: *Methods in Molecular Biology/Bioluminescence*. Humana Press, Totowa, NJ pp201-218.
21. Qureshi AA, Bulich AA, Isenberg DL, La Rossa RA (ed) (1998) In: *Methods in Molecular Biology/Bioluminescence*. Humana Press, Totowa, NJ pp185-199.
22. Urbanczyk H, Jennifer C Ast, Allisson J Kaeding, James D Oliver and Paul V Dunlap. (2008) Phylogenetic Analysis of the Incidence of *lux* Gene Horizontal Transfer in *Vibrionaceae*. *J Bacteriol* 190:10, 3494-3504.

COMPARISON OF LOCAL DISCRIMINANT ANALYSIS AND SINGULAR VALUE DECOMPOSITION FOR CLASSIFICATION OF SURFACE EMG SIGNAL

Navleen Singh Rekhi

Assistant Professor
Dr. B.R. Ambedkar NIT,
Jalandhar, INDIA
navleenr@yahoo.com

Ajat Shatru Arora

Professor
SLIET, Longowal, Punjab
INDIA
ajatsliet@yahoo.com

Hari Singh

Assistant Professor
DAVIET, Jalandhar, Punjab
INDIA
harisdhillon@gmail.com

ABSTRACT

Electromyography (EMG) signal is electrical manifestation of neuromuscular activation that provides access to physiological processes which cause the muscle to generate force and produce movement and allow us to interact with the world. In this paper, an identification of six degree of freedom for evaluating and recording physiologic properties of muscles of the forearm at rest and while contracting is presented. The first step of this method is to analyze the surface EMG signal from the subject's forearm using Local Discriminant Analysis (LDA) and Singular Value Decomposition (SVD) to extract features from raw surface EMG(sEMG) signal. The second step is to import the feature values into multi class Support Vector Machine as a classifier, to identify six degree of freedom viz. open to close, close to open, supination, pronation, flexion and extension

Keywords: sEMG, LDA, SVD, Multi- Class Support Vector Machine(MSVM).

INTRODUCTION

Electromyography (EMG) signal is electrical manifestation of neuromuscular activation, that provides access to physiological processes which cause the muscle to generate force and produce movement and allow us to interact with the world[1][3]. Its application to control prosthetic limbs that can restore some or all of the lost motor functions of amputees has presented a great challenge due to the complexity of the EMG signal[2][5].

Feature extraction and function classification is the key in processing and analyzing the EMG signals. In this paper, we address the issue of wavelet packet transform using singular value decomposition, from which the function parameters can be computed by a multi class SVM. The success of our work is based on a combination on three factors: (1) a careful choice of muscle activity recording sites that are relevant to different functions of hand (2) the use of simple feature extraction and dimensionality reduction techniques (3) a state of art classification method based on multi class SVM. EMG signal is recorded from carefully chosen locations on the user's forearm. This stream of data is transformed into feature vectors using wavelet packet transform and classified by multi class SVM. Using the singular value decomposition, as the dimensionality reduction technique, results showed that an accuracy of over 96% could be obtained for a six degree of freedom classification problem. Figure 2 shows the overall representation of the work.

METHODOLOGY

A. Surface EMG (SEMG) Data Acquisition

EMG signals were collected by EMG signal detection module (Biopac Systems Inc.). For analysis, two channel SEMG was used to distinguish six hand motions. Ten volunteers in the age group of 23 to 27 years participated in the experiments. Two active electrodes were placed at the skin surface of

Flexor Carpi Ulnaris and assigned as Channel 1 and the other two active surface electrodes were placed at the skin surface of Brachioradialis and assigned as channel 2.

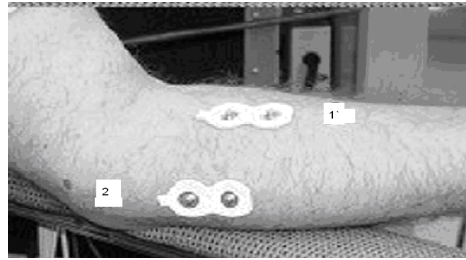


Figure1. Location of Surface Electrodes on the Forearm [1] Flexor Carpi Ulnaris [2] Brachioradialis

The sampling frequency for the purpose of recording was set at 2048 Hz. Number of samples recorded for the present work was 1024 with the time duration of 512 msec. The window of 256 msec was selected and computed the amplitude of each channel over this window.

B. Feature Extraction

The wavelet packet analysis [4] was employed to process the surface EMG signal. In this work, 'Symlet' (of order 5) mother wavelet was used in the Wavelet Packet Transform analysis and the decomposition level was set at the level '3'.

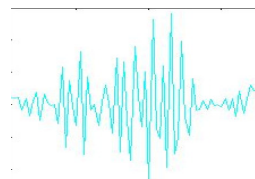


Figure 2. Close to Open



Figure 3. Open to Close



Figure 4. Pronation



Figure 5. Supination

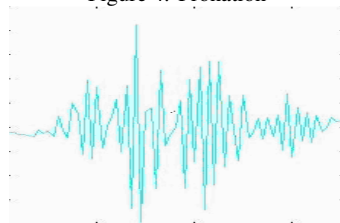


Figure 6. Flexion

The figure 2-6 shows the results of the wavelet decomposition for the different motions of forearm. The features were extracted using Singular Value Decomposition (SVD) and LDA. Singular value decomposition is a linear algebra technique that decomposes matrices into constituent parts, a left-hand and right-hand matrix separated by a descriptive diagonal matrix, the singular values, as their weighting. It takes a rectangular matrix of data (defined as X , where X is a $n \times p$ matrix) in which the n rows represent the text of SEMG data, and the p columns represent the wavelet coefficients. The SVD theorem states:

$$\mathbf{X}_{n \times p} = \mathbf{U}_{n \times n} \mathbf{S}_{n \times p} \mathbf{V}_{p \times p}^T$$

Calculating the SVD consists of finding the eigenvalues and eigenvectors of $\mathbf{X}\mathbf{X}^T$ and $\mathbf{X}^T\mathbf{X}$. The eigenvectors of $\mathbf{X}^T\mathbf{X}$ make up the columns of \mathbf{V} , the eigenvectors of $\mathbf{X}\mathbf{X}^T$ make up the columns of \mathbf{U} .

C. Local Discriminant Analysis

The best basis algorithm developed by Coifman and Wickerhauser was mainly for signal compression [8, 9]. This method first expands a given signal or a given collection of signals into a library of an orthonormal basis, i.e. a redundant set of wavelet packets or local trigonometric functions having a binary tree structure where any set of nodes of the tree represents a subspace with specific time-frequency localizations. Then a complete basis (so called *best basis*) is searched from this binary tree, minimizing a certain information cost function (e.g., here entropy was used as cost function).

Local Discriminant Basis Algorithm

1. Expand \mathbf{x} (Processed SEMG signal) into the library of orthonormal bases \mathbf{W} and obtain coefficients $\{W_{j,n} \cdot \mathbf{x}\}, 0 \leq j \leq J, n=0, \dots, 2^j-1$.
2. Define A_J as the initial basis constituted by all sub-bases $\{W_{J,n}\}, n=0, \dots, 2^J-1$.
3. Determine the best basis using the bottom search strategy as follows:-

For each level $j = (J-1), \dots, 0$, and each node $n=0, \dots, (2^j-1)$, the best sub-basis $A_{j,n}$ is obtained by

$$A_{j,n} = \begin{cases} W_{j,n} & \text{if } M(W_{j,n}\mathbf{x}) \leq M(A_{j+1,2n}\mathbf{x}) + M(A_{j+1,2n+1}\mathbf{x}), \\ A_{j+1,2n} \oplus A_{j+1,2n+1} & \text{if not,} \end{cases} \quad \dots\dots(3.11)$$

The principal component analysis is designed in such a way that the data set may be represented by a reduced number of effective features and yet retains most of the intrinsic information content of the data.

D. Multi-Class SVM

For multi class SVM, one against all [6][7] method was implemented. The ten untrained data was given to precisely classify the six different motions of hand. The kernel function used in this work was 'Gaussian Kernel'. One-against-all method constructs k SVM models where k is the number of classes. The i^{th} SVM is trained with all of the examples in the i^{th} class with positive labels, and all other examples with negative labels. Thus given l training data, $(x_1, y_1), \dots, (x_l, y_l)$, where $x_i \in R^n, i = 1, \dots, l$ and y_i

$\in \{1, \dots, k\}$ is the class of x_i , the i^{th} SVM solves the following problem:

$$\min_{w^i, b^i, \xi^i} \frac{1}{2} (w^i)^T w^i + C \sum_{j=1}^l \xi_j^i (w^i)^T$$

$$(w^i)^T \phi(x_j) + b^i \geq 1 - \xi_j^i, \quad \text{if } y_i = i$$

$$(w^i)^T \phi(x_j) + b^i \leq -1 + \xi_j^i \quad \text{if } y_j \neq i$$

$$\xi_j^i \geq 0, \quad j = 1, \dots, l$$

where training data x_i are mapped to a higher dimensional space by the function ϕ and C is the penalty parameter.

Minimizing $(1/2)(w^i)^T w^i$ means that we would like to maximize $2/\|w^i\|$, the margin between two

groups of data. When data are not linear separable, there is penalty term $C \sum_{j=1}^l \xi_j^i$ which can reduce the number of training errors. The basic concept behind SVM is to search for a balance between the regularization term $(1/2)(w^i)^T w^i$ and the training errors.

RESULTS

In 2-channel identification, the signals from Flexor Carpi Ulnaris and Brachioradialis were used. The recorded data was classified into the required six degree of freedom viz. open to close, close to open, supination, pronation, flexion and extension. After the wavelet packet analysis, features were selected using singular value decomposition. For multi class SVM, one against all method was implemented. The concept of kernel function is very powerful. It allows SVM models to perform separations even with very complex boundaries. The use of kernel function is to map the data into a different space where a hyperplane can be used to do the separation. The kernel function may map the data into high dimensional space to make it possible to perform the separation. The goal of SVM model is to find the optimal hyperplane that separates clusters of vector in such a way that cases with different categories are distinctly classified. The kernel function used in this work was 'Gaussian Kernel'. The benefit of using this function is that the number of basis function (the number of support vectors), the centres and the weights in the output layer are all determined automatically. The five untrained data was given to precisely classify the six different motions of hand. It was demonstrated that the multi class support vector machine could accommodate the diverse sets of the EMG patterns produced while contracting and at rest for different motion of the forearm muscle. During the training, the classifier was able to adapt each subject's motion of the forearm. During testing with the untrained data, the multi class support vector machine was unaffected by little variations in the feature values. The overall rate of correct class testing was 97%.

Table 1. Results From The Multi-Class SVM , Method:- SVD

S. No.	Motion of the hand	Output For tested Data For Each Motion						Success Rate (%)
1	CO	1	1	1	1	1	1	100
2	OC	2	2	2	2	2	2	100
3	P	3	3	3	3	3	3	100
4	S	4	4	4	4	4	1	80
5	F	5	5	5	5	5	5	100
6	E	6	6	6	6	6	6	100
Overall Success Rate								96.667

Where CO- close to open, OC- open to close, P- pronation, S-supination, F- flexion, E- extension

Table 2. Results From The Multi-Class SVM, Method:- LDA AND PCA

S. No.	Motion of the hand	Output For tested Data For Each Motion					Success Rate (%)
1	CO	1	1	1	2	1	80
2	OC	2	2	2	2	2	100
3	P	3	3	1	3	3	80
4	S	4	4	4	4	3	80
5	F	5	5	5	6	5	80
6	E	6	5	6	6	6	80
Overall Success Rate							83.33

CONCLUSION

The study brings out that the method of singular value decomposition produces better accuracy to classify the six different motions of hand using both the multi-class SVM. More investigations are being carried out focussing on different settings or setups of the data acquisition system to view how they influence the overall results. The work is being carried out for the realization of an interface between the peripheral nervous system (PNS) and the artificial device (i.e., a “natural” neural interface [NI]) to record and stimulate the PNS in a selective way for more accurate classification.

REFERENCES

- [1] Carlo De Luca ‘Electromyography’. Encyclopedia Of Medical Devices and Instrumentation (John G. Webster, Ed), John Wiley Publisher, 2006
- [2] Carlo J. De Luca Surface Electromyography: Detection and Recording.
- [3] Carlo J. De Luca, “The Use of Surface Electromyography in Biomechanics”, Neuro Muscular Research Center, Boston University, www.delsys.com.
- [4] Christopher J.C.Burges, “A Tutorial on Support Vector Machines for Pattern Recognition”, Kluwer Academic Publishers, Boston. Manufactured in The Netherlands, pp 1-43.
- [5] Englehart, K., Hudgins, B., Parker, P.A., and M. Stevenson, "Classification of the Myoelectric Signal using Time- Frequency Based Representations", Medical Engineering and Physics, Special Issue: Intelligent Data Analysis in Electromyography and Electroneurography, Vol. 21, pp. 431-438, 1999
- [6] M.Zecca, S. Micera, M.C. Carrozza, P. Dario 2002. Control of Multifunctional Prosthetic Hand By Processing the EMG signal. Critical Reviews in Biomedical Engineering, 30(4-6);459-485.
- [7] Yi Liu and Yuan F. Zheng, “One-Against-All Multi-Class SVM Classification Using Reliability Measures”, Proceedings of International Joint Conference on Neural Networks, Montreal, Canada, July 31 - August 4, 2005
- [8] Saito, N. and R.R. Coifman, “Local discriminant bases and their applications,” J. Math. Imaging and Vision, 1995, 5, 4, 337-358
- [9] Coifman, R.R. and M.V. Wickerhauser, “Entropy-based algorithms for best basis selection,” IEEE. Trans. Information Theory, 1992, 38, 2, 713-719.

EFFECTS OF STRONG COLUMN WEAK BEAM RATIO AS CONSTRAINT FOR STEEL FRAME OPTIMIZATION

Mohammad Ghozi

Bhayangkara Surabaya
University and PhD Student of
Sepuluh Nopember Institute of
Technology, INDONESIA.
mghozi2002@gmail.com

Pujo Aji

Sepuluh Nopember
Institute of Technology
INDONESIA.
pujo@ce.its.ac.id

Priyo Suprobo

Sepuluh Nopember
Institute of Technology
INDONESIA.
priyo@ce.its.ac.id

ABSTRACT

An approach is presented as usage of genetic algorithm (GA) concept for steel frame optimization. The purpose of this paper is to discuss differences between result of optimization with and without strong column weak beam concept for optimizing steel frame structure. The optimization processes are carried out through 660 members of 2D steel structure model using GA-SAP2000. With strong column weak beam ratio as constraint in optimization, it is not easier to raise the fitness value but the structure will have smaller total drift and good arranged column's plastic modulus. It is concluded that strong column weak beam constraint is important and should be used in structural design.

Keywords: Genetic algorithm, Optimization, Steel structure, SAP2000, Strong column weak beam.

INTRODUCTION

AISC Seismic has arranged ratio of flexural strength to make structures have “strong column weak beam” behaviour. With this limitation columns always have stronger flexural strength than beams at every joint. At this stage flexural strength is defined as plastic moment (AISC, 1999).

The application of genetic and evolutionary computation to the automated design of structures has followed several avenues. The first is topology and shape optimization, in which the applications have included elastic truss structures subjected to static loading (Cai & Thiéret, 1993). There have also been research efforts devoted to developing algorithms for optimized structure topologies to satisfy user-determined natural frequencies. The second major area of automated design using genetic algorithms has been their application for optimal member sizing for truss structures using linear elastic analysis with U.S. design specifications (Adeli & Sarma, 2006).

The final major application of genetic algorithms (GA) has been the automated design of steel frame structures. One excellent method was combining commercial finite element method (FEM) program with iteration method to find required area of steel reinforced concrete plate (Khennane, 2007) and commercial FEM program with GA in parallel computing method (Ghozi, et al, 2011).

Since we know the advantage of commercial FEM program for analyze and design structure and its combination with GA, it will be good for academics for using combination of commercial FEM-GA-Parallel computing for research in optimization. For this reason, it will be discussed the difference between optimization result with and without “strong column weak beam” constraint.

THEORIES

Strong column weak beam concept

The current design methodology in the AISC Seismic Provisions (AISC, 2002) requires that the specified interstory drift of a steel moment frame be accommodated through a combination of elastic and inelastic frame deformations. The inelastic deformations are provided through development of plastic hinges at pre-determined locations within the frame. When moment connections are used, the plastic hinges are developed through inelastic flexural deformations in the connecting beams and in the column panel zone. This results in a strong column and weak beam design philosophy (AISC, 1999). This code requires that the sum of column flexure strengths at a joint should be more than the sum of beam flexure strengths (AISC SEISMIC 1, 9.6).

Sap2000

SAP2000 structure analysis program is a well known finite element analysis tool which already used for analyzing and modeling structure. SAP2000 could process or import the file input with extension MDB, XLS, TXT and SDB. SAP2000 also could export analysis result and design to files with extension XLS, TXT and SDB. After input file being opened, SAP2000 will run analysis, save result and design all members (CSI, 2000a,b). From the output file, we can get required data such as frame stress and joint displacements as indicators for acceptance criteria (Ghozi, et al, 2011).

Simple Genetic Algorithm

GA, a member of Evolutionary Algorithm (EA), is a population-based global search technique based on the Darwinian theory (Goldberg, 1989). Common operators used in GA are initialization of population, evaluate population, selection, mating, crossover, mutation, stopping criteria and get results (Gen & Cheng, 1997). The preliminary approach of GAs is Simple Genetic Algorithm (SGA). SGA guides the evolutionary search by a single population P_i . The size of P_i is denoted by SP . Individuals are encoded in a string scheme associated with one of the codes of the binary, integer, and real. In the evolutionary search, the promising individuals $P_i - sel$ and $P_{i+1} - sel$ are chosen from the population by a selection operation (roulette wheel, stochastic universal sampling, ranking, truncation, etc.). Then, the individuals chosen are applied to recombination and mutation operation (one point or multipoint crossover and mutation, uniform crossover, etc.). These evolutionary operations (mutation mut , crossover cr , and selection sel) are governed by their related evolutionary parameters Par (mutation and recombination probability rates, selection pressure, etc.). The population P_{new} evolved by the application of these evolutionary operators is decoded. Then, the fitness values are computed by use of this population. The evolutionary search is executed to transmit (migration) the individuals (emigrant and immigrants) to the next populations until satisfying a predetermined stopping criteria (Gen & Cheng, 1997; Haupt, 2003).

Master-slave concept for GA

As a matter of influence the GA robustness, many researchers develop methods for fastening GA runtime. One of famous method used for parallel GA is distributed optimization for GA (Lampinen, et al, 1999).

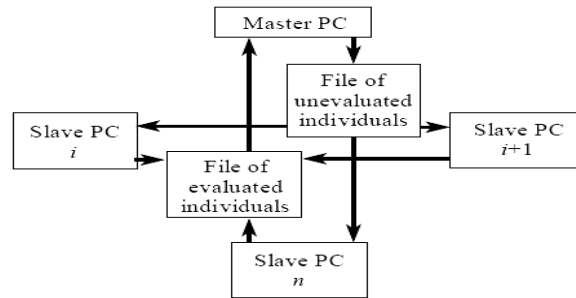


Figure 1. Parallel GA for distributed optimization (Lampinen, et al, 1999).

GA procedures are processed in Master PC and Slave PC's take only the remaining SAP2000's processes. In this method numbers of PC are used as Slave PC's (see Figure 1). Numbers method of hardware configuration for parallel computing definitively decrease required running time. We can use expensive and robust tool as supercomputer or use cheap PCs as a group of slaves. Boewulf method will be chosen because this method use cheap PCs.

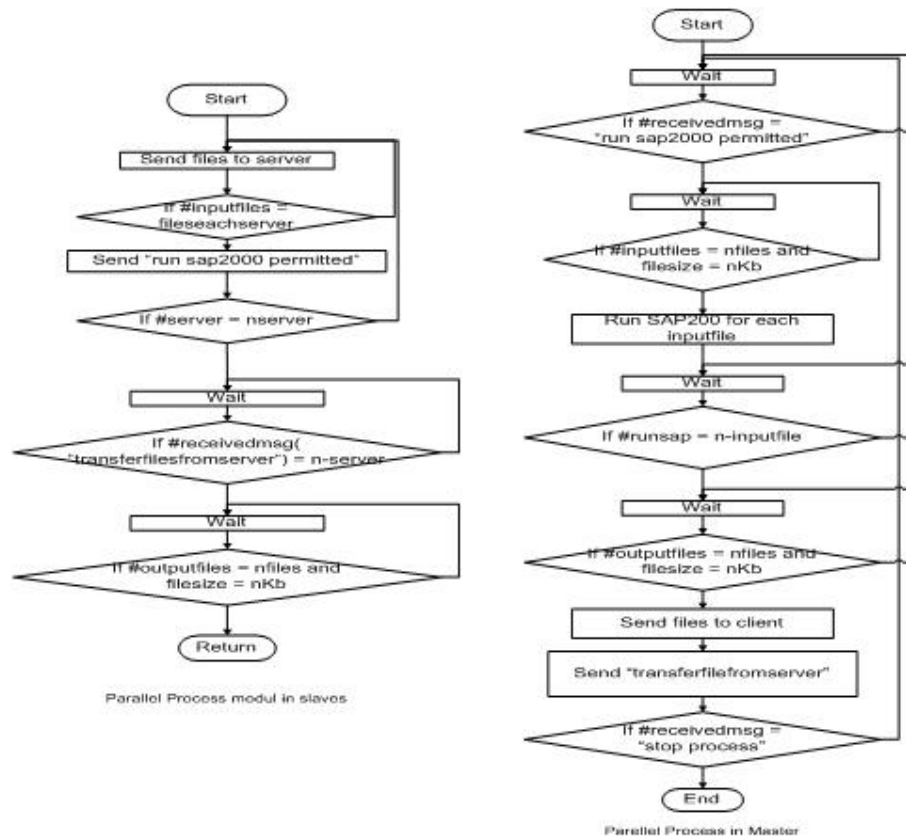


Figure 2. Flowchart a) in slave PC b) in Master PC (Ghozi, et al, 2011).

From master PC, the input file send to each slave PC. After send input files, master PC send message to each slave. The message is to command slave PC to 1) run SAP2000, 2) analyze input file, 3) design the input file (if necessary), 3) close SAP2000.

Each input file must have one output file. If number of output files is equal to number of input files, each slave send all output files to master PC. After all output files have been sent, each slave send message to master PC. The message is to let master PC to evaluate and calculate fitness value of each output file (see Figure 3). Raw data for of drift calculation are taken from table : Joint Displacements, data for stress constraint calculation are taken from table : *Steel Design 1 – Summary Data AISC-LRFD99*. Raw data for strong column weak beam ratio are taken from table : Frame Section Properties 01 - General. This iteration is stopped when generation = 20.

STEEL STRUCTURE MODEL FOR OPTIMIZATION

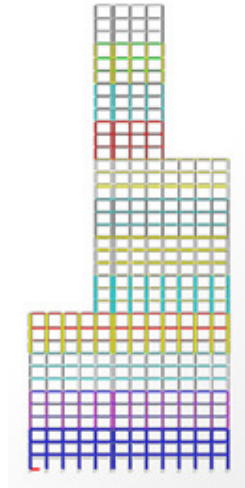


Figure 3. 2D steel structure model (Adeli, 2006)

The structure to be optimized is a 2D 36 stories steel structure (modified structure from Adeli, 2006). Each story has 11,68 ft height and each beam has 15 ft length. Twelve different types of columns are used in every three stories, twelve different types of beams are used in every three stories and twelve different types of braces are used in every three stories. 256 types of WF profiles used as available profiles are taken from SAP2000 database. Two objective functions compared in this paper. The first objective function is to minimize weight subject to three constraints (stress constraint, displacement constraint, flexural strength constraint) and forms as :

$$Objfunc1 = \sum \rho_i A_i L_i + gen_g^2 (\sum re_i + \sum rj_j + \sum scwb_j) \quad (1)$$

And the second objective function is to minimize weight subject to two constraints (stress constraint and displacement constraint) and forms as :

$$Objfunc2 = \sum \rho_i A_i L_i + gen_g^2 (\sum re_i + \sum rj_j) \quad (2)$$

Where *Objfunc* is objective function, ρ is unit weight, A is Area of cross sectional, L is length of element, gen is generation, re is element constraint, and rj is displacement constraint. $Re_i = 0$ if $ratio_i < 1$ and $re_i = ratio_i^2$ if $ratio_i > 1$, $rj_i = 0$ if $drift_i < 0,04672$ and $rj_i = drift_i^2$ if $drift_i > 0,04672$, $scwb_j = 0$ if $R_j < 1$ and $scwb_j = R_j^2$ if $scwb_j > 1$.

For displacement constraint, the interstory drift is limited to 0.004 times the story height. For stress constraints, the capacity ratio of each element is limited with equation (H1-1 AISC-LRFD99):

$$ratio = \frac{P_u}{\phi P_n} + \frac{8}{9} \left\{ \frac{M_{u33}}{\phi b M_{n33}} + \frac{M_{u22}}{\phi b M_{n22}} \right\} \text{ for } \frac{P_u}{\phi P_n} \geq 0.2 \quad (3)$$

$$\text{ratio} = \frac{P_u}{2\phi P_n} + \left\{ \frac{M_{u33}}{\phi_b M_{n33}} + \frac{M_{u22}}{\phi_b M_{n22}} \right\} \text{ for } \frac{P_u}{\phi P_n} < 0.2. \quad (4)$$

Where P_u is the required compressive strength, P_n is the nominal compressive strength, M_u is the required flexural strength, M_n is the nominal flexural strength, $\phi = 0.85$ and $\phi_b = 0.9$.

For the flexural strength constraint, the ratio of beam to column stiffness at every joint must under 1, with form as (9.6 AISC Seismic):

$$R = \frac{\sum_{n=1}^{nb} M_{pbm}}{\sum M_{pc}} < 1. \quad (5)$$

Where R is strong column weak beam ratio, M_{pbm} is plastic moment of beams, M_{pc} is plastic moment of columns above and below the joint.

The loading on the structure consists of a dead load of 375 lbs/ft' and a live load of 450 lbs/ft'. The lateral loads due to wind are computed according to the UBC (1994). Lateral forces are determined by assuming a basic wind speed of 113 km/h (70 mil/h), exposure C, and an importance factor of 1. Earthquake force is defined by auto lateral load according to UBC97 and with CQC modal combination of response spectrum, SRSS directional combination, modal analysis case use 8 modes Eigen vector type mode. GA process are carried out with parameters: 40 individuals, 20 generations, 0.8 crossover, 0.005 mutation, 1 cut point crossover, 25% elitism and the rest use roulette wheel selection.

RESULT AND DISCUSSION

Optimization of 2D brace has done successfully with the presence (type 1) and absence (type 2) of beam to column strength ratio as constraint. Objective function, total drift, maximum displacement and also fitness plots are taken from individual which has the highest fitness at each generation. Each fittest individual of every generation have already zero stress constraint violation. They are plotted as result of optimization process and are shown in figures below.

As we can see in Figure 4, fitness of type 2 raise in ease way than the type 1. This is caused by the number of constraints only two. Type 1 objective function structure has no violation since generation 14 as type 2 has it in generation 2.

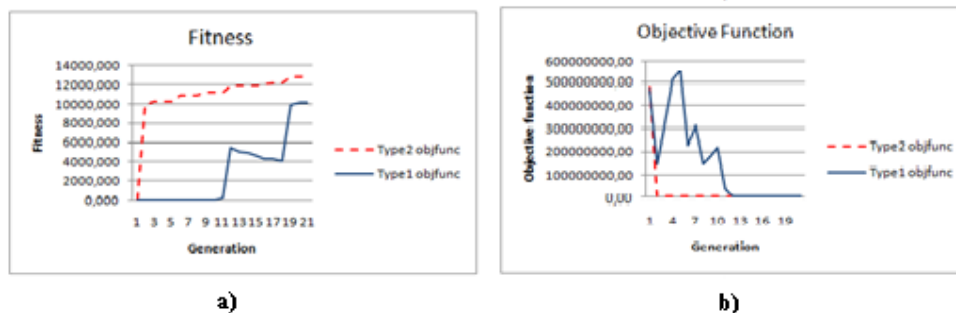


Figure 4. a)Fitness b) objective curve

The total drift and displacement of structure are also analyzed. The structure is mostly accepted if it has small drift and bigger column's plastic modulus in lower story. Type 2 objective function have bigger total drift than type 1. This could happen because structure with type 1 objective function has stronger columns than beams and the lower columns have bigger plastic modulus than columns at upper story (see Figure 6). The type 1 objective function structure has good arranged column's plastic modulus.

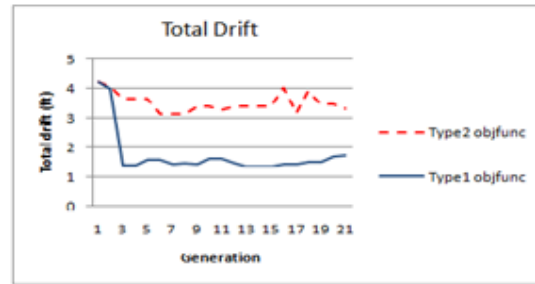


Figure 5. Total drift of structures.

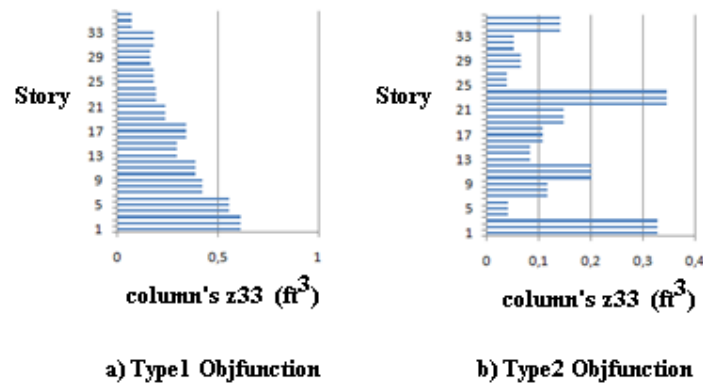


Figure 6. Column's plastic modulus from fittest individual at the last generation.

From the weight of structure which are taken from the best individual at the last generation, it can be seen that type 2 of objective function have the lighter weight than type 1 at both structures (see Table 1 below).

Table 1. Weight structure from fittest individual at the last generation.

Items	Details	
	Type 1 objfunc	Type 2 objfunc
Weight	986745 lbs	773978 lbs

CONCLUSION

Two optimization process have been completed to compare effect of presence and absence of beam-column strength ratio. 2D steel structure with 660 elements has been optimized as model with combination of GA-SAP2000. The objective function is to minimize weight subject to three and two constraints. Structure with beam-column strength ratio as constraint is more difficult to raise the fitness value, has smaller total drift of structures and has good arranged column's plastic modulus but bigger in weight. It is concluded strong column weak beam as constraint is useful and should be included in design of steel structure.

REFERENCES

- Adeli, H. & Sarma, K. C. (2006). *Cost Optimization Of Structures : Fuzzy Logic, Genetic Algorithms, And Parallel Computing*, England, John Wiley & Sons Ltd.,
- AISC. (2002). AISC Seismic Provisions, USA
- Cai, J. B., and Thiereut, G. (1993). Discrete Optimization of Structures Using an Improved Penalty Function Method. *Engineering Optimization*, Vol. 21, No. 4, pp.293-306.
- Gen, M. and Cheng, R., (1997). *Evolutionary Algorithm And Engineering Design*. A wiley-Interscience publication, John wiley & Sons, Inc., New York, 1997.
- Ghozi, M., et al., (2011). Evolutionary Parallel Sap2000 For Truss Structure Optimization, *International Journal Of Academic Research* Vol. 3. No. 2, Part IV, pp. 1140-1145.
- Goldberg, D.E., (1989) *Evolutionary Algorithm In Search, Optimization and Machine Learning*. Addition wesley publishing company Inc, USA.
- Haupt, RL., Haupt, SE. (2004). *Practical Genetic Algorithm*. Wiley-Interscience Publication, USA.
- Joghataie, A. & Takalloozadeh, M. (2009). Improving Penalty Functions for Structural Optimization, *Transaction A: Civil Engineering* Vol. 16, No. 4, pp. 308-320, Sharif University of Technology.
- Khennane, Amar, "Performance Design Of Reinforced Concrete Slabs Using Commercial Finite Element Software", http://eprints.usq.edu.au/708/1/Khennane_SLAB_DESIGN_revised_paper.pdf, accessed July 2007.
- Lampinen J., et al., (1999). Differential Evolution – New Naturally Parallel Approach For Engineering Design Optimization. Edited by Topping B. H. V. Civil-comp press. Edinburgh, UK. pp. 217-228.

REDUCE SCANNING TIME INCREMENTAL ALGORITHM (RSTIA) OF ASSOCIATION RULES

Yehia.M EL-Rahman

Department of Computer Science,
Philadelphia University, Amman,
JORDAN

Yehia_by@hotmail.com

Mohammad.M AL-Widyan

Department of Computer Science,
Al al-Bayt University, Mafraq,
JORDAN

Mohamdwidyan@hotmail.com

ABSTRACT

In the real world where large amounts of data grow steadily, some old association rules can become stale, and new databases may give rise to some implicitly valid patterns or rules. Hence, updating rules or patterns is also important. A simple method for solving the updating problem is to reapply the mining algorithm to the entire database, but this approach is time-consuming. This paper reuses information from old frequent itemsets to improve its performance and addresses the problem of high cost access to incremental databases in which data are very changing by reducing the number of scanning times for the original database. a log file has been used to keep track of database changes Whenever, a transaction has been added, deleted or even modified, a new record is added to the log file. This helps identifying the newly changes or updates in incremental databases. A new vertical mining technique has been used to minimize the number of scanning times to the original database. This algorithm has been implemented and developed using C#.net and applied to real data and gave a good result comparing with pure Apriori.

Keywords: Data mining; Vertical mining; Association rules; Incremental databases.

INTRODUCTION

Recent advances in data mining have attracted much attention in database research. And this is because their wide applicability in many areas, including industry and the finance sector. The availability of automated tools has enabled the collection of large amount of data. These large databases contain information that is potentially useful for making market analysis and financial forecasts.

So, data mining is an approach to discover such useful information from very large and dynamic databases. This information includes association rules, characteristic rules, classification rules, generalized relations, discriminant rules, etc.

There are various data mining problems, but the mining of association rules is an important one. A well-known example for association rules is about basket market analysis . where a record in the sales data describes all the items that are bought in a single transaction. Together with other information such as the transaction time, customer-id, etc. mining association rules from such a database is to discover from the huge amount of past transactions , all the rules like "A customer who buys item A and item B is most likely to buy item C in the same transaction". Where A,B and C are initially unknown. Such rules are very useful for marketers to develop and implement customized marketing programs and strategies.

A feature of data mining problems is that in order to have stable and reliable results, a huge amount of data has to be collected and analyzed. The large amount of input data and mining results poses a

maintenance problem. While new transactions are being appended to a database and obsolete ones are being removed. Rules that already discovered also have to be updated. In this paper we examine the problem of maintaining discovered association rules. We propose a new incremental algorithm which can handle all the update cases including insertion, deletion and modification of transactions.

STATEMENT OF PROBLEM

In Apriori (Agrawal, et al., 1993), the discovery of frequent itemsets from transactional databases is accomplished in a step wise fashion, where itemsets found to be frequent in a particular step (n) are used to produce potential frequent itemsets, known as candidate itemsets, at step n+1. During each step, a database scan is essential to perform support counting of the new candidate itemsets. After the presentation of Apriori, numerous association rule algorithms (Zaki, et al., 1997; Han, et al., 2001) have focused on improving Apriori candidate generation step by reducing the number of database passes, main memory usage and other CPU costs.

In this paper, a new incremental technique based on vertical mining has been introduced which aims to reduce the number of scanning time to the original database and to update the stale patterns or rules without reapplying the mining algorithm to the entire database which is time-consuming.

LITERATURE REVIEW

In the real world where large amounts of data grow steadily, some old association rules can become stale, and new databases may give rise to some implicitly valid patterns or rules. Hence, updating rules or patterns is also important. A simple method for solving the updating problem is to reapply the mining algorithm to the entire database, but this approach is time-consuming. The algorithm in this paper reuses information from old frequent itemsets to improve its performance. Several other approaches to incremental mining have been proposed.

Although many mining techniques for discovering frequent itemsets and associations have been presented, the process of updating frequent itemsets remains trouble for incremental databases. The mining of incremental databases is more complicated than the mining of static transaction databases, and may lead to some severe problems, such as the combination of frequent itemsets occurrence counts in the original database with the new transaction database, or the rescanning of the original database to check whether the itemsets remain frequent while new transactions are added.

This work proposes an algorithm for incremental mining, which can discover the latest rules and doesn't need to rescan the original database.

In (D. W. Cheung) the authors have proposed an algorithm called Fast Update algorithm (FUP) to efficiently generate associations in the updated database. The FUP algorithm relies on Apriori and considers only these newly added transactions. Let db be a set of new transactions and DB be the updated database (including all transactions of DB and db). An itemset x is either frequent or infrequent in DB or db. Therefore, x has four possibilities, as shown in table 1. in the first pass, FUP scans db to obtain the occurrence count of each 1-itemset. Since the occurrence counts of F_k in DB are known in advance, the total occurrence count of arbitrary x is easily calculated if x is in Case 2. if x is unfortunately in Case 3, DB must be rescanned. Similarly, the next pass scans db to count the candidate 2-itemsets of db. If necessary, DB is rescanned. The process is reiterated until all frequent itemsets have been found. In the worst case, FUP does not reduce the number of the original database must be scanned.

Table 1. Four scenarios associated with an itemset in DB

db DB	Frequent itemset	Infrequent itemset
Frequent itemset	Case 1: Frequent	Case 2:
Infrequent itemset	Case 3:	Case 4: Infrequent

Furthermore, a recently proposed associative algorithm called MCAR (Thabatah, et al., 2004) adopts the tid-list intersection methods of (Zaki et al., 1997) from association rule to discover classification rules in a single training data scan. A tid-list of an item is the transaction numbers (tids) in the database that contain that item. Experimental results on real world data and synthetic data (Thabatah, et al., 2004) revealed that algorithms that employ tid-lists fast intersection method outperform Apriori-like ones with regards to processing time and memory usage. In spite of the advantage of tid-list intersection approach, when the cardinality of the tid-list becomes very large, intersection time gets larger as well. This happens particularly for large and correlated transactional databases.

Finally, developing efficient frequent ruleitems discovery methods, which decrease the number of database scans and minimize the use of complex data structure objects during the learning step is vital. This is because that most of the time is spent during the training phase.

Apriori Algorithm

The Apriori algorithm concentrates primarily on the discovery of frequent itemsets according to a user-defined minSup. The algorithm relies on the fact that an itemset could be frequent only when each of its subset is frequent; otherwise, the itemset is infrequent. In the first pass, the Apriori algorithm constructs and counts all 1-itemsets. (A k-itemset is an itemset that includes k items.) After it has found all frequent 1-itemsets, the algorithm joins the frequent 1-itemsets with each other to form candidate 2-itemsets. Apriori scans the transaction database and counts the candidate 2-itemsets to determine which of the 2-itemsets are frequent. The other passes are made accordingly. Frequent (k - 1)-itemsets are joined to form k-itemsets whose first k-1 items are identical. If k 3, Apriori prunes some of the k-itemsets; of these, (k - 1)-itemsets have at least one infrequent subset. All remaining k-itemsets constitute candidate k-itemsets. The process is reiterated until no more candidates can be generated.

Example 1: Consider the database presented in Table 2 with a minimum support requirement is 50%. The database includes 11 transactions. Accordingly, the supports of the frequent itemsets are at least six. The first column “TID” includes the unique identifier of each transaction, and the “Items” column lists the set of items of each transaction.

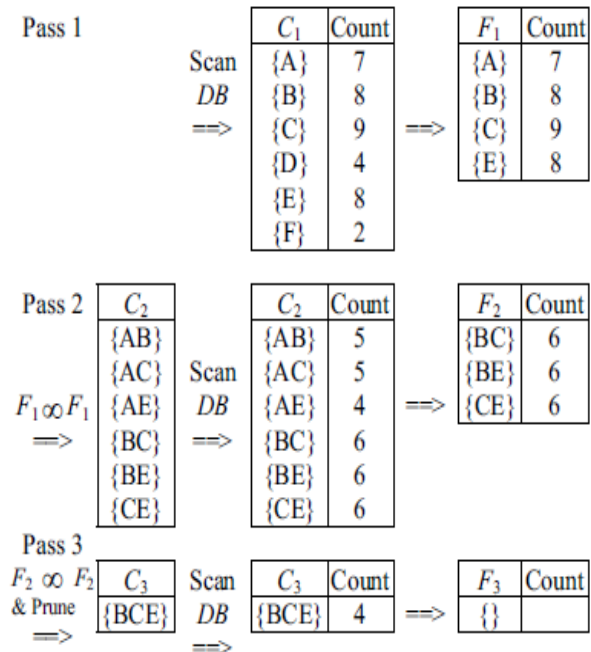
Let C_k be the set of candidate k-itemsets and F_k be the set of frequent k-itemsets. In the first pass, the database is scanned to count C_1 . If the support count of a candidate exceeds or equals six, then the candidate is added to F_1 . The outcome is shown in Figure 1. Then, $F_1 \& F_1$ forms C_2 (Apriori-gen function is used to generate C_2) after the database has been scanned for a second time, Apriori examines which itemset of C_2 exceeds the predetermined threshold.

Moreover, C_3 is generated from F_2 as follows. Figure 1 presents two frequent 2-itemsets with identical first item, such as {BC} and {BE}. Then, Apriori tests whether the 2-itemset {CE} is frequent. Since {CE} is a frequent itemset, all the subsets of {BCE} are frequent. Thus, {BCE} is a candidate 3-itemset, or {BCE} must be pruned. Apriori stops to look for frequent itemsets when no candidate 4-itemset can be joined from F_3 . Apriori scans the database k times when candidate k-itemsets are generated.

Table 2: An example of a transaction database

TID	Items
001	A C D E
002	A C D
003	B C E
004	A B C E
005	A B E
006	B C E
007	A B E
008	B C D E
009	A B C D
010	C E F
011	A B C F

Figure 1: application of Apriori algorithm



Reduce Scanning Time Incremental Algorithm (RSTIA)

Apriori algorithm is based on finding large itemsets from database transactions by keeping a count for every itemset. However, since the number of possible itemsets is exponential to the number of items in the database, it is impractical to count every subset we encounter in the database transactions. The Apriori algorithm tackles the combinatorial explosion problem by using an iterative approach to count the itemsets.

The iterative nature of the Apriori algorithm implies that at least n database passes are needed to discover all the large itemsets if the biggest large itemsets are of size n . since database passes involve slow access, to increase efficiency, we should minimize the number of database passes during the mining process. one solution is to generate bigger-sized candidate itemsets as soon as possible, so that their supports can be counted early.

```

foreach(tranID in DelT)
for(j=0 ; j< Ln.Count ; j++) // n = 1.....
if (tranID Exist in Ln[j]. TransactionList)
{
Ln[j].TransactionList.remove(tranID);
Ln[j].Support--;
}

LI ← pass(AddT);
for (k = 2;  $F_{k-1} \neq \emptyset$ ; k++) do
 $L_k \leftarrow$  candidate-gen( $L_{k-1}$ );
for each transaction  $t \in$  AddT do
for each candidate  $l \in L_k$  do
if  $l$  is contained in  $t$  then

```

```

{ L.Support++;
  L.TransactionList.Add(t) }
end
end
end

Lf ← {L ∈ Lk | L.count/n ≥ minsup}
generateRule(Lf);

save(L1, Ln, Lf, Rule);

```

Figure 2: RSTIA Algorithm

This paper addresses the problem of high cost access to incremental databases in which data are very changing and time-varying by reducing the number of scanning times for the original database.

In this approach, a log file has been used to keep track of database changes, the log file contains three columns which are the transactionID, ActionID and finally ActionDate. Whenever, a transaction has been added, deleted or even modified, a new record is added to the log file. This helps identifying the newly changes or updates in incremental databases by avoiding scanning database to locate newly updates. On the other hand, an xml file has been used to store the date of the last time the algorithm has been executed to ensure that on the next time the algorithm should be executed from the last time it executed.

How It Works

This algorithm is Apriori-based but, tries to solve the shortcoming of multi scan to the original database by generating bigger-sized candidate itemsets as soon as possible, so that their supports can be counted early.

And this can be summarized as follows:

Step 1: check the xml file, if it exists then go step 2, else call vertical_ Apriori.

Step 2: read the log file and compare the ActionDate attribute values with the stored value in the xml file, if they are greater than the value of xml file, then go to step 3

Step 3: for each record in the log file that satisfy step 2, check the value of ActionID, if one then go to step 4, if two got step5, if 3 go to steps 5,4 respectively.

Step 4: The value one of ActionID means a new transaction has been added to the database, so, for each item that involved in such transaction, increment its support by one, and concatenate the transactionID to each item involved in it.

Step 5: The value two of ActionID a transaction has been deleted from the database, so, for each item that involved in such transaction, decrement its support by one, and remove the transactionID from each item involved in it.

VERTICAL_ APRIORI:

it is the same for normal Apriori, but the only two differences are, that a new information is added to frequent times which is the transactions where they lay, and the other difference is that vertical_Apriori scans database first time only and store all frequent tiems , their support, and the transactions they lay in a text file, so in the next time the algorithm run, it no longer scans the

database, rather it check the text files which number of passes on the database for future times the algorithm runs.

Example 1: Consider the database presented in Table 3 with a minimum support requirement is 50% and xml file doesn't exists. The database includes 4 transactions. Accordingly, the supports of the frequent itemsets are at least 2. The first column "TID" includes the unique identifier of each transaction, and the "Item" column lists the set of items of each transaction.

Table 3: An example of a transaction database

TID	Item	LOG File →	TID	ActionID	Date
1	Ab		1	1	2011/05/1 8 12:30
2	Bc		2	1	2011/05/1 8 12:35
3	Ac		3	1	2011/05/1 8 12:40
4	Abc		4	1	2011/05/1 8 12:42

First, there is no rule-generation has been done yet so the algorithm scans the original database and counts all frequent 1-itemsets and store them into FrequentItemsL1 file with their support and transactionID they located to make it easily finding such transactions, see table below

ListIndex	Itemset	Support	TransactionList
1	A	3	1, 3, 4
2	B	3	1, 2, 4
3	C	3	2, 3, 4

In this step, we use FrequentItemsL1 file to generate Candidate itemset of size 2, C2 and count their support by scanning the original database and store them to AllFrequentItem file as it is in previous step

ListIndex	Itemset	Support	TransactionList
1	Ab	2	1, 4
2	Ac	2	3, 4
3	Bc	2	2, 4

In the next step, C3 is generated and their support is counted again by scanning the original database and then the resultant C3 with support are appended to the AllFrequentItem file.

istIndex	Itemset	Support	TransactionList
1	ab	2	1, 4
2	ac	2	3, 4
3	bc	2	2, 4
1	abc	1	4

In this step, Aproiri Stops, since there is no more candidate itemsets, so we use the AllFrequentItem file to generate The final all frequent item set by matching the required support with their support, and discover the most frequent itemsets in the database.

ListIndex	Itemset	Support
1	a	3

2	b	3
3	c	3
4	ab	2
5	ac	2
6	bc	2

And finally, the rules are generated as follows:

ListIndex	Itemset	confidence
1	a->b	66.6%
2	a->c	66.6%
3	b->a	66.6%
4	b->c	66.6%
5	c->a	66.6%
6	c->b	66.6%

CONCLUSION

This paper reuses information from old frequent itemsets to improve its performance and addresses the problem of high cost access to incremental databases in which data are very changing by reducing the number of scanning times for the original database. a log file has been used to keep track of database changes.

Whenever, a transaction has been added, deleted or even modified, a new record is added to the log file. This helps identifying the newly changes or updates in incremental databases. This algorithm has been implemented and developed using C#.net and applied to real data and gave a good result comparing with pure Apriori.

ACKNOWLEDGEMENTS

Authors would like to thank Dr. Hasan AL-Refai from Philadelphia University for his supported and help. This support is gratefully acknowledged.

REFERENCES

1. Arawal, R., Amielinski, T., and Swami, A. (1993) Mining association rule between sets of items in large databases. Proceedings of the ACM SIGMOD International Conference on Management of Data, (pp. 207-216). Washington, DC.
2. D. W. Cheung, J. Han, V. T. Ng, and C. Y. Wong, "Maintenance of discovered association rules in large databases: an incremental updating technique," In Proc. 12th Intl. Conf. on Data Engineering, New Orleans, LA, pp. 106-114, Feb. 1996.
3. M. J. Zaki, S. Parthasarathy, M. Ogihara, and W. Li. New algorithms for fast discovery of association rules. 3rd KDD Conference, pp. 283-286, August 1997.
4. W. Li, J. Han, and J. Pei. CMAR: Accurate and efficient classification based on multiple-class association rule. In ICDM'01, pp. 369-376, San Jose, CA, Nov. 2001.
5. F. Thabtah, P. Cowling and Y. Peng. A New Multiclass, Multi-label Associative Classification Approach. To appear at the 4th International Conference on Data Mining (ICDM '04). Brighton, UK, Oct. 2004.

OPTIMIZATION DIAMETER OF PIPE AT FRESH WATER NETWORK SYSTEM

Chairil Saleh

Department of Civil Engineering
University of Muhammadiyah, Malang
INDONESIA
Chairissy@yahoo.com,

Sulianto

Department of Civil Engineering
University of Muhammadiyah, Malang
INDONESIA

ABSTRACT

This paper studied optimization diameter of pipe. Diameter of pipe was due to fresh water network system. Location of study was at Turen District, Malang Regency, and Indonesia. The methodology consisted of optimization using genetic algorithm so that was got average rest of pressure. Results could be used as consideration to optimize service of fresh water use.

Keywords: optimization, diameter of pipe, rest of pressure

INTRODUCTION

The most common type of coherent structure associated with secondary flow in curved bends was the main cell of cross-stream circulation, or helix, within which the fluid particles follow a helicoidal path (Constantinescu et al., 2011). If the bed was not strongly deformed, the main cell extends over a large part of the cross section. Once the pool-point bar structure developed, this cell generally extended only over the outer, deeper part of the channel (Constantinescu, 2011),

Channel geometry equations which relate discharge to channel width or channel cross section were considered to be the most reliable (Tayfur and Singh, 2011). Some author developed regression equations relating discharge to channel cross section to yield the most satisfactory results. Once hydraulic geometry equations were defined for a stream, the cross-section area measurements was all that was needed for estimating the discharge.

Step-pool geometry, including relationships between step length, step height, grain size, stream gradient, and channel width, and variance in these relationships, had been investigated to seek insights into formative processes, hydraulic controls, and analogies to lower-gradient systems (Wilcox et al., 2011). Step-pool sequences, in which flow plunges over channel-

spanning boulder, log, and/or bedrock steps into downstream scour pools, produce stepped longitudinal profiles and dissipate energy in high-gradient streams.

Traditionally, the optimal design of water distribution network considered minimization of economic cost. Nowadays, however, minimization of design cost was considered as the objective function of a water distribution network design problem and diameters of the network's pipes as its variables. In a discrete optimization problem with 10 locations for the pipes and 10 commercial diameters available for each pipe, the decision space for such a problem would be 10^{10} different states (Sultanjalili et al., 2011). Design of water distribution networks that do not consider performance criteria would possibly lead to less cost but it could also decrease water pressure reliability in abnormal condition such as a breakage of pipes of the network.

CONTEXT AND REVIEW OF LITERATURE

Flow in element of pipe

Flow in pipe had energy as velocity energy, pressure energy, and head energy. Based on principal of Bernoulli, total energy was described as Figure 1 (Triadmojo, 1995).

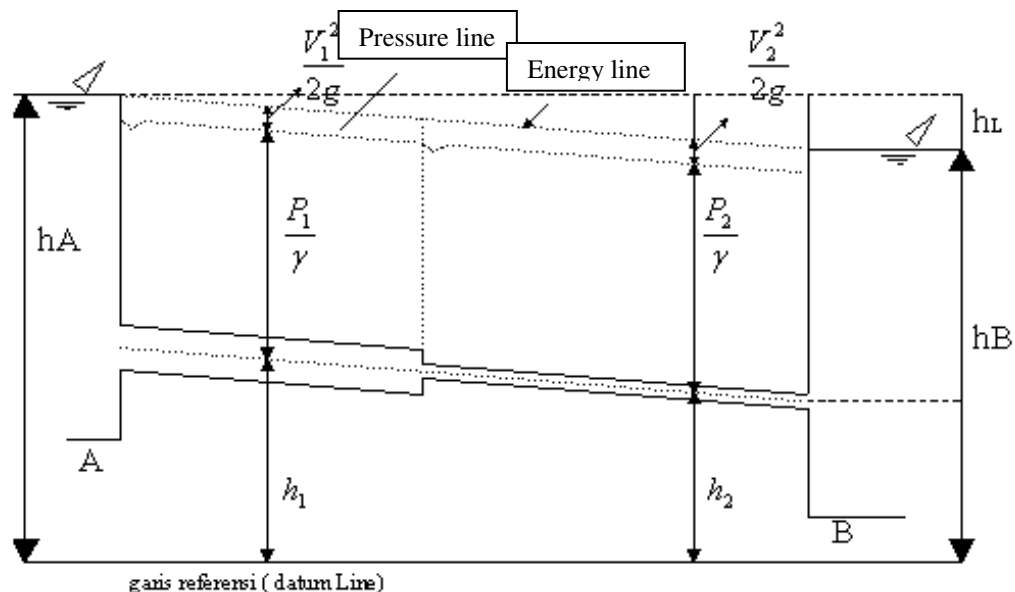


Figure 1 Diagram of energy

Bernoulli equitiom was as follow : (Triadmojo, 1995)

$$E_1 = E_2 = h_1 + \frac{v_1^2}{2g} + \frac{P_1}{\gamma} = h_2 + \frac{v_2^2}{2g} + \frac{P_2}{\gamma} + h_L \quad \dots\dots\dots (1)$$

Note : $\frac{v_1^2}{2g}$ = velocity head at point-1 (m)

$\frac{v_2^2}{2g}$ = velocity head at point-2 (m)

$\frac{p_1}{\gamma}$ = pressure head at point-1 (m)

$\frac{p_2}{\gamma}$ = pressure head at point-2 (m)

h_1 = elevation head at point-1 (m)

h_2 = elevation head at point-2 (m)

h_L = head loss (m)

Head losses

Reynold number was as follow: (Triadmojo, 1995)

$$Re = \frac{V D}{\nu} \quad \dots\dots\dots (2)$$

Note :

D = Diameter of pipe (m)

V = velocity in pipe (m.s⁻¹)

ν = kinematic viscocity of fluid (m².s⁻¹)

Re = Reynold number

Re < 2000, → laminair

2000 < Re < 4000 → transition

Re > 4000 → turbulence

Optimization model

System analysis using mathematical model provides a suitable methodology to analyze various aspect of water resource system planning (Holko and A, Lepsito, 1997). Linear Programming is used for this study. This program would give some advantages for analyzing water resources system planning as follow (Cheng Yun at al., 2008): (1) Constraints and objective function which are used in this program are linear function; (2) This program is quite simple because there are many solver can use to solve this problem; (3) If it can be build the optimization procedure (the objective function with any kinds of constraints), it can be approached the real problem.

The step by step to carry out Linear Programming is as follow (Loucks, 1982): (1) To built optimization models (Figure 2); (2) To determine the resources which would be optimized (for

this case study are irrigation and hydro electrical power); (3) To calculate the quantities of input or output for every kind of activity unit; (4) To build the mathematical modeling.

METHODS

Location of study was at Turen District, Malang Regency, East Java Province of Indonesia, it was included 5 villages namely Desa Talok, Desa Pagedangan, Desa gedog wetan, Kelurahan turen, and Desa Sedayu. At this location, supply water was come from Umbul Rejo source. There was used transmtion of pipe gravitically to reach the users. Capacity of Umbul Rejo source was 325 l/s. Spesification of existing pipe was as Table 1. Turen District used S 12.5 for the kind of pipe.

Table 1 Diameter and thickness of pipe

No	Diameter (mm)	Thickness (mm)
1	40	1.6
2	63	2.5
3	90	3.5
4	110	4.2
5	160	6.2
6	200	7.7
7	250	9.6
8	315	12.1
9	355	13.6
10	400	15.3

The steps of research were included

1. To simplify pipe network with lossing the branch of pipe.
2. To analyze hydraulics of branch pipe.
3. To apply genetic algorithm, which included the steps as follow:
 - To determine parameter related to genetic algorithm such as population, probability, mutation, and maximum generation. Mengasumsikan diameter pipa sebagai kromosom.
 - To perform individual population randomly.
 - To evaluate the fitness
 - To select the individual fitted to the best
 - Crossover and Mutation.

FINDINGS AND DISCUSSIONS

Comparison curve rest pressure between due to manual procedure and the sodtware was described as Figure 1 below:

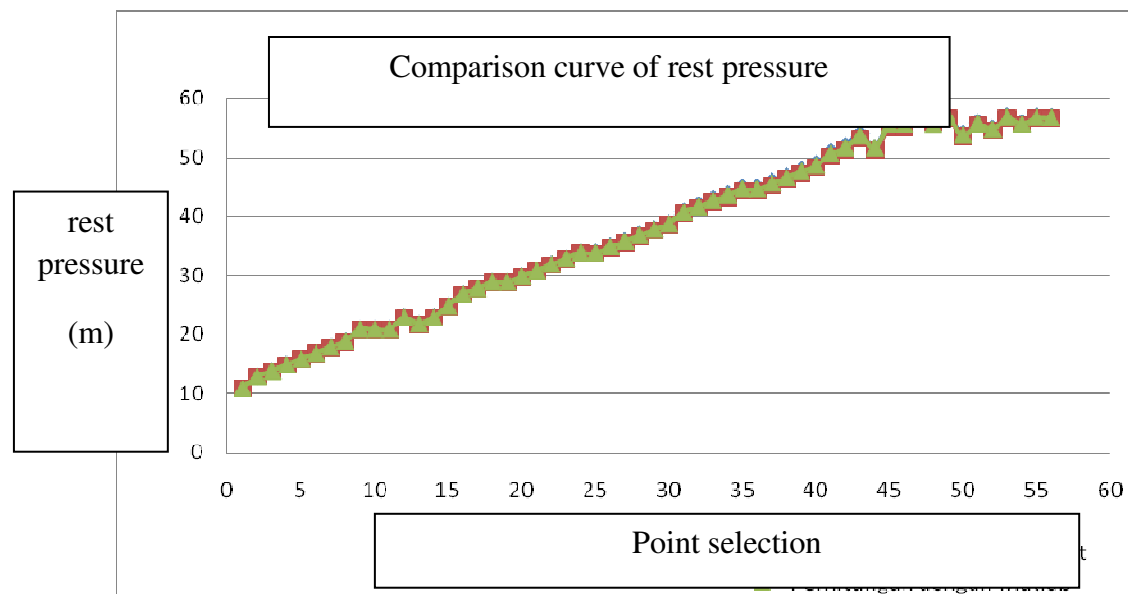


Figure 1 Comparison Curve of rest pressure

Justification of pipe diameter could be carried out due to:

1. Selection of justified diameter was as the comparison between existing and optimized diameter.
2. To select the biggest diameter between existing and optimized diameter using discrete approaching to the field condition.

Comparison curve of diameter was described as Figure 2.

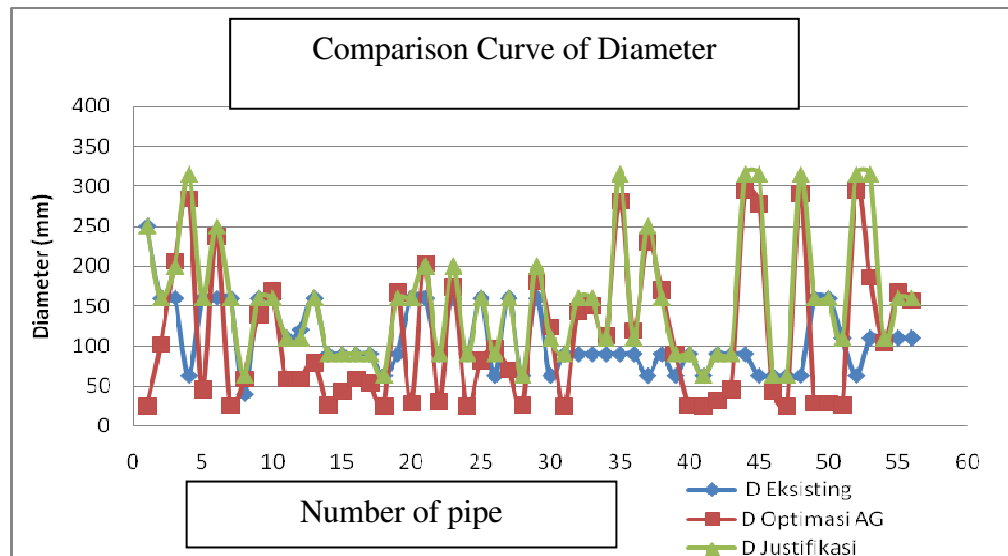


Figure 2 Comparison Curve of diameter

(Note: D Eksisting = D existing, D optimasi AG = D optimized genatic algorithm, D justifikasi = D justification)

Rest pressure were not as well as the result of optimized genetic algorithm. It was shown that rest pressure was 29.49 m, minimum value was 7.93 m and maximum value was 37.42 m. Control result of rest pressure was low enough, it was 27.55 m but at existing condition, it was 43.86 m. This condition was described as Figure 3 below,

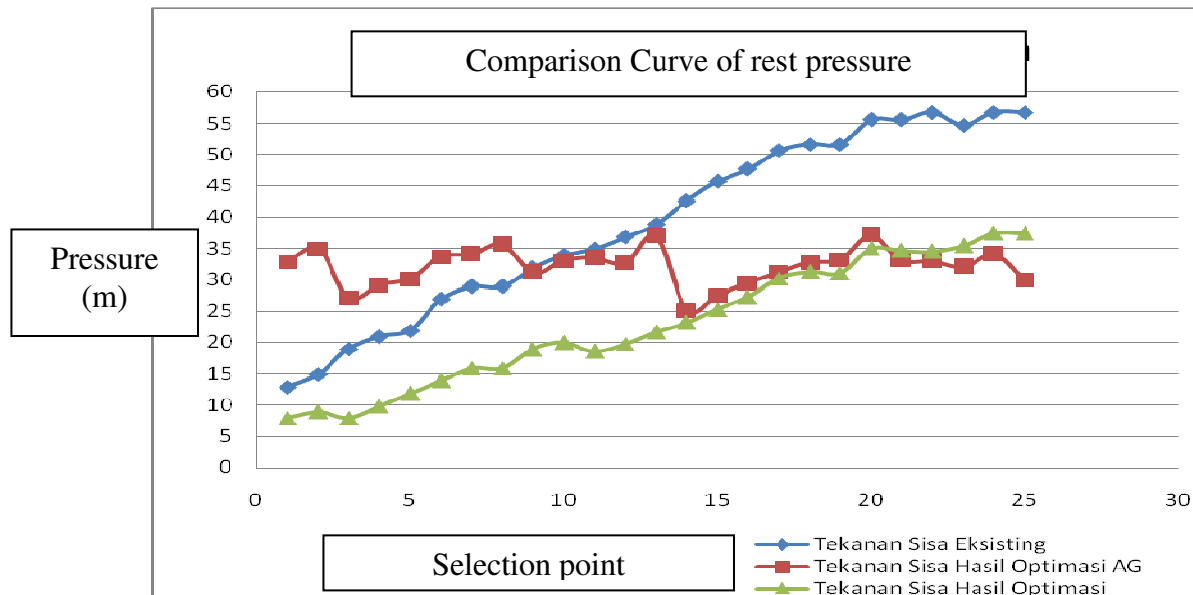


Figure 3 Comparison Curve of rest pressure

(Note: tekanan sisa eksisting = existing rest pressure, tekanan sisa hasil optimasi AG = rest pressure due to genetic algorithm, tekanan sisa hasil optimasi = rest value due to optimization result)

CONCLUSION

Performance of pipe network after optimization due to genetic algorithm showed that the difference rest value with the minimum value was 11.99 m (the minimum value was = 25.19 m and maximum value was 37.09 m). Based on justification of diameter, it showed that the difference rest value with the minimum value was 7.93 m (the minimum value was = 37.42 m and maximum value was 43.86 m).

REFERENCES

1. Constantinescu, George ; Miyawaki, Shinjiro ; Rhoads, Bruce ; Shukhodolov, Alexander ; and Kirkil, Gokhan (2011). The Structure of Turbulent Flow at a River Confluence with Momentum and Velocity Ratios Close to One Insight Provided by An Eddy-Resolving Numerical Simulations. *Atmosphere, Earth and Energy Division*, Lawrence National Lab, PO Box 808, Livermore, CA 94551

2. Tayfur, Gokmen and Singh, Vijay P. (2011). Predicting Mean and Bankfull Discharge from Channel Cross-Sectional Area by Expert and Regression Methods. *Journal of Water Resource Manage* (25) p. 1253-1267
3. Wilcox, Andrew C.; Wohl, Ellen E; Comiti, Francesco; and Mao, Luca. (2011), Hydraulics, morphology, and energy dissipation in an alpine step-pool channel. *Atmosphere, Earth and Energy Division*, Lawrence National Lab, PO Box 808, Livermore, CA 94551
4. Sultanjalili, Mohammadjafar; Bozorg, Omid; Haddad; and Mariiio, Miguel A. (2011) Effect of Breakage Level One in Design of Water Distribution Networks. *Journal of Water Resource Manage* (25): 311-337
5. Triadmojo (1995). Hidrolika Teknik. Andi offset. Yogyakarta
6. Holko, L. and A. Lepsito. 1997. Modelling the Hydrological Behaviour of Mountain Catchment Using TOPMODEL, *Journal Hydrology* 196: 361-377.
7. Cheng Yun; Cheng-Haw Lee; Yhi Chi Tan; and Hsin Fu Yeh, 2008. An Optimal Water Allocation For An Irrigation District In Pingtung Country, Taiwan. *Published on line in Wiley Inter Science* (www.interscience.wiley.com), DOI: 10.1002/ird.411)
8. Loucks, P, Daniel, 1982. Water Resources System Planning And Analysis, New Jersey: Prentice-Hall, 559 pages

ROLE OF TOILET TYPE IN TRANSMISSION OF INFECTIONS

**Dr. Mohammadjavad
Mahdavinejad**
College of Art & Architecture
Tarbiat Modares University
I.R.IRAN
mahdavinejad@modares.ac.ir

**Dr. Mohammadreza
Bemanian**
College of Art & Architecture
Tarbiat Modares University
I.R.IRAN
bemanian@modares.ac.ir

Saeed Farmahin Farahani
Tarbiat Modares University
I.R.IRAN
sfarahani@modares.ac.ir

Dr. Ali Tajik
Tehran University
I.R.IRAN
dralitajik@yahoo.com

ABSTRACT

Context: There are two types of toilets including the dry toilet and the wet toilet and the most common type of toilet is the **flush toilet** that is a wet toilet. Some people due to some cultural and religious matters are less likely to use these toilets and usually use the squat toilets. Finding some scientific documentation would result in a better judgment about the best toilet.

Aims: This study was conducted to obtain definite results about the role of toilet type in transmission of infections.

Settings and Design: Home Toilets, Cross-sectional study

Methods and Materials: Forty toilets including 20 sitting and 20 squat toilets were selected and the frequency of pathogenic germs and their types were determined and compared between two groups. All the toilets were white and it was one year passed from their manufacture.

Statistical Analysis: The statistical analysis of data obtained from the toilets was performed using SPSS version 14.0 software using the Fisher and Chi-square tests.

Results: The frequency and microorganisms was differed between two types of toilets and the sitting toilets had fewer microorganisms ($P > 0.05$). But the frequency of gastrointestinal and non-gastrointestinal germs was not significantly differed between squat and sitting toilets ($P > 0.05$).

Conclusions: Totally, according to our findings, it may be concluded that use of sitting toilets should be encouraged to reduce the rate of infection transmission and prevention of gastrointestinal, respiratory, and genital infectious diseases.

Keywords: Toilet Type, Transmission, Infections

INTRODUCTION

The toilet is a system for the disposal of the **body wastes** [1]. There are two types of toilets including the dry toilet and the wet toilet and the most common type of toilet is the **flush toilet** that is a wet toilet [2]. In the other hand, there are two types of toilets including the sitting toilet and the squat toilet [3]. The most common type in western societies is the sitting toilet [3]. However, the **squat toilets** are extensively used by the majority of the world's population including Iran.

Toilet facilities are an important tools integrated in gastrointestinal health in general population especially in children with integration in fecal-oral transmission of diseases [4, 5]. Especially when not cleaned in a routine periodical manner these are a major source of microbial transmission and act as a hidden source for infections [6]. The ability to enforce the transmission of bacteria is relatively related to structure of toilets and those toilets more difficult to be washed and cleaned are more possible to help to transmission of infections [7]. Squat toilets are an example of this matter. These toilets that are extensively used in Iran are not deep enough and the infectious droplets may reflect to subjects' bodies. Also these toilets have many inaccessible sites that may not be washed easily and these matters would result in a higher risk for infection transmission compared with sitting toilets [8, 9]. In the other hand the sitting toilets that are not routinely used in Iran, are more easily cleaned and

also have less inaccessible sites and angles [10]. This matter may result in a lower transmission of infections [11]. But Iranian people due to some cultural and religious matters are less likely to use these toilets and usually use the squat toilets. Finding some scientific documentation would result in a better judgment about the best toilet. Accordingly, this study was conducted to compare the frequency and type of the microbial germs isolated from both sitting and squat toilets.

RESEARCH METHODS

In this descriptive cross-sectional study, 40 toilets including 20 sitting and 20 squat toilets were selected and the frequency and the presence of pathogenic germs and their types were determined and compared between two toilets. All the toilets were white and only one year was passed from their manufacture.

The toilets with hazy appearance and some minor and major fractures and also those out of homes (in public places) were excluded from the study. The sampling was performed with both sterile hard and soft swabs and the samples were incubated in different culture media (according to probable germs) for 48 hours. The microbiological results were then evaluated and presence and type of microorganisms were determined in two toilets.

The statistical analysis of data obtained from the toilets was performed using SPSS version 14.0 software (SPSS Inc, Chicago, IL) using the Fisher and chi-square tests. A *P* value of 0.05 was considered significant.

DISCUSSION

This study was conducted to compare the presence of pathogenic microorganisms between two types of toilets including sitting and squat toilets. The study showed interesting results and the frequency of microorganisms was differed between two types of toilets and squat toilets had more germs. However the types of microorganisms were alike between two types of toilets.

Non-public toilets are almost never separated by sex and all people usually use squat toilets in Iran. The importance of this matter is because of an increased risk of infection in female subjects due to easy transmission of microbial germs reflected from the bowl to their genitalia leading to vaginal infections that also may be transmitted to their sexual partners via intercourse. The importance of matter is especially more in Iranian people that usually have hand contacts with their anus for washing the fecal matter from it and rub their hand in a forward direction (from the anus to the perineum) that would facilitate the transmission of infection especially in women and children [12, 13, 5].

Many people may be uninformed about the risk of spreading of microbes when using the toilet and the subsequent surface contamination that may extend infection within the home, via simple contacts [14, 15]. In both male and female subjects this matter may result in transmission of infection. Some viruses could persist in the air even after toilet flushing and infection may be acquired after inhalation and swallowing [16]. Hence presence of more microbes in squat toilets compared with sitting toilets would also lead to a more rate of contact and air-born infections.

Large numbers of bacteria and viruses when seeded into household toilets may remain in the bowl even after flushing, and even continual flushing could not remove a persistent fraction [11]. This was found to be due to the adsorption of the organisms to the porcelain surfaces of the bowl, with gradual elution occurring after each flush. Hence, there is also a possibility that a subject may get an infection from an aerosol created in a toilet that this matter may also be seen with a more magnitude in squat toilets [17, 18, 19].

Totally, according to our findings, it may be concluded that use of sitting toilets should be encouraged to reduce the rate of infection transmission and prevention of gastrointestinal, respiratory, and genital infectious diseases. Finally, it is recommended to perform further studies to obtain more definite results and the determining the contributing factors for transmission.

RESULTS

In this study in 12 out of 20 sitting toilets (60%) and 11 out of 20 squat toilets (55%), the toilets were placed in the bathroom ($P > 0.05$). In 18 out of 20 sitting toilets (90%) and 17 out of 20 squat toilets (85%), the toilets were placed in a location with windows opening to the outside ($P > 0.05$). All the sitting and squat toilets had good-working fans. A window with sunray exposure in the southern part of the toilet was available in 16 out of 20 sitting toilets (80%) and 17 out of 20 squat toilets (85%) ($P > 0.05$). The artificial light (lamp) was present in all the sitting and squat toilets.

The frequency and microorganisms was differed between two types of toilets (Table 1) and the sitting toilets had fewer microorganisms ($P > 0.05$). But the frequency of gastrointestinal and non-gastrointestinal germs was not significantly differed between squat and sitting toilets ($P > 0.05$).

Being placed in the bathroom, type and quality of fans in the toilets, having windows opening to the outside, and having window with sunray exposure in the southern part of the toilet had no effect on the positive results and type of microorganisms cultured in the bathroom ($P > 0.05$).

Table 1- Results of microbial culture in two types of toilets*

Culture result	Squat (20 toilets)	Sitting (20 toilets)
No growth	1 (5%)	7 (35%)
E-coli	7 (35%)	5 (25%)
Klebsiella pneumoniae	3 (15%)	1 (5%)
Pseudomonas aeruginosa	1 (5%)	1 (5%)
Entrobacter	2 (10%)	1 (5%)
Proteus mirabilis	2 (10%)	1 (5%)
Staphylococcus aureus	2 (10%)	2
Streptococcus	1 (5%)	1 (5%)
Entrococci	1 (5%)	1 (5%)

*There was a statistically significant difference between the presence of microorganisms in two types of toilets ($P < 0.05$); but the type of the germs was not differed ($P > 0.05$).

REFERENCES

1. Cai D, You M. An ergonomic approach to public squatting-type toilet design. *Appl Ergon* 1998; 29:147-53.
2. Cohen-Mansfield J, Biddison JR. The potential of wash-and-dry toilets to improve the toileting experience for nursing home residents. *Gerontologist* 2005; 45:694-9.
3. Sikirov D. Comparison of straining during defecation in three positions: results and implications for human health. *Dig Dis Sci* 2003; 48:1201-5.
4. Litvinov IV, Sugathan P, Cohen BA. Recognizing and treating toilet-seat contact dermatitis in children. *Pediatrics* 2010; 125:e419-22.
5. Vernon S, Lundblad B, Hellstrom AL. Children's experiences of school toilets present a risk to their physical and psychological health. *Child. Care. Health. Dev* 2003; 29:47-53.
6. Barker J, Bloomfield SF. Survival of Salmonella in bathrooms and toilets in domestic homes following salmonellosis. *J Appl Microbiol* 2000; 89:137-44.
7. Farrell G. Toilet hygiene: clean round the bend. *Health Soc Serv. J.*, 1980; 90:1265.
8. Bloomfield SF, Stanwell-Smith R, Crevel RW, Pickup J. Too clean, or not too clean: the hygiene hypothesis and home hygiene. *Clin Exp Allergy* 2006; 36:402-25.
9. Rusin P, Orosz-Coughlin P, Gerba C. Reduction of faecal coliform, coliform and heterotrophic plate count bacteria in the household kitchen and bathroom by disinfection with hypochlorite cleaners. *J Appl Microbiol* 1998; 85:819-28.
10. Rutala WA, Weber DJ. Infection control: the role of disinfection and sterilization. *J Hosp Infect* 1999; 43 Suppl: S43-55.
11. Gerba CP, Wallis C, Melnick JL. Microbiological hazards of household toilets: droplet production and the fate of residual organisms. *Appl Microbiol* 1975; 30:229-37.
12. Pickering LK, Woodward WE, DuPont HL, Sullivan P. Occurrence of Giardia lamblia in children in day care centers. *J Pediatr* 1984; 104:522-6.
13. Rabiou KA, Adewunmi AA, Akinlusi FM, Akinola OI. Female reproductive tract infections: understandings and care seeking behaviour among women of reproductive age in Lagos, Nigeria. *BMC Womens Health* 2010; 10:8.
14. Giannini MA, Nance D, McCullers JA. Are toilet seats a vector for transmission of methicillin-resistant Staphylococcus aureus? *Am J Infect Control* 2009; 37:505-6.
15. Kagan LJ, Aiello AE, Larson E. The role of the home environment in the transmission of infectious diseases. *J Community Health* 2002; 27:247-67.
16. Boone SA, Gerba CP. The occurrence of influenza A virus on household and day care center fomites. *J Infect* 2005; 51:103-9.
17. Barker J, Jones MV. The potential spread of infection caused by aerosol contamination of surfaces after flushing a domestic toilet. *J Appl Microbiol* 2005; 99:339-47.
18. Morawska L. Droplet fate in indoor environments, or can we prevent the spread of infection? *Indoor Air* 2006; 16:335-47.
19. Srikanth P, Sudharsanam S, Steinberg R. Bio-aerosols in indoor environment: composition, health effects and analysis. *Indian. J Med Microbiol* 2008; 26:302-12.

LEARNING PARADIGMS FOR GAME ARTIFICIAL INTELLIGENCE

Chukwuchekwa Ulumma Joy

Department of Mathematics
Federal University of
Technology, Owerri
NIGERIA.
rejoice2k7@yahoo.com

Chukwuchekwa Nkwachukwu

Electrical & Electronics
Engineering Department,
Federal University of
Technology, Owerri
NIGERIA.

ABSTRACT

One of the main challenges facing Computer games is creating agents that are driven by artificial intelligence (AI) that interact with the player in reliable and entertaining ways. In the game world, it is being accepted that careful and considered use of learning makes it possible to come out with smarter and more robust AIs without the need to appropriate and counter every strategy that a player may adopt. It follows therefore, that rather than having all non-player character behaviours being determined by the time a game is produced, the game should instead evolve, learn, and adapt throughout the period the game is being played. The outcome of this is that the game grows with the player and is very difficult for the player to predict the next action, thus extending the play-life of the game. These learning techniques normally change the way that games are played, by forcing the player to continually search for new strategies to defeat the AI. This paper tries to highlight some of the learning paradigms for Game AI and the great potential they offer to the game world. It was discovered that each of the learning paradigm is suited to a different type of problem, and so the game developer has to be careful in the choice of a particular paradigm.

Key words: Machine Learning, Game Artificial Intelligence, Computer games, Artificial Neural Networks

INTRODUCTION

“It is anticipated that the widespread adoption of learning in games will be one of the most important advances ever to be made in game AI.... In addition, the careful and considered use of learning makes it possible to produce smarter and more robust AIs without the need to pre-empt and counter every strategy that the player might adopt (Manslow, 2002)”. Artificial Intelligence (AI) is playing an increasingly important role in the success or otherwise of computer games and the quality and intricacy of the AI techniques used in games is also steadily increasing. The AI techniques used in computer games can be divided into those that are rule-based (deterministic) and those that make attempt at learning or adapting to the player’s behaviour (nondeterministic) (Bourg, 2004). The rule-based techniques include the Finite state machines, scripting and Fuzzy logic. The nondeterministic techniques include the Neural Networks, Evolutionary Algorithms (e.g. Genetic Algorithms and Genetic programming), Bayesian Networks (Naive Bayes Classifier), Decision trees, K-Nearest Neighbours, and Reinforcement learning.

The deterministic act or performance is usually explicit and predictable. An example of a deterministic behaviour is a chasing algorithm where developers can clearly code a nonplayer character to move towards some target point by advancing along the x and y coordinate axes until the character’s x and y coordinates coincide with the target location (Bourg, 2004)). Nondeterministic behaviour is uncertain and is unpredictable and the degree of uncertainty depends on the AI method used and how well that method is comprehended. An example of nondeterministic performance is a nonplayer character learning to adapt to the fighting tactics of a player (Bourg, 2004). Nondeterministic techniques aid learning and unpredictable gameplay and such learning could use a neural network, a Bayesian technique, decision trees or a genetic algorithm. Developers don’t have to clearly code all behaviour in anticipation of all possible scenarios. These techniques also learn and

extrapolate on their own and behaviour can emerge without explicit instructions. Deterministic techniques have advantages of being predictable, fast, and easy to implement, understand, test, and debug. The disadvantages are that it places the burden of anticipating all scenarios and coding all behaviour solely on the developers' shoulders, discourages learning or evolving, and after a little game play, tends to become predictable, thus often limiting the game's play-life.

Learning and the family of algorithms based on the principles of learning can be utilised by game developers and players in a variety of ways. For instance, solutions to problems that are very difficult to solve can be solved by learning algorithms, with little or no human supervision. Additionally, in-game learning can be used to adapt to conditions that cannot be anticipated prior to the game's release, such as the particular tastes, dispositions and styles of individual players (Manslow, 2002).

LEARNING PARADIGMS FOR GAME ARTIFICIAL INTELLIGENCE

2.1 LEARNING BY NEURAL NETWORKS

2.1.1 Overview Of Neural Networks

Artificial Neural Networks (ANNs) (Caudil, 1991; Basheer, 2000; Haykin, 1996) also known as Neural Networks (NNs), are constructed according to the model of the human brain and thus have outstanding ability to derive meaning from complex or fuzzy data and can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. Computers usually do well at repetitive tasks but they lack human-like capabilities for pattern recognition and decision-making. An ANN is simply a structure for information processing and pattern recognition that is constructed based on biological neural networks. An ANN is comprised of a series of neurons (units or nodes), interconnected by links (weights) with various characteristics. The characteristics of these weights can change during a training process for the ANN.

The human brain usually learns by adjusting synaptic connections (weights) between individual neurons. A typical artificial neuron is shown in Figure 1.1. ANNs learn by exposing the system to a set of input and output data (datasets) to allow the system to adjust and create connection weights relevant to the specific system it is learning. The aim of a learning (training) process is to establish connection weights between neurons to solve specific problems. ANNs training allows the system to discover and predict patterns or to solve problems that are very complicated and not linearly separable or for which more traditional computational techniques would not work. ANNs are good in pattern recognition and are robust classifiers with the ability of making generalization and also possess ability of making decisions from large and fuzzy input data.

ANNs have been utilized in many domains such as speech recognition, playing chess, fingerprints identification or facial characteristics and for solving diagnostic problems in biology and medicine. ANNs have proofs of capabilities in many domains including financial prediction (such as shares and currency), Control (such as aircraft, industrial processes and space), medical (such as diagnosis and prognosis), marketing (such as data mining), among others. ANNs with ability of learning by example makes them highly flexible and effective in many different domains.

2.1.2 Classification of Anns

ANNs may be categorised in many different ways according to one or more of their relevant features. Generally, classification of ANNs may be based on (Basheer, 2000) "(i) the function that the ANN is designed to serve (e.g., pattern association, clustering), (ii) the degree (partial/full) of connectivity of the neurons in the network, (iii) the direction of flow of information within the network (recurrent and non-recurrent), with recurrent networks being dynamic systems in which the state at any given time is dependent on previous states, (iv) the type of learning algorithm, which represents a set of systematic equations that utilize the outputs obtained from the network along with an arbitrary performance measure to update the internal structure of the ANN, (v) the learning rule (the driving engine of the

learning algorithm), and (vi) the degree of learning supervision needed for ANN training. Supervised learning involves training of an ANN with the correct answers (i.e., target outputs) being given for every example, and using the deviation (error) of the ANN solution from corresponding target values to determine the required amount by which each weight should be adjusted. Reinforcement learning is supervised, however the ANN is provided with a critique on correctness of output rather than the correct answer itself, that is, the network is not explicitly given target outputs in the form of a training set, but is rewarded when then it does the right thing. Unsupervised learning does not require a correct answer for the training examples, however the network, through exploring the underlying structure in the data and the correlation between the various examples, organizes the examples into clusters (categories) based on their similarity or differences (e.g., Kohonen networks). Finally, the hybrid learning procedure combines supervised and unsupervised learning”.

Once a network has been customised for a particular application, that network is ready to be trained. There are two approaches to training, supervised and unsupervised (Basheer 2000). The most often used ANN is the fully connected, supervised network (the multilayer perceptron) with backpropagation learning rule. This type of ANN is mostly useful at classification and prediction tasks. Another is the Kohonen or Self Organizing Map with unsupervised learning algorithm, which is very useful at finding relationships among complex sets of data.

2.1.3 Structure of Multi Layer Perception Neural Networks

Many ANNs are based on the principle of biological neural networks and contain layers of nodes (input, hidden, output) (Figure 2.1). These nodes are richly interconnected by weighted connection lines. Every input data point is normally associated with a weight and can increase or decrease the activation of the node (neuron or unit) depending on whether it is negative or positive. A typical multi layer perceptron (MLP) is shown in Figure 2.2.

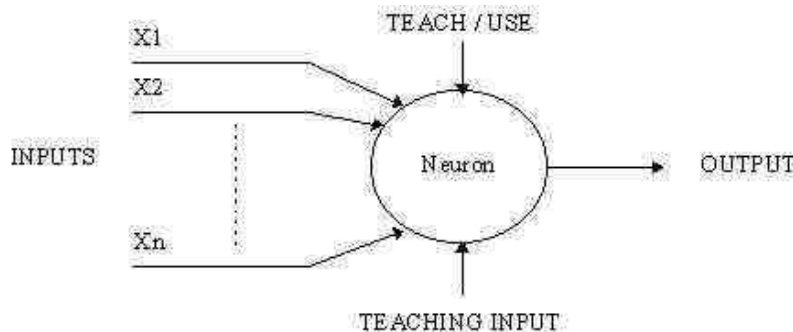


Figure 2.1: A Simple Neuron (extracted from Stergiou, C. & Sigamos, D., 1996)

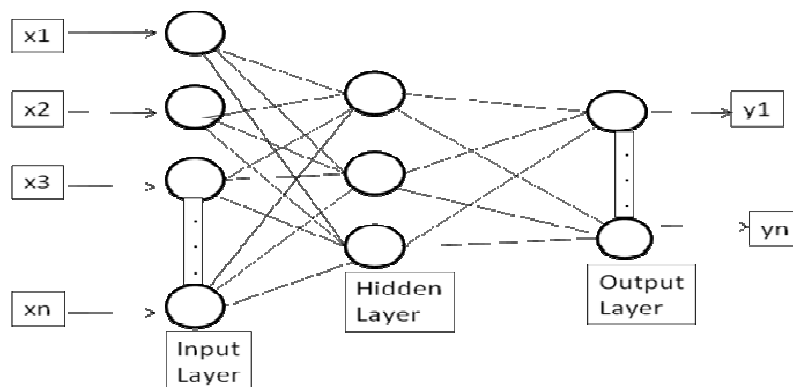


Figure 2.2: A typical multilayer perceptron neural network with one hidden layer

Neural networks are normally arranged in layers. Each layer in a multi layered network is an array of neurons. Information passes through each element in an input-output manner, that is, each neuron receives an input signal, manipulates it and forwards an output signal to the other connected neurons in the adjacent layer. MLP networks normally have three layers of neurons with only one hidden layer, but there is no restriction on the number of hidden layers. The only work that the input layer does is to receive the external information and propagate it to the next hidden layer. The hidden layer receives the weighted sum of incoming signals sent by the input units, and processes it by means of an activation function. The activation functions most commonly used are the sigmoid and hyperbolic tangent functions. The hidden units in turn send an output signal towards the neurons in the next layer. This adjacent layer could be either another hidden layer of arranged neurons or the output layer.

2.1.4 Training of Anns

Neural networks learn in two ways - supervised or unsupervised. In supervised learning, a set of input-output examples are presented to the network. At the start of the training process, the network is repeatedly presented with a set of input vectors along with the desired output vectors for each of them. As training progresses, the network changes itself internally until it reaches a stable stage at which the outputs given by the Neural Network are approximately the same as the actual value. Learning is an adaptive process during which the weights associated to all the interconnected neurons change in order to provide the best possible response to all the observed patterns (Adrian, 2001; Stergiou, C. & Sigamos, D., 1996).

In reality, the acquired data set is divided into training and test set. After training with the training data set, the performance of the ANN is evaluated by presenting the unknown test data set to the ANN. The application phase is related to the application of the net in reality, where usually no information about the desired output is presented to the neural network. "An ANN based system is said to have learnt if it can: (i) handle imprecise, fuzzy, noisy, and probalistic information without noticeable adverse effect on response quality, and (ii) generalize from the tasks it has learnt to unknown ones (Basheer, 2000).

2.1.5 Training Mlp with the Back-Propagation Algorithm

There are numerous learning rules but the most often used is the Delta rule or Back-propagation rule. A neural network is trained to map a set of input data by iterative adjustment of the weights. Information from inputs is fed forward through the network to optimize the weights between neurons. Optimization of the weights is usually made by backward propagation of the error during training or learning phase. The ANNs read the input and output values in the training data set and change the value of the weighted connections (links) to reduce the difference between the predicted and target values. The error in prediction is reduced across many training cycles (epochs) until network reaches specified level of accuracy. This kind of training algorithm is known as the backpropagation algorithm and details can be found in (Stergiou & Sigamos, 1996).

2.1.6 Game Examples of Learning by Neural Networks

Neural networks, as AI techniques, have been applied in a wide variety of problems, and the computer games industry is no different from the numerous industries in which the NNs can be applied. This is because an NN can be used to make decisions or interpret data based on previous input and output examples that it has been given. This training set can be composed of many different types of data that represent many different types of events, characters, or environments (Sweeter, 2004). In a computer game, the input can be a set of variables from the game world, which usually represent the attributes of the game world, game event, or game character. The output from the neural network can be seen as a decision, a classification, or a prediction. For example (Bourg, 2004), the input to the NN could represent the attributes that describe other characters that the AI has encountered in the game world, consisting of variables like health, hitpoints, strength, stamina, attack, etc. The outputs could be a set

of possible actions that the AI can take, such as talk, run away, attack, or avoid. Alternatively, the output could be a classification of how the AI feels about this character, such as loathe, dislike, neutral, like, or love. This feeling could then contribute to the AI's decisions about how to react to this character in different situations.

In the game world, Neural networks can be used as neural controllers for robotic applications, which implies that you can have a computer-controlled, half-track mechanized unit in your game or you may want to use a neural network to handle the flight controls for a spaceshift or aircraft. Neural network can also be useful in threat assessment game. They are also applied in the Attack and Flee game. Details of these applications are found in (Bourg, 2004). In the game world, NNs have also been applied in the following tasks Battle Cruiser: 3000AD, Black & White, Creatures, Dirt Track Racing, and Heavy Gear (Sweetser, 2004a).

2.2 LEARNING BY OPTIMISATION (GENETIC ALGORITHM)

2.2.1 OVERVIEW OF GENETIC ALGORITHMS

Genetic algorithms (GAs) (Mitchell, 1996) are a family of computational models based on evolution. Genetic algorithms are inspired by Darwin's theory of evolution. Thus, solution to a problem solved by genetic algorithms is evolved. Genetic algorithms (GAs) was originally conceived, introduced and investigated by Holland in 1975 and by the students of Holland, example De Jong (Whitley, 1994). Genetic algorithm can also be seen as any population based model that uses selection and recombination operators to generate new sample points in a search space. "Genetic algorithms (GAs) have been shown to be a useful alternative to traditional search and optimization methods, especially for problems with highly complex and ill-behaved objective functions. A key element in a genetic algorithm is that it maintains a population of candidate solutions that evolves over time. The population allows the genetic algorithm to continue to explore a number of regions of the search space that appear to be associated with high performance solutions (Grefenstette, 1992)."

"Almost every practical heuristic search algorithm is controlled by some set of parameters ... No matter which variation operator you choose, there are a number of possible parameterizations that you must decide. Each decision is important. If you make a poor choice for your parameters you can generate truly disastrous results (Michalewicz, 2004)." When using genetic algorithm, factors to be considered include the representation, the evaluation function, the variation operators, the population size, the termination criterion among others.

A genetic algorithm operates according to the following steps (Timothy, 1993): "

- **Initialization** – Randomly generate a population.
- **Evaluation** – Test each individual, using the objective function. Compute a fitness value, which is a measure of how well the individual optimizes the function.
- **Parent Selection** – Choose pairs of individuals from the population in such a way that those with higher fitness will be chosen more often.
- **Reproduction** – Generate (usually two) children from each pair of parents. Each parent contributes half of its genetic makeup to each child.
- **Mutation** - Randomly change a tiny amount of the genetic information in each child".

A complete pass through the above processes is referred to as a generation. After each generation is completed, a new one starts with the evaluation of each of the children. Genetic algorithms (GAs) work in the following way. Firstly, a population of random organisms are created (initialized). The

organisms are then tested on the problem that is being solved and then they are ranked in order of fitness. If the best organisms have reached our performance goal, we stop otherwise we take the best organisms and repeat the process. In the basic genetic algorithm, solutions are encoded as fixed length vectors (chromosomes). The initial population of solutions is chosen randomly. These solutions are called chromosomes and are allowed to evolve over a number of generations. At each generation, a measure of how well the chromosome optimizes the objective function is calculated. Subsequent generations are created through a process of selection, recombination (crossover), and mutation. Chromosome fitness is useful in selecting which individuals will recombine. Recombination (crossover) operators merge the information contained within pairs of selected parents' chromosomes by placing random subsets of the information from both parents into their respective positions in a member of the subsequent generation. Nevertheless, because of the selective pressure applied through a number of generations, the overall trend is towards higher fitness chromosomes. Mutations are used to help preserve diversity in the population. Mutations introduce random changes into the chromosomes (Shumeet, 1995).

2.2.2 GAME EXAMPLES OF LEARNING BY GENETIC ALGORITHM

Once the behaviour of an agent has been parameterized and a performance measure developed, it can then be improved by using an optimization algorithm (such as genetic algorithm) to search for sets of parameters that make the agent perform well in game (Manslow, 2002).

The possible applications of Genetic Algorithms are numerous. This is because any problem that has a large enough search domain could be suitable for genetic algorithm applicability. Genetic algorithms offer opportunities for developing interesting game strategies in areas where traditional game AI is weak, particularly where traditional methods of search and optimization are too slow in finding a solution in a very complex search space, in that genetic algorithm is a robust search method requiring little information to search effectively in a large, complex, or poorly understood search space, or in nonlinear problems. Genetic algorithms have been used for problem solving, modelling, and applied to many scientific, engineering, business, and entertainment problems. Also, GAs have been successfully used in problems in machine and robot learning, such as classification and prediction, designing neural networks, evolving rules for learning classifier systems, and the control of robots (Sweetser, 2004b). "Genetic algorithms are slowly but surely gaining popularity with game developers. They are currently used mostly as in-house tweaking tools, but they are also beginning to be used in-game, either as an integral part of the gameplay or as an aid for the user (Buckland, 2004)"

There are many ways in which genetic algorithms could be used in computer games. For example, genetic algorithms can be used in a real-time strategy (RTS) game to tune the AI's strategy to target the human player's weaknesses. This could simply involve tuning a set of parameters that define the AI's personality, in terms of its preference for types of unit, its weighting on offensive and defensive and defensive, preferences for scientific advances, and so on. Alternatively, genetic algorithms could be used to tune the behaviour of individual or groups of units in an RTS. Additionally, genetic algorithms could be used in a role playing game (RPG) or first person shooter (FPS) to evolve behaviours of characters and events. For example, genetic algorithms could tune the creatures in the game that have survived the longest and evolve them to produce future generations. This would only need to be done when a new creature is needed. Furthermore, genetic algorithms could be used in games for pathfinding,.... This genetic algorithm could be extended to include obstacle avoidance, factoring for different types of terrain and possibly using waypoints instead of vectors....Some computer games in which genetic algorithms have been applied successfully include Cloak, Dagger, and DNA, the Creatures series, Return Fire 11, and Sigma (Buckland, 2004).

2.3 LEARNING BY DECISION TREES

Decision Trees (Evans, 2002; Hopgood, 2001) are a promising Learning Paradigm for game AI because they are easy to use and provide a high level of flexibility with less computational requirements. If learning is to occur only before a game is released, DTs are often attractive and are also commonly used if learning must occur during gameplay, because of their computational

efficiency. A decision tree is a way of relating a series of inputs (usually measurements from the game world) to an output (usually representing something you want to predict) using a series of rules arranged in a tree structure. For example (Rabin, 2004, inputs representing the health and ammunition of a bot could be used to predict the probability of the bot surviving an engagement with the player. At the root node, the decision tree might test to see whether the bot's health is low, indicating that the bot will not survive if that is the case. If the bot's health is not low, the decision tree might then test to see how much ammunition the bot has, perhaps indicating that the bot will not survive if its ammunition is low, and will survive otherwise. Decision trees are particularly useful for applications like in-game learning because (in contrast to competing technologies like neural networks) extremely efficient algorithms exist for creating decision trees in near real-time.

One famous algorithm used for the decision tree learning is ID3 (Roach, 2009b), which uses the Training Set to decide which attribute is the most important in dividing the cases into the different outcomes. This attribute is then placed at the top of the Decision Tree, and the process repeats to find the next most important attribute along each branch. Choosing the best attribute uses a measurement from Coding and Information Theory, called *entropy*. The description of the ID3 algorithm is given by (Roach, 2009b).

2.3.1 Game Examples of Learning by Decision Trees

“The best known game-specific use of the decision trees is in the game Black & White where they are used to allow the creature to learn and form “opinions” (Evans, 2002). In Black & White, a creature will learn what objects in the world are likely to satisfy his desire to eat, based on feedback it gets from the player or world. For example, the player can provide positive or negative feedback by stroking or slapping the creature. A decision tree is then created that reflects what the creature has learned from its experiences. The creature can then use the decision tree to decide whether certain objects can be used to satisfy its hunger. While Black & White has demonstrated the power of decision trees to learn within games, they remain largely untapped by the rest of the game industry (Rabin, 2004)”.

“Although DTs are highly flexible, there some things they cannot efficiently model. For example, a battle between opposing armies might be likely to result in a draw if they are of approximately equal size. A DT that was trying to learn to predict the outcome of a battle would therefore find the prediction of draws problematic unless the difference in size between the armies was explicitly represented in one of its inputs. This is because the DT has no capacity to derive the size difference itself, but without, the conditions under which a battle is likely to be drawn cannot be represented by a single rule or a simple tree (Baekkelund, 2006)”

2.4 LEARNING BY BAYESIAN NETWORKS TECHNIQUE

Bayesian networks (Bourg, 2004; Hopgood, 2001) allow an AI to perform complex humanlike reasoning when faced with uncertainty. Bayesian updating is a technique for handling the uncertainty that arises from statistical variations or randomness (Hopgood, 2001). Bayesian inference and networks enable non-player characters (NPCs) to make decisions when the states of the game world are uncertain. Bayesian networks are graphs that represent the relationship between random variables for a given problem (Bourg, 2004). These graphs help in performing reasoning or decision making in the face of uncertainty. Bayesian networks consist of nodes representing random variables and arcs representing the casual relationship between variables. In a Bayesian network, variables relating to particular states, features, or events in the game world are represented as nodes in a graph, and the casual relationships between them as arcs. Probabilistic inference can then be performed on the graph to infer the values of unknown variables, or conduct other forms of reasoning (Rabin, 2004).

2.4.1 Game Examples of Learning by Bayesian Network

“One particularly important application for Bayesian networks in games lies in modelling what an AI should believe about the human player based on the information it has available. For example, in a real-time strategy game, the AI can attempt to infer the existence or nonexistence of certain player-built units, like fighter planes or warships, based on what it has seen produced by the player so far. This keeps the AI from cheating and actually allows the human to deceive the AI by presenting misleading information, offering new gameplay possibilities and strategies for the player (Rabin, 2004)”.

Bayesian networks are based on a mathematical theory known as Bayes’ Theorem, which is used to calculate the probability of an event occurring given a known related piece of information. Bayes’ theorem states that

$$P(A|B) = \frac{P(B|A) P(A)}{P(B)}.$$

This theorem can be used to calculate the statistical probability of events occurring even if we know next to nothing about the world, which provides some information for reasoning under uncertainty. It helps to determine a more realistic and probable assumption about the occurrence of A if we know that B has occurred. As a human player plays a game they make mistakes but as the player learns more about the game and the world he adapts to make better decisions. This is the same with Bayesian networks. Under uncertain conditions the network will calculate the probability of a certain variable, which may be the wrong decision, but as more information is uncovered about the world the network is able to update the probabilities of other variables, causing the calculated variable to be updated, thus producing machine learning and an evolving artificial intelligence. An example where the Bayesian technique can be used in AI game is illustrated (Roach, 2009a):

“In a futuristic warfare game, an NPC trooper is to make a decision about whether to jump out of hiding and make a run towards the location the PC was last seen. It bases its decision on whether the PC is thought to still have ammunition, and whether or not it thinks the PC has already teleported away from that position”.

Since the above situation concerns making decisions in uncertainty, the Bayesian Belief Network is best suitable for this problem. The Bayesian Network representation of the above scenario is shown below:

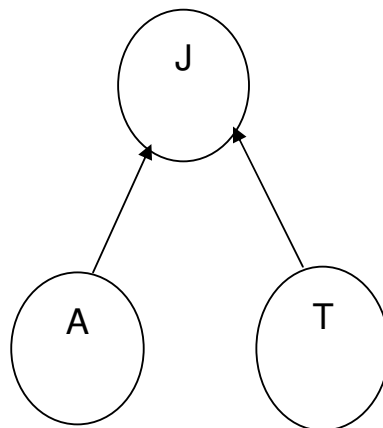


Fig. 2.3: The Bayesian Network Representation of the Warfare game

Where A is a belief in whether the PC is thought to still have ammunition, T is the belief that the PC has already teleported away from its previous position and J is the belief that NPC jump from hiding and running towards the PC will be successful. Details of the implementation of this game application can be found in (Roach, 2009a).

2.5 LEARNING BY REINFORCEMENT

This involves learning the relationship between an action taken by the agent in a particular state of the game world and the performance of the agent. Once this has been done, the best action (that is that which yields the best average performance) can be selected in any state. This technique attempts to learn the optimal mapping from state to action by considering a representation of the state as an input vector and the probability of each action as an output vector. This idea forms the basis of reinforcement learning (RL). Reinforcement learning has been successfully applied to a wide variety of complex problems ranging from creating AI players of Othello and backgammon, to balancing a pole on a moving cart (Manslow, 2002; Champandard, 2002).

Reinforcement learning has enabled computers to teach themselves how to play many classic games such as Checkers, Othello, Backgammon, Go, Chess, and card games like Poker and Blackjack (Manslow, 2004). The game developers find the reinforcement learning very useful because of the following reasons (Manslow, 2004): “

- The same RL engine can be used to solve a wide variety of unrelated problems, ranging from producing a competent Chess player, controlling an aircraft to fly as low as possible to avoid radar without crashing, controlling AI vehicles to follow paths specified as a series of waypoints, controlling the movements of dogfighting aircraft, to producing a competent player of a real-time strategy game.
- Provided that the problem is set up correctly, RL is likely to find a close to optimal solution with minimal effort...
- It can find optimal behaviours even in situations where the effect of an action might not be immediately apparent....
- It learns as an AI interacts with the game world, making it suitable for use both during development and to facilitate in-game learning once a game is complete”.

CONCLUSION

In this paper, some of the major learning paradigms in game AI and the great potential they offer to the game world have been investigated and illustrated. This report did not actually exhaust all the available learning paradigms but simply highlighted some of the common paradigms used in game AI. Also, because of space, this paper did not cover implementation details for each learning paradigm. The implementation details can be found in the sources cited in the paper. It is also worthy of note that each of the learning paradigm is suited to a different type of problem, and so the game developer has to be careful in the choice of a particular paradigm (see Baekelund, 2006).

REFERENCES

- BAEKELUND, C. 2006. A Brief Comparison of Machine Learning Methods, AI Programming Wisdom 3, Charles River Media, 2006. Edited by Steve Rabin.
- BASHEER, I. A and HAJMEER, M., 2000. Artificial Neural Networks: Fundamental, Computing, Design, and Application. Journal of Microbiological Methods, Vol. 43, Issue 1, pp. 3 – 31.
- BOURG, D. M. and SEEMANN, G., 2004. *AI for Game Developers*. O'Reilly: California.
- BUCKLAND, M., 2004. Building Better Genetic Algorithms, AI Programming Wisdom 2 Charles River Media, 2004. Edited by Steve Rabin.
- CAUDIL, M. AND CHARLES, B., 1991. *Naturally Intelligent Systems*, A Bradford Book – The MIT Press, Cambridge, Massachesetts.

- CHAMPARD, A. J., 2002. The Dark Art of Neural Networks. AI Programming Wisdom, Charles River Media, 2002. Edited by Steve Rabin.
- EVANS, R., 2002. Varieties of Learning. AI Programming Wisdom, Charles River Media, 2002. Edited by Steve Rabin.
- GREFENSTETTE, J. J., 1992. Genetic Algorithms for Changing Environments. Parallel Problem Solving from Nature 2.
- HAYKIN, S., 1999. *Neural Networks – A Comprehensive Foundation*, Second edition, Prentice-Hall, Inc.
- HOPGOOD, A., 2001. *Intelligent Systems for Engineers and Scientists*. CRC Press: New York.
- MANSLOW, J., 2002, Learning and Adaptation. AI Programming Wisdom, Charles River Media, 2002. Edited by Steve Rabin.
- MANSLOW, J., 2004. Using Reinforcement Learning to Solve AI Control Problems, AI Programming Wisdom 2, Charles River Media, 2004. Edited by Steve Rabin.
- MASTERS, T., 1993, *Practical Neural Network Recipes in C++*. Academic Press, Inc.
- MICHALEWICZ, Z. and FOGEL, D. B., 2004. *How to Solve It: Modern Heuristics, Second Edition*. Springer-Verlag Berlin Heidelberg .
- MITCHELL, M., 1996. *An Introduction to Genetic Algorithms*. MIT Press.
- MONTANA, D. J. AND DAVIS, L., 1989. Training Feedforward Neural Networks Using Genetic Algorithms, "Proceedings of the International Joint Conference on Artificial Intelligence, pp. 762-767.
- RABIN, S., 2004. Promising Game AI Techniques, AI Programming Wisdom 2, Charles River Media, 2004. Edited by Steve Rabin.
- ROACH, P., 2009a. CS3SO8 AI for Computer Games Developers Handouts. Faculty of Advanced technology, University of Glamorgan Wales, UK.
- ROACH, P., 2009b. CS4S22 Expert Systems Handout Techniques. Faculty of Advanced technology, University of Glamorgan Wales, UK.
- SHUMMET, B. and RICH, C., 1995. Removing the Genetics from the Standard Genetic Algorithm. Proceedings of the Twelfth International Conference on Machine Learning, Lake Tahoe, CA.
- STERGIOU, C. and SIGANOS, D. 1996. Neural Networks. Available from: http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html [Accessed 20 July 2010].
- SWEETSER, P., 2004a. How to Build Neural Networks for Games, AI Programming Wisdom 2, Charles River Media, 2004. Edited by Steve Rabin.
- SWEETSER, P., 2004b. How to Build Evolutionary Algorithms for Games, AI Programming Wisdom 2, Charles River Media, 2004. Edited by Steve Rabin.
- WAINWRIGHT, R. L., 1993. Introduction to Genetic Algorithms, Theory and Applications. Proceedings of the first International Conference on Genetic Algorithms. Editor – John Grefenstette.
- WHITLEY, D., 1994. A Genetic Algorithm Tutorial. Stat. Comput. Vol.4, pp 65 – 8

SCREENING OF ENVIRONMENTAL BACTERIA HAVING POTENTIALLY ACTIVE CHARACTERS FOR INCREASING SOIL BIOLOGICAL ACTIVITIES

Nadia Jamil,
Centre for Molecular Genetics,
University of Karachi,
PAKISTAN.
diaraj@hotmail.com,

Nazia Jamil
Centre for Molecular Genetics,
University of Karachi,
PAKISTAN.

Nuzhat Ahmed
Centre for Molecular Genetics,
University of Karachi,
PAKISTAN.

ABSTRACT

Sustainable agriculture involves successful management of agricultural resources to satisfy human needs while maintaining or enhancing environmental quality and conserving natural resources for future generations. Improvement in agriculture sustainability will require the optimal use and management of soil fertility and soil physical properties. Both rely on soil biological processes, which are influenced by, soil bacterial diversity, diversified bacteria increase soil biological activity and build up long-term soil productivity and health. Bacterial strains from different environments (soil, air and water) were screened for characters, which have potential for increasing soil fertility. The studied characters were solubilization (P and S in soil) bioabsorbent (water retaining biopolymers) and production of antimicrobial compounds (bactericides and fungicides i.e. biocontrol of plant pathogens).

Keywords: Solubilization, Antibacterial Activity, Bioabsorbent, environment

INTRODUCTION

Bacteria have been on the earth 2 to 3 billion years longer than any other life. They are one of the most diverse life forms on earth and may consist of more than one million species. Only a fraction of these species have been identified, even fewer have been studied and are available in culture collections centers (Hill et al. 2000). The vastness of bacterial diversity is a concept that is overwhelming to the human mind, and our knowledge of the genetic diversity within the bacterial genome is limited (Colwell 1997). The bacterial diversity (especially the genomic diversity) of the earth which although is important but is still untapped and unknown resource of the planet. Bacterial diversity influences nutrient cycling and decomposition, soil structure and biological interactions (De weger et al. 1995). The identification of obvious bacterial functions is attainable, but it is more difficult to further dissect species function and relationships. The present proposal addressed the critical issues of understanding diversity of bacteria in a soil system. The challenge ahead is to identify the level of bacterial diversity, species composition and distribution to maintain the ecosystem and withstand environmental stress. Bacteria possess characters, which are of remarkable scientific and economic interests (Vuichiro et al. 1994).

In Pakistan, agriculture provides a major share of national income and export earning, which ensures food security, income and employment to a large proportion of the population. Deterioration of soil fertility is a major worry while the central paradigm for the biological management of soil fertility is Soil biota. Some bacteria that are associated with the roots of crop plants can exert beneficial effects on their hosts and they are often collectively referred to as PGPR (Plant Growth Promoting Rhizobacteria). PGPR are being exploited commercially for plant protection to induce systemic resistance against various pest and diseases. Biocontrol of phytopathogens appears to be a major mechanism of plant growth promotion by these bacteria. Suppression of phytopathogens results from the production of bacterial secondary metabolites or can be mediated by the plant's own defence system that is elicited by the root-associated bacteria (Induced Systemic Resistance, ISR). The

fluorescent pseudomonads constitute a major group among these PGPR. (<http://www.agr.kuleuven.ac.be/>) Seed treatment with PGRP causes cell wall structural modification and biochemical physiological changes leading to synthesis of proteins and chemicals involved in plant defense mechanisms. Lipopolysaccharides, siderophores and salicylic acid are the major determinants of PGPR mediated ISR (Introduction of Systemic Resistance) (Rammamoorthy et al., 2001). PGPR affect plant growth by synthesizing phytochromes, increasing availability and uptake of nutrients to enhanced plant height and productivity, decreasing heavy metals toxicity, antagonizing plant pathogens and including systemic resistance in plants to pathogens (Burd et al, 2000).

Plant diseases, caused primarily by fungal and bacterial pathogens, cause severe losses to agriculture and horticultural crops every year. These losses result in reduced food supplies poorer-quality agricultural products, economic hardships for grower and processes and ultimately, higher price. Traditional chemical control methods are not always economical or effective for many diseases, in some chemical controls may have unwanted health, safety and environmental risks (Rovera et.al.1998).

Biological control involves the use of beneficial microorganisms, such as specialized fungi and bacteria, to attack and control plant pathogens and the disease they cause. Biological control offers an environmentally friendly approach to the management of the plant disease and can be incorporated with cultural and physical controls and limited chemical usage for an effective and integrated disease management system (Rovera et.al.1998). These natural 'antibiotics' creating a zone of inhibition of varying diameter where certain pathogens cannot exist surround the colonies of *L. acidophilus* and *bulgaricus*. *Acidophilin* and *bulgarican* have been shown to inhibit the growth of the food poisoners *Clostridium botulinum*, *Staphylococcus aureus*, *Escherichia coli* and some *Salmonella* species. It is important to note that unlike penicillin and other pharmaceutical antibiotics that destroy both pathogenic and friendly bacteria, the natural 'antibiotics' produced by lactic bacteria do not attack friendly microbes. It is also interesting to note that the virulent strains of bacteria that are becoming increasingly resistant to commercially produced antibiotics do not mutate against natural intestinal flora like Lactobacilli (<http://www.nrdc.org>). Today as a result of extensive research, the study of microbial products were recognized as an integral component of natural products chemistry and as well as they are significant resource for environment friendly compounds. Eco-friendly compounds have multiple industrial and agricultural applications. This work was carried out to characterize the bacteria from different environmental sources for the production of commercially and agricultural important products.

MATERIALS AND METHODS

Isolation, purification and growth conditions

Five bacterial strains were selected which were from the CMG stock; CMG645, CMG646 and CMG648 these strains were from marine origin and one was isolated from the drain water, which has later on given the code of CMG649, one was isolated from the garden mud which was later on given the code of CMG650. These isolates were grown on the nutrient agar and the purification was done by streaking and restreaking and the cultures were preserved on nutrient agar slants at 4°C. The bacterial strains were grown on nutrient agar plates supplemented with the commercially available antibiotics like Kanamycin (Km), Tetracycline (Tc), Chloramphenicol (Cm), Streptomycin (Sm) and Ampicillin (Am), with varying concentrations such as 25µg/ml, 50µg/ml, 100µg/ml, 200µg/ml, 300µg/ml. Plates were incubated at 37°C for 48-72 hours and their maximum tolerable concentrations (MTC) were determined. Stock solutions of antibiotics were prepared as described by Maniatis (1992).

Screening of Bacterial isolates for plant growth promoting characters

1. Solubilization

All the bacterial strains were characterized and screened for different properties like bioabsorbent production, solubilization of insoluble inorganic metal salts and antibacterial activity. Bacterial strains were screened for ability to solubilize, insoluble inorganic metal compounds, based on clear haloes

around bacterial colonies. Tris media (liquid and solid) amended with in-soluble inorganic metal salts were used to detect the solubilization activity. Solubilization was checked on Tris minimal media having composition as follows, (gm/L) Tris HCl, 6.06; NaCl, 4.68; KCl, 1.4; NH₄Cl, 1.07; Na₂SO₄, 0.43; MgCl₂.6H₂O, 0.7; CaCl₂.2H₂O, 0.003; Carbon source 0.2%. pH adjusted at 7.00 with the HCl. After autoclaving the media Zinc salts were added in the medium. (Fasim *et. al* 2002)

2. Bioabsorbent biopolymers

Bacterial isolates, producing bioabsorbent polymer, were screened by ethanol precipitation method. Broths of all bacterial isolates were treated with ethanol. All strains were grown in *E. coli* medium. Cultures were grown at 37°C at 180 rpm on shaker in an incubator for 24 hours. After 24 hours these cultures were treated with 70% ethanol to detect the presence or absence of the bioabsorbent polysaccharide production.

3. Antibacterial activity

Bacterial isolates were studied for their antibacterial activity by a method known as Spot-on-the-lawn deferred antagonism method (Haris *et al.*, 1989). Antibacterial activity was checked on nutrient agar. Lawn of a sensitive strain was spread over the nutrient plate and a drop of the culture (to be tested) was placed in the center of the plate. Plates were incubated at 37°C for 24 hours. Antibacterial activity was measured by the appearance of zone of inhibition around the culture. The strains scored positive by the deferred antagonism method were then tested for direct or well diffusion assay (Muriana *et al.*, 1987).

Effect of Different Factors on Antibacterial Activity

After two hours difference, culture broth of the selected bacterial strains were removed and supernatant was inoculated to the nutrient agar plates having the lawn of the sensitive strain to check the production of antibacterial activity appears in the medium. Supernatant was obtained by centrifugation, and then supernatant was filtered by millipore filter paper (0.2µm) and used for antibacterial activity testing.

For the identification of the nature of antibacterial compound/s and to check the effect of enzymes the culture of selected strains was treated with the enzymes. For this purpose the culture of selected bacterial strains were picked up from center of a plate of deferred antagonistic assay (Naz *et al.*, 1993) and inoculated to 5 ml luria broth and after 24 hours this 5 ml of each strain was distributed in five eppendorfs. These cultures were centrifuged at 14,000 rpm for 5 minutes. Supernatant was drawn out from the eppendorfs tubes and then it was filtered with millipore filter paper (0.4 µm) and then this filtrate was treated with enzymes. Enzymes, which were used, were protease P, protease K, pepsin, lysozyme and RNase. The activity of enzyme treated supernatant was tested by the “agar-well diffusion method”. To know whether the antibacterial activity was heat sensitive or not the supernatant was heated at 121°C for 5 minutes. Later the activity of heat-treated supernatant was tested by the agar-well diffusion method.

Crude Extraction of Antibacterial Compound

Bacterial isolate CMG 646 having antibacterial activity was inoculated on the lawn of a sensitive strain and after 24 hours the zone of inhibition was observed. Agar piece having zone of inhibition was cut and dipped in diethyl ether in schott duran bottle to get a crude extraction of antibacterial compound. As the piece of agar was also added so in another schott duran bottle only agar was added to the diethyl ether to use it as a negative control. Extracted samples were air dried for further analysis.

Analytical Chromatography

Crude extract having antibacterial compound were chromatographed on T.L.C aluminum sheets (20x20 cm, silica gel 60 F254 MERCK), to get separate spots of different compounds present in the crude extraction, by ascending method using a solvent system (v/v) of diethyl ether: water in 1:1 ratio and detected by spraying with aniline phthalate solution. And then it was observed under U.V lamp.

Silica gel was developed twice to get better separation. Control was also run to exclude the similar bands appeared in the crude extract and the control.

Purification of Antibacterial Compound

Crude extract was developed twice on a large silica gel cards to get bands clear apart, these bands from the silica cards were cut separately and marked as spot 1 to 6. Square pieces of silica cards were placed in diethyl ether to allow the compound to get dissolve in the diethyl ether, while silica cards without compound were also dipped in diethyl ether and it was used as a negative control.

After the complete dissolution of compound/s Whatman filter paper discs were soaked in the diethyl ether having dissolved compound and in the control also. A filter paper was also soaked in the simple culture as a positive control. All these filter papers were then placed on a plate having lawn of a sensitive strain (*Staphylococcus aureus*) and the plate was incubated at room temperature.

RESULTS AND DISCUSSION

Pakistan is an agriculture –based country about 60% of our population is currently related to the agriculture and it provides a major share of national income and export earning, which ensures food security, income and employment to a large proportion of the population. Improvement in agriculture sustainability will require the optimal use and management of soil fertility and soil physical properties. Soil bacterial diversity, increase soil biological activity and build up long-term soil productivity and health. It is believed that their diversity with respect to selected characters (antibacterial activity, solubilization and bioabsorbent biopolymer) could be used for improving fertility of agricultural lands.

Bacteria at different stages during their growth produce different types of compounds mainly divided into primary and secondary metabolites. Bacterial metabolites are important not only in biotechnological research but also gaining importance for commercial purposes. Some of the bacterial products are considered as the best substitute of the synthetic products, because synthetic products are not eco-friendly and can not be easily degraded or when degraded increase pollution. There fore those bacterial products, which can replace the synthetic products, is gaining importance in industrial and agriculture areas.

In this context, in this study, bacteria from different environments were isolated to analyze for the production of secondary metabolites, which have potential to be used as bioinoculants. Center for Molecular Genetics culture stock was screened for selected characters and three bacterial strains were selected from CMG stock i.e. CMG645, CMG646 and CMG648. All of them were marine and collected from different sites in the sea. As all these strains selected from CMG stock were marine so some terrestrial strains were also isolated to study some of the terrestrial bacteria for the production of commercially important bacterial products.

Bacteria isolated were given the name of the environment from where they were isolated i.e. drain water isolate (DWi), garden mud isolate (Mi) later these were given the codes CMG649 and CMG650 respectively. All these selected bacterial strains were grown on nutrient media Streaking and restreaking was done in order to obtain pure culture. CMG stock was already identified and CMG645 and CMG646 were found to be *Pseudomonas sp*; CMG648 was found to be *Klebsiella sp*.

CMG645, CMG646, CMG649 produced green pigment on nutrient agar medium while other gave off white colonies on nutrient agar. All these strains were stained with Gram staining procedure described by Gram (1994) to study cellular morphology and purity of the culture. Out of three isolates from CMG stock and isolated all were Gram-ve. All of these bacterial strains were grown in nutrient broth and after 24 hours they were used in screening for the production of bioabsorbent polysaccharide for water absorbing capacity, solubilization compounds for solubilizing insoluble inorganic metal salts and antibacterial compounds active against disease causing bacterial strains.

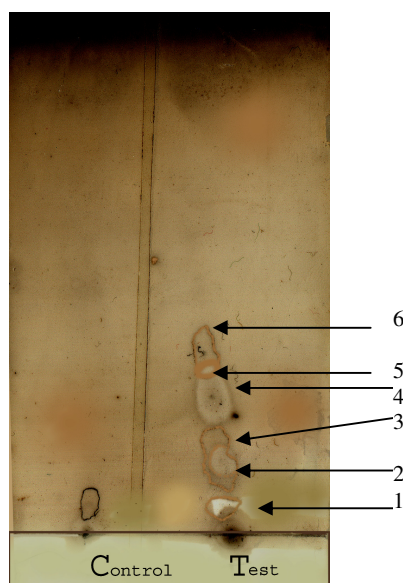


Fig. 1 Thin Layer Chromatography

Cont. (Plane agar piece treated with solvent and run as control),
Test Sample, (Crude Extract from Deferred Antagonistic
Activity Plate of CMG646 against lawn of *Staph. aureus.*),
Numbers 1 to 6 show the spots (compound) present in crude extract.

Table 4 Rf values of the spots observed by Thin Layer Chromatography
for Antibacterial Activity of CMG646

Isolate			
CMG 646	Distance	Solvent front =6.3cm	Rf value
	4mm		0.063
	8mm		0.126
	11mm		0.174
	13mm	*Rf = b/a	0.206
	25mm		0.396
	27mm		0.428

$$\text{*Rf} = \frac{\text{Distance starting line - solvent front} = a}{\text{Distance starting line - middle of spot} = b}$$

All of these bacterial strains were grown in nutrient broth and after 24 hours they were used in screening for the production of bioabsorbent polysaccharide for water absorbing capacity, for solubilizing insoluble inorganic metal salts and antibacterial compounds active against disease causing bacterial strains.

MTC's of isolates were checked for five antibiotics on asset of nutrient agar plates containing different concentrations of antibiotic compound. The antibiotic compounds tested were ampicillin, tetracycline, chloramphenicol, streptomycin and kanamycin. CMG649 and CMG645 and CMG650 proved to be more resistant to most of the antibiotics. MTC's of antibiotics for the selected strains CMG645, CMG646, CMG648, CMG649 and CMG650 were determined. CMG645 was found to be resistant to Tc, Cm, Amp, up to 200µg/ml, 300µg/ml, and 300µg/ml respectively. It is sensitive to Km, and Sm, CMG646 was resistant to Cm, and Amp, both up to 300µg/ml. CMG648 was found to be resistant to only Amp, up to 300µg/ml. CMG649 was resistant to Sm, Cm, Km, Amp, up to

200µg/ml, 300µg/ml, 100µg/ml, 300µg/ml respectively. CMG650 was found resistant to all five antibiotics used i.e. Sm, (300µg/ml), Tc, (100µg/ml), Cm, (100µg/ml), Km, (200µg/ml), Amp, (300µg/ml). These suggest that except CMG648 all the selected bacterial strains are resistant to drugs belong to β -lactum group. High resistance like CMG645 to Tc, (200µg/ml), Cm, (300µg/ml), CMG646 Cm, (300µg/ml), CMG649 Cm, (300µg/ml), CMG650 Tc, (100µg/ml), Cm, (100µg/ml) shown by most of the selected strains to Tc, And Cm, is might be due to an alternative metabolic pathway or enzymes reaction. Second possibility is that these organisms acquired the resistance genes are present on the plasmids (Gale *et al.* 1981).

Biopolymers are large molecules formed by the polymerization of many identical or two or more kinds of fundamental units under biological process by living organisms. They can be biologically active molecules and offer a number of novel material properties and commercial opportunities. The ability to produce biopolymer is direct and logical response to selective pressure in natural environment (Weiner *et al.* 1997). Extracellular polymers are usually composed of high molecular weight capsular polysaccharides these include cellulose, (Carpita and Vergar, 1998) xanthane (Sutherland, 1998) dextrane (Aslop 1983) gellan (Pollock 1993), a pullulan etc. Bacteria especially of marine and soil origin have been reported for bioabsorbent polymers. These have the ability to absorb water significantly more than its own weight. Bioabsorbent biopolymers are polysaccharides extracted from bacterial sources having high water absorbing capacity and can retain water for a long period of time (Weiner 1997). When treated with water, they form gel like substances they easily degradable and do not cause pollution problems. They can be used in agriculture they enhance water holding capacity of the soil and in sanitary products especially baby diapers. Their production is effected by growth condition. They have application in food industry, oil industry and in medicine. Bioabsorbent biopolymer production was checked in all selected bacterial strains, which were grown in nutrient broth and after 24 hours they were used in screening for the production of bioabsorbent polysaccharide for water absorbing capacity, production of biopolymer were checked by treating the culture with ethanol, which indicates that these bacterial strains produce exopolysaccharides (EPS) because ethanol lyses the bacterial cell wall thus making the attached EPS to precipitate and become visible. These selected bacterial strains produce off-white precipitates after treating with ethanol. CMG646 gave a bit different results in a sense that it not only produced the off-white precipitates but also a gel like material given the name of gelatin, this showed that probably CMG646 produced two types of polysaccharides, one was in the form of a gel and another was in the form of precipitates. These precipitates were then analyze for water absorbing capacity and showed 13% water absorbance as compare to their relative weight. Time of incubation is directly proportion to production rate and water absorbance capacity (Fig 3). On Tris minimal media all the selected bacterial strains showed solubilization zone for their respective metals. Solubilization activity was detected by the disappearance of added mineral particles i.e. insoluble inorganic Zn and production of clear zones around the growth.

Table 1. Quantitative measurements of Antibacterial Activity by Bacterial cells Inoculation Antibacterial Activity after 24 hours.

S.No	Lawns →	CMG	CMG	CMG	CMG	CMG	CMG	CMG	CMG	K2
	↓ Inoculums	641	642	644	645	646	647	904	1306	
1	CMG645	-	+	-	-	-	-	-	-	-
2	CMG646	-	-	-	+	-	-	-	-	-

Analysis of antibacterial activity

Antibacterial activity of all bacterial strains was checked using the preliminary screening test for bacteriocins i.e. “Deferred antagonistic assay” (lawn of a sensitive strain with drops of culture to be tested as antibacterial compound producing strain)(Naz *et al.* 1993). Eight strains showed antagonistic activity (antibacterial activity) against indicator strains, the strains that were used as indicator are *Bacillus subtilis* (CMG904), *Bacillus polymxa* (CMG644), *E.coli* (CMG642), *Klebsiella oxytoca* (CMG641), CMG1306 (Uncultured bacterium clone), and *Staphylococcus aureus* (CMG1025).

Strains which scored positive by the deferred antagonism assay to detect by “Agar well diffusion assay” to detect the inhibitory activity in liquid cultures (Table 1 & 2). Antibacterial activity of the culture was tested through agar well diffusion method, and readings were taken after 12 hours interval up to 3 days. It was observed that the zone appeared within 8 hours after inoculation, but it was very small, and it remained increasing till 24 hours rapidly, after which it slows down which indicates that the organism has stopped producing the products not essential for its own growth, due to the nutrients depletion in the medium, however when the same organisms were inoculated in the fresh medium they again start producing the antibacterial compound. Same procedure was done with the supernatant of these bacterial strains. Quantitative analysis of antibacterial compound showed that it is present in the supernatant and can produce zone of inhibition as in the case of culture itself. Two sets of plates were used; one was inoculated with 12 hours old supernatant and one set of plates were inoculated with 24 hours old supernatant this was done to check that up to which time the antibacterial compound remains in the supernatant, and this was observed that zones appeared in the 12 hours old supernatant and also increased up to a certain level when checked after 12 hours of inoculation but in case of 24 hours old supernatant this was observed that either the zone was not produced or if otherwise produced were not increased significantly only CMG645 and CMG646 gave zones against CMG644 (0.7 cm) and CMG641 (0.4 cm) respectively (Table 2).

Table no. 2 Antibacterial Activity after 48 hours.

S.No	Lawns →	CMG	CMG	CMG	CMG	CMG	CMG	CMG	CMG	K2
	↓ Inoculums	641	642	644	645	646	647	904	1306	
1	CMG645	0.3	1.9	1.06	-	-	-	-	-	-
2	CMG646	0.4	4.3	0.7	1.4	-	-	-	-	-

Digits in columns show the size of zone of inhibition in cm

Supernatant inoculations at two hours interval during growth showed that antibacterial activity does not appear in the supernatant before 4 hours after inoculation. By filtering the culture with Millipore filter paper the bacteria free supernatant was inoculated and which showed the antibacterial activity thus it means that the antibacterial compound is released by the bacterial strains in the supernatant. In CMG649 this activity appears in the supernatant round 6th hours of the growth and persists up to 18th hours of the growth. In CMG 646 it appears at 8th hours. of growth and persists up to 34th hours of the growth. While in CMG 645 it appears at 8th hours. and persists up to 24th hours. CMG646 shows the maximum retention of the antibacterial compound in the supernatant. Treatment with enzymes showed different results in different strains. In case of CMG646 positive control plate showed the appearance of the zone of inhibition that is a positive result. In case of CMG646 only pepsin has stopped the activity of CMG646, while protease K, protease E, RNase, Lysozyme had no effect on the activity (Table 3).

Table 3. Qualitative Analysis of Antibacterial Activity.
Antibacterial Activity of enzymes treated Supernatant of CMG646

Inoculum CMG646

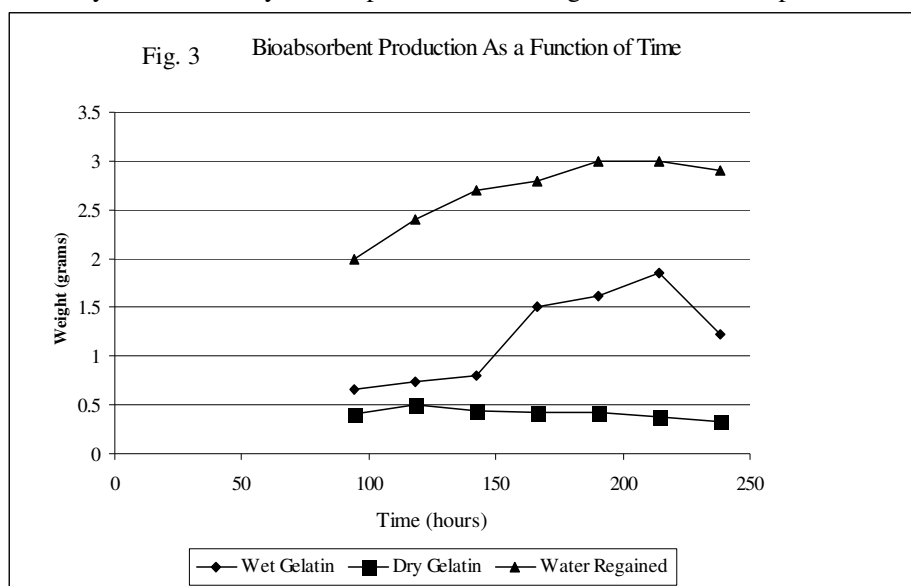
Lawn →	With out any inoculum (+ve control) CMG1306		CMG 1025				CMG 645				CMG 641			
Hrs →	12	24	12	24	36	48	12	24	36	48	12	24	36	48
-ve Control	-	-	+	+	+	+	-	-	-	-	+	+	+	+
Protease K (10ug/ml)	-	-	+	+	+	+	-	-	-	-	-	-	-	-
Protease E (10ug/ml)	-	-	+	+	+	+	-	-	-	-	-	-	-	-

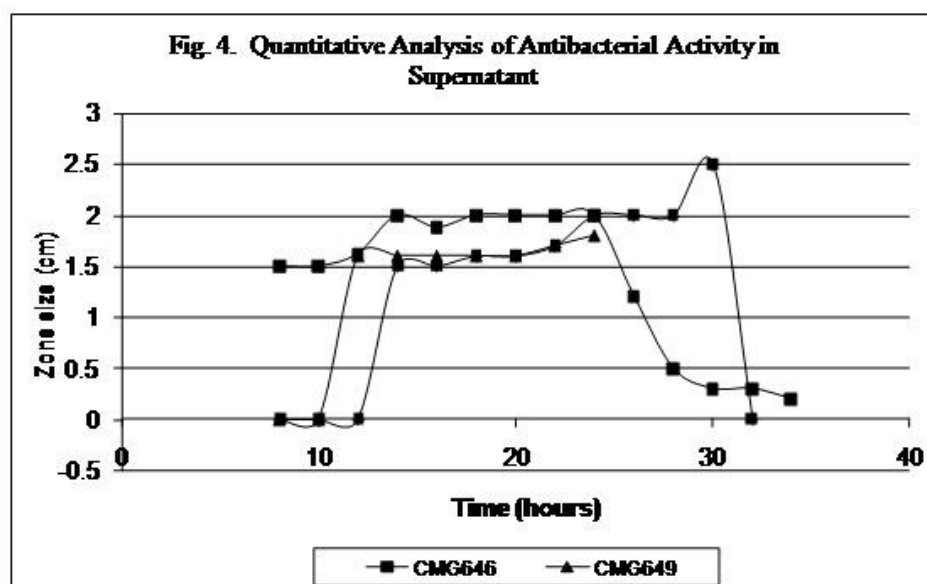
RNase (1ug/ml)	-	-	+	+	+	+	-	-	-	-	-	-	-	-
Lysozyme (10ug/ml)	-	-	+	+	+	+	-	-	-	-	+	+	+	+
Pepsin (10ug/ml)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

+ Sign shows the appearance of zone of inhibition, - Sign shows the absence of zone of inhibition

Supernatant of the bacterial strains cultures were heated and it was observed that heat destroyed the antibacterial activity of all the five selected bacterial strains. Which showed that the compound was heat sensitive (Table 3). For the chemical analysis T.L.C was done and for this purpose bacterial strain was grown on the nutrient agar having lawn of sensitive strain and after 24 hours the piece of gel from the zone of inhibition was dissolved in the diethyl ether and then this diethyl ether was allowed to evaporate and this was done twice and a thick mixture was prepared, which was yellow in color. T.L.C. or thin layer chromatography is similar to paper chromatography, but instead of a paper, an aluminum sheet coated with a thin layer of an absorbent material, such as finely powdered silica gel or aluminum oxide, is used. Spots of solution are applied onto a base line near the slide's lower edge, and the slide is then placed into a shallow bath of solvent. The solvent travels upward by capillary action, passing through the point at which the sample was applied, carrying the component with it at different rates. The T.L.C. plate is developed with aniline pthylate spray and viewed under ultraviolet light to reveal each component separated by T.L.C cards (Fig. 1).

After the development of the silica gel card, the card was divided into six portions with respect to the spots, each spot was separated from other by cutting the silica card in form of silica strips, then each strip was cut into small pieces which were then dip into diethyl ether to extract the individual spot into the solvent and solvent was air dried and finally all the silica gel got dissolved. Now filter paper strips were dipped in the purified extracts along with the positive control i.e. the pure culture and negative control i.e. the silica gel dissolved in the diethyl ether. These filter paper strips were placed on the plate having bacterial lawn of *Staphylococcus aureus* and it was observed that within six hours the zones of inhibition were produced. And it was observed that two spots showed antibacterial activity not all. T.L.C of crude extract from CMG646 showed six spots with different Rf values (Table 4) three of which were aniline pthylate spray sensitive and three were U.V sensitive (Fig. 1) and two of which showed antibacterial activity upon inoculation in the plate having *staphylococcus aureus* lawn. As the bacterial strains CMG646, CMG645, CMG649 showed antibacterial activity against different indicator strains with the same intensity, so it seems that they show broad-spectrum antagonistic antibacterial activity and hence they are the producers of strong antibacterial compound.





LITERATURE CITED

1. Agriculture statistics of Pakistan, 2001-2002.
2. Aslop, R. M. 1983. Industrial production of dextrans. Elsevier Science publishers. Vol. 83 printed in Netherlands. 40-44
3. Bonsall, R. F., Weller, D.M. and Thomashow S. L. 1997. Quantification of 2,4-Diacetylphloroglucinol Produced by Fluorescent *Pseudomonas* of Wheat. Appl. Environ. Microbiol. 63 (3): 951-955.
4. Burd, G. L., Dixon, D.G. and Glick, B.R. 2000. Plant growth promoting Rhizobacteria that decreases heavy toxicity in plants. Can. J. Microbiol. 33:237-245.
5. Carpitia, N., and C. Vergara 1998. Arecipe of cellulose. Science vol 279, 30-32.
6. Colwell, R.R. (1997). Microbial biodiversity and biotechnology. In: Biodiversity II: Understanding and protecting our biological resources. Reaka-Kudla, M.L., Wilson, D.E. & Wilson, E.O. (eds). Joseph Henry Press, University of Washington, D.C.
7. De Weger, L.A., Vaneder, A. J., Dekkers, L.C., Simons, M., Wijffelman, C.A., and Lugtenberg, B., 1995. Colonization of the rhizosphere of the crop plants by plant beneficial *Pseudomonas*. FEMS Microbiol. Ecol. 17:221-228.
8. Fasim, F., N. Ahmed and G. M. Gadd. 2002. Solubilization of zinc oxide and zinc phosphate by bacterium from air environment of a tannery. FEMS Microbiology Letters, 213 (1): 1-6.
9. Gale N.L. 1981. The Role of Algae and other Microorganisms in Metal Detoxification. In Biotechnology for Mining. Metal refining and Fossil Fuel Processing Industries. Pp; 171-180. Jhon Wiely and sons, New York.
10. Hill, G. T., Motrowski, N.A., Wolfe, L.A., Emele, L.R., Jurkoine, D.D., Ficke, A., Ramirez, S.M., Lynch, S.T. and Nelson, E.B., 2000. Methods for assessing the composition and diversity of soil microbial communities. Appl. Soil. Ecol., 15: 25-36.
11. <http://www.nrdc.org>.
12. <http://www.agr.kuleuven.ac.be>

13. Haris, L. J., Daeschel, M. A., Stiles, M. E. and Klaenhammer, T. R. 1989. Antimicrobial Activity of lactic acid bacteria against *Listeria monocytogenes*. J. Food Prot.52: 384-387.
14. Lee-Wicker, L. J. and Chassy, B. M. 1984. Production and regeneration of *Lactobacillus casei* protoplast. Appl. Environ. Microbiol. 48: 994-1000.
15. Muriana, P.M. & Klaenhammer, T.R. (1987). Purification and partial characterization of Lactacin F, a bacteriocin produced by *Lactobacillus acidophilus* 11088. Appl. Environ. Microbiol. 57: 114-121.
16. Naghma Naz 1993. Study of indigenous strain Lactobacilli and improvement of strain. Centre of Molecular Genetics
17. Paul VJ, ed. (1992). Ecological Roles of Marine Natural Products. Iaca: Comstock. 245 pp.
18. Pollock, T. J., 1993. Gellan related polysaccharides and e genus *saphingomonas*. J. Gen. Microbiol. 139: 1939-1945.
19. Rammamoorthy, U., Vismanathan, R., Ragnchander, J., Prakasam, V. and Samiyappan, R., 2001. Induction of systemic resistance by plant growth promoting Rhizobacteria in crop plants against pests and diseases. Crop protection.20: 1-11.
20. Rovera, M.Crrea, M.N., Reta, M., Andres, J.A., Rosas, S.B.and Correa N.S.Chemical Identification of Antifungal Metabolites, produced by *Pseudomonas aurantiaca*.
21. Sutherland, I. W., 1998. Novel and established applications of microbial polysaccharide. Tibtech volume 16. (Jan 98). 41-46.
22. Tagg, J. R. and McGiven, A. R. 1971. Assay system for bacteriocin. Appl. Microbiol. 21: 943-944
23. Vuichiro, R., K and Nohata Y. 1994. A new water absorbing polysaccharide from *Alcaligenes latus*. Biosci. Biotech. Biochem. 58(2): 235-238.
24. Weiner, M. Ronald 1997. Biopolymers from marine prokaryotes. Tibtech vol 15, 390-394.

Academic Research International

ISSN-L: 2223-9553, ISSN: 2223-9944 Print, ISSN: 2223: 9952 CD

Vol. 1, No. 2

September 2011

Part II

SAVAP International

Bright Home, Lodhran City - 59320, PAKISTAN.

URL: [http:// www.journals.savap.org.pk](http://www.journals.savap.org.pk)

THE EFFECTS OF READING RACETRACKS AND FLASHCARDS FOR TEACHING OF SIGHT WORDS

Holly R. Romjue

Department of Special Education
Gonzaga University,
Spokane, WA
USA

Prof. Dr. T. F. McLaughlin

Department of Special Education
Gonzaga University,
Spokane, WA
USA
mclaughlin@gonzaga.edu

K. Mark Derby

Department of Special Education
Gonzaga University,
Spokane, WA
USA

ABSTRACT

The purpose of this study was to assess the effects of pairing reading racetracks and flashcards for teaching of sight words. Two male elementary school male students served as our participants. The first participant was diagnosed with a specific learning disability, and the second participant was diagnosed with mild intellectual disabilities. Data were taken on the number of corrects and errors from selected sight words. A reversal design with follow up probes was used to evaluate the reading racetrack and flashcard intervention. The results found that reading racetracks paired with flashcards were effective in increasing sight word reading. These outcomes were replicated across each participant and each phase of the investigation. The efficacy of employing reading racetracks and flashcards at the classroom level was discussed.

Key words: sight words, elementary students, learning disabilities, intellectual disabilities, correct rate, error rate, classroom research, fluency

INTRODUCTION

Reading is a very important and vital skill. The lack of skills in reading has been linked to a wide variety of life problems (Askov, 1991). These problems have included: (a) failing to complete high school (Chambers, Dunn, & Rabren, 2004); (b) developing behavioral issues (Bennett, Brown, Boyle, Racine, & Offord, 2003; Kauffman, 2008); (c) chronic under or unemployment (Askov, 1991; Livingstone, 1998); (d) poverty (Howard, McLaughlin, & Vacha, 1996); and (e) difficulty with the law (Gersten & Keating, 1987; Gersten, Keating, & Becker, 1988). Therefore, gaining skills in reading has both short term as well as long term benefits for individuals as well as society as a whole (Adams, 1991; Report of the National Reading Panel [NICHHD], 1999a, 1999b).

Reading fluency is recognized as an essential element of every reading program, especially for students who struggle in reading (Hudson, Lane, & Pullen, 2005). In 2000, the National Reading Panel found that fluency is one of the critical factors necessary for reading comprehension, and is often a component neglected many of today's classrooms.

Quick and effortless word identification in a fluent reader is important because if one can read words automatically, one's cognitive resources can be used for comprehension (National Institute of child Health and Human Development, 1999a, 1999b).

Reading racetracks have shown to be effective and easy to implement for students with reading abilities above or below grade level (Rinaldi, Sells, & McLaughlin, 1997). Reading racetracks are an instructional strategy that focuses on improving fluency. A variety of materials can be used such as lists of Dolch Sight Words, words from passages of reading texts, trade books, word lists, vocabulary lists, etc. can be placed on a reading racetrack. These words should be carefully selected to avoid having any two words on a particular racetrack that were either auditorily or visually similar. There were two different types of racetracks, each containing 28 cells. The first type of racetrack consists of seven target sight words that are repeated in random order. The random order is used to avoid the occurrence of patterns which may interfered with the students learning the words and instead focusing on and learning the pattern in which the words appeared. Every fifth racetrack is a review racetrack containing the accumulation of the 28 different words that were introduced in the four previous racetracks. Two measures are taken. The first is the number of words read correctly from the reading racetrack during a 1-min timing while the second was the frequency of errors during the same 1-min timed reading. An error is not counted if the participant made a self-correction before going on to the next word. When errors are made before the timing of the child, the teacher or teacher's aide must use the "model, lead, test and retest" Direct Instruction procedure (Marchand-Martella, Slocum, & Martella, 2004) to teach or review the words that were missed by the participant. This procedure consists of first modeling the correct pronunciation of the word, then saying the word with the child, the participant then reads the word independently, and finally, the participant is required to reread the word correctly three or more times. This procedure should take approximately 1 to 5 minutes, depending on the number of errors made by the student. At the beginning of each reading session, the participants are given the particular racetrack that he or she was working. The participant is then taught to inform the teacher when he or she was ready to begin. This is followed by the teacher giving the prompt, "On your mark, get set, go!" The teacher keeps track of the number of words read by placing a mark each time the participant completed a full circle around the track. At the end of the 1-min timing, the teacher says "Stop!" The participant and teacher then place a mark the word that was just read. Upon completion of each 1-minute timing, the participant counts the number of words that he or she read and self-records these data. The teacher tallies the number of errors, give this number along with specific feedback to the participant, who then records these data below the number correct. These data are collected and documented by the teacher on a data collection sheet. Often, students plot their own performance after each session is completed.

Reading racetracks have also been shown effective (Rinaldi & McLaughlin, 1996). Also racetrack procedures can be paired with flashcards, to improve sight word recognition (Anthony, Hern, Rinaldi, & McLaughlin, 1997; Falk, Band, & McLaughlin, 2003; Hyde, McLaughlin, & Everson, 2009; McLaughlin, Weber, Derby, Hyde, Violette, Barton et al. 2009; Printz, Band, & McLaughlin, 2006; Rinaldi & McLaughlin, 1996). In addition, research has found that these procedures can assist students in math (Beveridge, Weber, Derby, K. M., & McLaughlin, 2005) and spelling (Arkoosh, Weber, & McLaughlin, 2009).

The present study was implemented to assess reading racetracks and flashcards with two males ages 9 and 11. Both boys had delays in reading, writing, and math. We extended our earlier work by using reading racetracks pairing it with flashcards to increase the accuracy of sight word reading. This study also attempted to replicate and extend the use reading racetracks and flashcards (Anthony et al., 1997; Falk et al., 2003; Printz et al., 2006; Rinaldi & McLaughlin, 1996; Rinaldi et al., 1997) with two pupils with differing ages and disability

designations than we have employed in our previous investigations. Our previous research employed students who were younger (10 years) and diagnosed with just learning disabilities. The present report attempts to provide some initial evidence regarding the efficacy of employing reading racetracks for a student with mild intellectual disabilities.

METHOD

Participants and Setting

There were two participants for this study. The first was a 9-year-old male, who had been diagnosed with a specific learning disability. He was receiving specialized instruction in the areas of reading, writing, and math. The second participant was an 11-year-old male who had been diagnosed with mild intellectual disabilities, and was also receiving specialized instruction in reading, writing, and math. They were chosen based on the recommendation of the classroom teacher and their low achievement scores in reading. Each participant was below grade level in reading when the *Woodcock Johnson Psycho-educational Battery* (Woodcock, McGrew, & Mather, 2001) was administered in the early spring.

Both of the participants attended a self-contained special education classroom for students with developmental delays. Both participants spent part of each school day in the general education classroom for library, art, and physical education. The classroom was located in an upper-low to middle income suburban school in the Pacific Northwest. Sessions were held three to four times a week, lasting between 10 to 20 minutes per session. There were six other students present in the classroom with disabilities. Their disabilities included moderate intellectual disabilities, autism, and fetal alcohol syndrome the time of the investigation. The first author was completing her student teaching in the classroom. The class was staffed by a certified teacher, a student teacher (first author), and one permanent instructional aide.

Materials

A reading racetrack described by Rinaldi et al. (1997) was employed during this intervention. A reading racetrack contains 28 cells placed along an oval track. The words chosen for inclusion on the racetracks came from the pre-primer and primer Dolch word list, as well as the school districts 4th grade core word list; which were placed the sight words on 3x5 index cards. The school districts 4th grade core word lists included the words that all fourth grade students in the district should be able to say and spell. The range of lists reflected the differences in reading skills of our two participants. The flashcards were used to provide additional practice with the word list, as well as a way to present the words during baseline and reversal phases. For data collection and analysis, word lists were typed up for each session on the classroom computer. A digital kitchen timer was used to time student performance on their reading racetrack.

Dependent Variables and Measurement Procedures

The dependent variable was the number of correct and incorrect words. Once the students completed reading their 28-cell racetrack, the number of correct and errors were recorded. A correct was defined as the student correctly saying the written word. An error was defined as the participant saying a word that did not match the pronunciation of the written word, or if the student failed to read the word. An error was not scored if the participants self-corrected themselves before moving on to the next word.

Data Collection and Inter-observer Agreement

For data collection, word lists were typed up for each of the sessions enabling corrects and errors to be monitored while each participant read. To keep track of the data session, on the top of each list were the experimental condition, the session number, and the racetrack number. The total number of corrects and errors were recorded on the sheet when the session was completed.

Either the classroom teacher or one of the instructional assistants independently scored the session to obtain interobserver agreement. To calculate interobserver agreement, the smaller number was divided by the larger number and multiplied by 100. The mean agreement was 100% for number of words read by the students. Data were also gathered for the fidelity of the implementation of the reading racetracks procedures. This was completed by having the second and third authors come to the classroom and determine which condition was being implemented. Each employed a checklist that detailed either baseline or the use of the reading racetrack procedures. This was done on three separate occasions with 100% agreement among raters.

Experimental Design and Conditions

Reading racetracks were evaluated using an ABCABCABCDDDD single case reversal with replications design. (Barlow, Nock, & Hersen, 2008; Kazdin, 2010). A description of the various conditions follows.

Pre-assessment. Before baseline data were taken, a pre-assessment of sight word identification was taken for each participant. The first author was told by the classroom teacher that the first participant was working on pre-primer and primer Dolch words, and that the second participant could read quite a few words from the 4th grade core words list. The first author assessed the first participant on the pre-primer and primer Dolch lists. The participant was asked to read each word on each of the lists. If they came to a word they did not know to try to sound it out, or to skip the word. He correctly read 20 out of the 40 pre-primer word list, and 13 out of 52 primer word list. The words to work on during baseline and intervention would come from these two Dolch lists.

The first author began assessing the second participant's knowledge of the 4th grade core word list. The second participant was asked to do the same as the first participant when reading the words on the lists. He could correctly read 107 out of 150 4th grade core words.

After assessing the number of words the students could read from their lists, reading racetracks were then constructed. Word lists were created using the principle of not introducing words together that were both auditorily or visually similar (Carnine, Silbert, Kameenui, & Tarver, 2004; McLaughlin et al., 2009; Rinaldi et al., 1997). The word lists for both participants consisted of 14 words. A word such as main or mane, man or men would not be placed on the same racetrack. Each list contained 7 unknown words and 7 known words. All racetracks looked the same and only the words that were being trained were included. Once the word lists were created, every word placed on 3x5 inch index cards.

Baseline (B). There was one baseline point taken at the beginning of each new word list, when the word list was presented to each participant. The participant was asked to read 14 flashcards presented to him. We presented the flashcards one-by-one and the participant

would have to respond within 5-s. If the participant did not know the word, they could respond by saying “skip.” The participant was provided no feedback on their accuracy. Words were separated into a correct pile and an incorrect pile. After the participant had read through all of the flashcards, the piles were counted and corrects and errors were recorded.

Flashcards and reading racetracks (RR). After baseline data was taken for each word list, instruction on words began with flashcards. The participants were presented flashcard individually. The participants were asked to read the word if they knew it, but if they did not know it, instruction was provided on the word. Specifically, the word was said to model it, and then the participant was asked “What word is this?” The participant read the word, and repeated it several times before proceeding to the next word.

After going through the flashcards two or three times, instruction continued using the reading racetrack. Each word list had two forms of the racetrack, A and B. The two forms of the racetrack were alternated every session to prevent word order memorization. After the track was selected, the first author would point to each word on the track and the student would read the words that were pointed to. The student received praise and feedback about the words. The student read through the track one to two times, or until the student expressed confidence to continue.

Once the participant had read through the racetrack, “a practice timing” was conducted. The student was asked to point to the first word on the racetrack and told, “get ready to read.” During the practice timing, the timer was set to one minute, and the participant was asked to read each word on the racetrack. After the timing was over, the participant reread all the words read incorrectly. We then praised the participant while reading through the racetrack.

Participants typically needed one practice timing, but were allowed more timings if they requested. Once timing was completed, an official timing was conducted to collect the number of correct or incorrect words. During the official timing, the participant did not receive any praise or assistance. While the participant read the words, corrects and errors were recorded. Corrects were marked with a plus sign (+), while errors were scored with a dash (-). After timing was completed, the total number of corrects and errors were tabulated. There were three to five sessions with the reading racetracks for each list, alternated between the A and B forms of the racetrack. In order for the participant to move on to a new list of words, the participant would either have to receive 28 corrects and 0 errors for three sessions in a row or complete five sessions on the same list.

Reversal (RV). After the participant completed three to five sessions of the reading racetracks, the words from flashcards were presented. This was done to determine if the participant could read the words without flashcard instruction or using the reading racetrack. We conducted this reversal during the last data point taken from each of the word lists. This phase was implemented four times.

Review racetrack (RWR). Once four word lists were completed, review sessions were carried out. During review sessions, the participants were asked to read all 28 words that had been the unknown words within the four previous racetracks. There were a total of four review sessions for each participant, regardless of how many corrects or errors each session. This phase lasted for four sessions.

Reinforcement System

During all phases of the investigation, a reinforcement system using the Premack principle (Alberto & Troutman, 2008) was in place. Specifically, all on-task behavior (looking at the teacher, looking at or writing in curriculum materials, raising one's hand for assistance, or correct answers was followed with verbal praise from the first author. In addition, the participants were given access to desirable consequences that were determined from a preference assessment. Such items as free-time, edibles, computer games, listening to music were provided following the evaluation sessions. The cost of edibles each participant ranged from \$2.50 to \$5.00 for the duration of data collection.

RESULTS

Participant 1.

The number of correct or error words during baseline, reading racetrack intervention plus review tracks, and reversal data points are presented on Figure 1. During baseline for List 1, this participant read 8 words correctly and made 6 errors. Throughout the reading racetrack intervention, he averaged 28 corrects with 0 errors. He finished List 1 by reading all 14 words correctly with no errors. He had 11 corrects and 3 errors during baseline for List 2. Throughout the reading racetrack intervention, he averaged 28 corrects with 0 errors. He completed this word list with 14 words correct and 0 errors. For List 3, he had 9 corrects and 5 errors for baseline. During the reading racetrack intervention, he averaged 27.5 corrects and just .5 errors (range from 28 to 26 corrects and 2 to 0 errors.) He was able to read all 14 words correctly from the list during reversal. On List 4, participant 1 had 5 corrects and 9 errors for baseline. During the intervention, he averaged 24 corrects and 4 errors (range from 26 to 22 corrects and 2 to 6 errors). He was able to read 13 of the 14 words from the list during reversal. On the review racetrack, the participant averaged 27 corrects and 1 error (range from 28 to 26 and 2 to 0 errors)

Participant 2.

The number of words read correctly or as errors during baseline, the reading racetrack intervention and reversals are displayed in Figure 5. During baseline for List 1, the participant read 7 words correctly and made 7 errors. Throughout the reading racetrack intervention, he averaged 28 corrects with 0 errors. He read all 14 words correctly during reversal, making 0 errors. For List 2, this participant had 7 corrects and 7 errors during baseline. During the reading racetrack intervention, he averaged 27.5 corrects and .5 errors (range from 26 to 28 corrects and 0 to 2 errors.) He read all 14 words correctly with no errors during reversal. On List 3, this participant had 10 corrects and 4 errors during baseline. Throughout the reading racetrack intervention, he averaged 28 corrects and 0 errors. The participant read all 14 words correctly with no errors during reversal. On List 4, this participant had 7 corrects and 7 errors during baseline. During the intervention, he averaged 28 corrects and 0 errors. He then was able to read all 14 words correctly with no errors during reversal. Finally, during the review reading racetrack phase, the participant averaged 28 corrects and 0 errors.

DISCUSSION

Our results demonstrate reading racetracks paired with flashcards were an effective way of teaching sight words to both participants. Word recognition skills were maintained during the review reading racetrack sessions.

Anecdotally, the first participant would get frustrated when presented with novel things, such as new words. Thus when a new list was presented to him, the first session was often difficult for him to finish. He was most frustrated when reading racetrack 4 was presented. During baseline, he was only able to correctly read 5 of the 7 of his known words. During that racetrack, he typically passed on the words he did not know. Fortunately, he did not engage in any inappropriate behaviors during the investigation. He asked to work for Blow Pops, and they remained a strong motivator during reading racetracks.

The second participant was positive about the project and this lasted throughout data collection. He was apparently reinforced working one-on-one with adults; thus, it appeared that adult interaction was the only consequence he needed to participate in the project. He would let the first author know when he would like to do the racetracks that day. Often he would tell the teacher a sentence with the word in it, without any prompting. This demonstrated he not only was able to read the word, but also knew the meaning of the word.

This study was practical, inexpensive, time-efficient, and easy to implement and create. The intervention was easily employed in the classroom setting, and did not take much instructional time out of the day. The classroom teacher was able to replicate it easily, and continued its use after formal data collection ceased. The improvement of student sight-word vocabulary has been linked to improving long-term outcomes for students with and without disabilities (Howard et al., 1996; Farkas & Beron, 2004; Slavin, 1996).

There were limitations in the present research. First, the pre-assessment of the words the participants knew could have taken place for longer than just one session. In future research, the pre-assessment should be carried out at least two or three times. This should allow the teacher to determine if there were any inconsistencies or patterns between known and unknown words. This may have prevented problems such as List 4 for the first participant. In baseline he was only able to read 5 words that were on the known list, and would not have had 9 unknown words. Another way to address our assessment problem would have been to employ some type of criteria, such as corrects and errors per minute, to establish the instructional level for our participants. We only included two participants because that was the number of students recommended by the classroom teacher. Adding an additional participant would have added additional validity to our outcomes (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005). The lack of standardization reviewing the flashcards either two or three times should also be changed. Review the flashcards two or three times and on a consistent basis. Another limitation was that not enough data were collected during experimental condition. Only one data point was plotted for each baseline condition. With only one data point, determining trend, level of performance, and stability was not possible. Similarly, only one measure of performance was taken during reversal condition. The use of a reward system in conjunction with the reading racetrack intervention produces an additional confounding variable in the present study. As part of our ongoing documentation of candidate performance in changing student outcomes (McLaughlin, Williams, Williams, Derby, Weber, & Bjordahl, 1999), we require that our students carry out a preference assessment in the student teaching experience. The participants earned their preferred reward

for each session during the reading racetrack phases. Unfortunately, we could not provide any evidence that the reading intervention would have been effective without the use of our reward system.

The present research adds to the growing literature on the positive outcomes when racetrack procedures are employed (McLaughlin, Weber, Derby, Hyde, Violette, Barton, et al., 2009). The present outcomes replicate our previous research (Anthony et al., 1997; Falk et al., 2003; Printz et al., 2006; Rinaldi & McLaughlin, 1996; Rinaldi et al., 1997). Also, we were able to demonstrate that reading racetracks could be effective with a student with mild intellectual disabilities. Racetrack procedures could be employed with other subject matter areas such as math (Beveridge, Weber, Derby, & McLaughlin, 2005). Additional research in such subject-matter areas such as spelling, social studies, and science appears warranted.

This study demonstrates that reading racetracks paired with flashcards and a reward system was an effective way to teaching sight words to two participants with moderate disabilities in a self-contained classroom. To better evaluate the effects of reading racetracks, data could be gathered from various settings and with students with various disabilities. Finally, one could compare the effects of reading racetracks with and without employing a reward system. One could employ an alternating treatments design (Barlow et al., 2008) to add and remove such a system across racetracks as a way to assess its contributions of classroom reward procedures.

ACKNOWLEDGEMENT

The researcher would like to thank the participants and their parents for their cooperation, support, and enthusiasm for learning. Also, we would like to extend her gratitude toward the cooperating teachers for their assistance and guidance throughout this study.

Author(s) Note

This research was completed in partial fulfillment for the Bachelor of Education in Special Education at Gonzaga University. Requests for reprints should be addressed to the authors, Department of Special Education, Gonzaga University, Spokane, WA 99258-0025 or via email at mclaughlin@gonzaga.edu

REFERENCES

- Adams, G. L. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.
- Alberto, P. A., & Troutman, A. (2008). *Applied behavior analysis for teachers* (8th ed.). Upper Saddle River, NJ: Prentice-Hall/Pearson.
- Arkoosh, M., Weber, K. P., & McLaughlin, T. F. (2009). The effects of motivational/reward system and a spelling racetrack on spelling performance in general education: A case report. *The Open Education Journal*, 2, 17-20.
- Askov, E. N. (1991). Literacy: Impact on the workplace, family, and school. *Education*, 111, 542,548.

- Anthony, C., Rinaldi, L., Hern, C., & McLaughlin, T. F. (1997). Reading racetracks: A direct replication and analysis with three elementary students. *Journal of Precision Teaching and Celeration*, 14(2), 31-36.
- Barlow, D. H., Nock, M., & Hersen, M. (2008). *Single case research designs: Strategies for studying behavior change* (3rd ed.). New York: Allyn and Bacon.
- Bennett, K. J., Brown, S. K., Boyle, M., Racine, Y., & Offord, D. (2003). Does low reading achievement at school entry cause behavior problems. *Social Science & Medicine*, 56, 2443-2448.
- Beveridge, B., Weber, K. P., Derby, K. M., & McLaughlin, T. F. (2005). The effects of a math racetrack with two elementary students with learning disabilities. *International Journal of Special Education*, 20(2), 58-65.
- Carnine, D., & Silbert, J., Kameenui, E. J., & Tarver, S. G. (2004). *Direct instruction reading* (4th ed.). Upper Saddle River, NJ: Merrill/Pearson.
- Chambers, D., Dunn, C., & Rabren, K. (2004). Variables affecting students' decisions to drop out of school. *Remedial & Special Education*, 25, 314-325.
- Falk, M., Band, M., & McLaughlin, T. F. (2003). The effects of reading racetracks and flashcards on sight word vocabulary of three third grade students with a specific learning disability: A further replication and analysis. *International Journal of Special Education*, 18(2), 57-61
- Farkas, G., & Beron, K. (2004). The detailed age trajectory of oral reading vocabulary knowledge: Differences by class and race. *Social Science Research*, 33, 464-467.
- Gersten R., & Keating, T. (1987). Long term benefits from direct instruction. *Educational Leadership*, 44(6), 28-31.
- Gersten, R., Keating, T., & Becker W. C. (1988). The continued impact of the Direct Instruction Model: Longitudinal studies of Follow Through students. *Education and Treatment of Children*, 11, 318-327.
- Horner, R., Carr, E., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*, 71, 165-180.
- Howard, V. F., McLaughlin, T. F., & Vacha, E. F. (1996). Educational capital: A proposed model and its relationship to academic and social behavior of children at risk. *Journal of Behavioral Education*, 6, 135-152.
- Hudson, R., Lane, H., & Pullen, P. (2005). Reading fluency assessment and instruction: What, why, and how? *The Reading Teacher*, 58, 702-714.
- Hyde, C. A., McLaughlin, T. F., & Everson, M. (2009). The effects of reading racetracks on the sight word fluency and acquisition for two elementary students with disabilities: A further replication and analysis. *The Open Social Science Journal*, 2, 1-4.
- Kauffman, J. M. (2008). *Characteristics of emotional and behavioral disorders of children and youth* (8th ed.). Upper Saddle River, NJ: Merrill/Pearson Education.
- Kazdin, A. E. (2010). *Single case research designs: Methods for clinical and applied settings* (2nd ed.). New York: Oxford University Press.

- Livingstone, D. W. (1998). *The education-jobs gap: Underemployment or economic democracy*. Boulder, CO: Westview.
- McLaughlin, T. F., Weber, K. P., Derby, K. M., Hyde, C., Violette, A., Barton, C., Petersen, P., Green, C., Verduin, S., Printz, K., Gonzales, R., & Arkoosh, M. (2009). The use of a racetracks procedure to improve the academic behaviors of students in special and remedial education: Suggestions for school personnel. In O. Demir & C. Celik (Eds.). *Multimedia in education and special education* (pp. 55-81). Columbus, OH: Nova Science Publishers, Inc.
- McLaughlin, T. F., Williams, B. F., Williams, R. L., Peck, S. M., Derby, K. M., Bjordahl, J. M., & Weber, K. M. (1999). Behavioral training for teachers in special education: The Gonzaga University program. *Behavioral Interventions*, 14, 83-134.
- National Institute of Child Health and Human Development. (1999a). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. Reports of the subgroups*. Washington DC: National Institute of Child Health and Human Development.
- National Institute of Child Health and Human Development. (1999b). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. Summary*. Washington DC: National Institute of Child Health and Human Development.
- Printz, K., McLaughlin, T. F., & Band, M. (2006). The effects of reading racetracks and flashcards on sight word vocabulary: A case report and replication. *International Journal of Special Education*, 21(1), 103-108.
- Rinaldi, L., & McLaughlin, T. F. (1996). The effects of reading racetracks on the fluency of see-to-say words in isolation by a student with learning disabilities. *Journal of Precision Teaching and Celeration*, 13(2), 44-52.
- Rinaldi, L., Sells, D., & McLaughlin T. F. (1997). The effects of reading racetracks on sight word acquisition of elementary students. *Journal of Behavioral Education*, 7(2), 219-234.
- Slavin, R. E. (1996). *Education for all*. Exton, PA: Swets & Zeitlinger Publishers.
- Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock Johnson Psycho-educational Battery*. Reading Meadows, IL: Riverside Publishing.

Dolch Pre-Primer (40 Words)

a	here	play
and	I	red
away	in	run
big	is	said
blue	it	see
can	jump	the
come	little	three
down	look	to
find	make	two
for	me	up
funny	my	we
go	not	where
help	one	

Figure 1. Dolch Pre-Primer Word List

Dolch Primer (52 words)

all	into	that
am	like	there
are	must	they
at	new	this
ate	no	too
be	now	under
black	on	want
brown	our	was
but	out	well
came	please	went
did	pretty	what
do	ran	white
eat	ride	who
four	saw	will
get	say	with
good	she	yes
have	so	
he	soon	

Figure 2. Dolch Primer Word List

Fourth Grade Core Words

able	complete	heard	order	stop
a	course	himself	perhaps	strong
against	cut	hold	person	sun
ago	didn't	horse	piece	sure
am	dog	hot	plants	surface
American	done	hundred	play	table
among	door	idea	point	talk
answer	draw	inside	probably	ten
anything	early	it's	ran	that's
area	eat	I'll	ready	thing
became	English	I'm	really	though
become	example	kept	red	told
before	face	knew	remember	top
behind	family	later	rest	toward
back	fast	learn	river	town
body	feel	learned	room	tree
book	felt	less	run	true
box	fine	letter	sad	try
brought	fire	list	sea	turn
built	fish	lived	seen	turned
cannot	five	living	several	United States
can't	front	matter	short	upon
car	full	mean	shown	usually
certain	gave	money	six	voice
change	green	morning	space	whether
city	ground	move	special	whole
class	group	nothing	stand	wind
close	grow	notice	start	yes
cold	half	oh	state	yet
common	hear	open	stood	young

Figure 3. The 4th Grade Core Word List

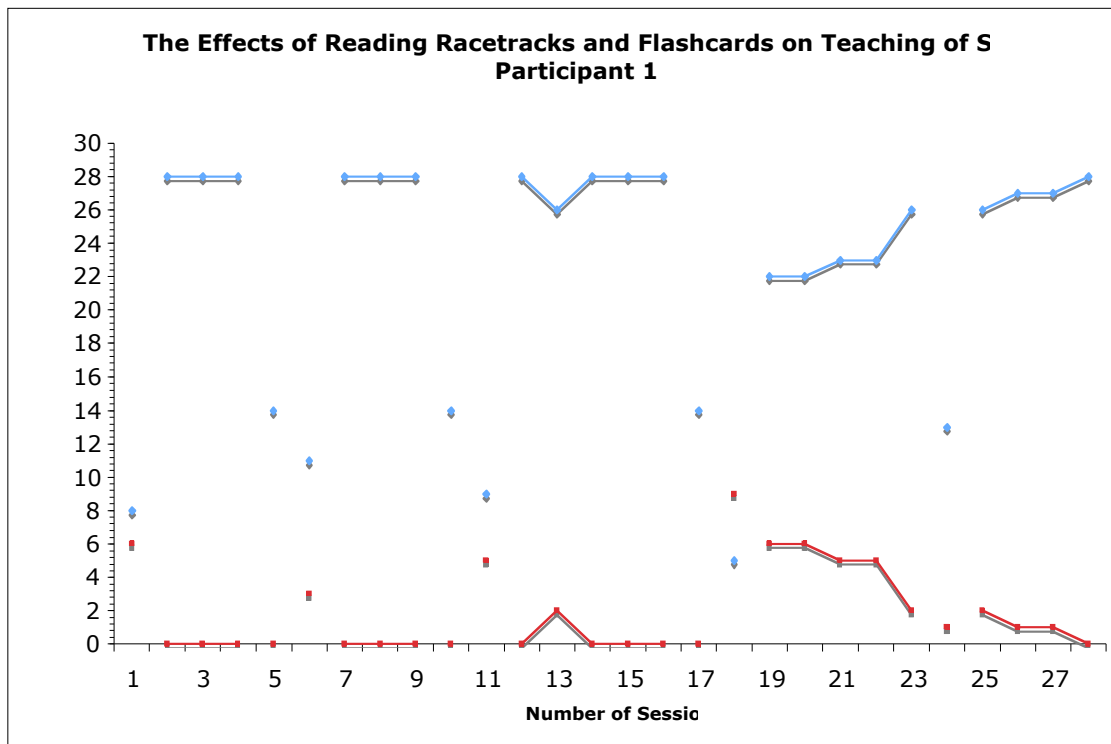


Figure 4. The number of corrects and errors for Participant 1 during baseline, reading racetracks, reversal, reading racetracks, and maintenance.

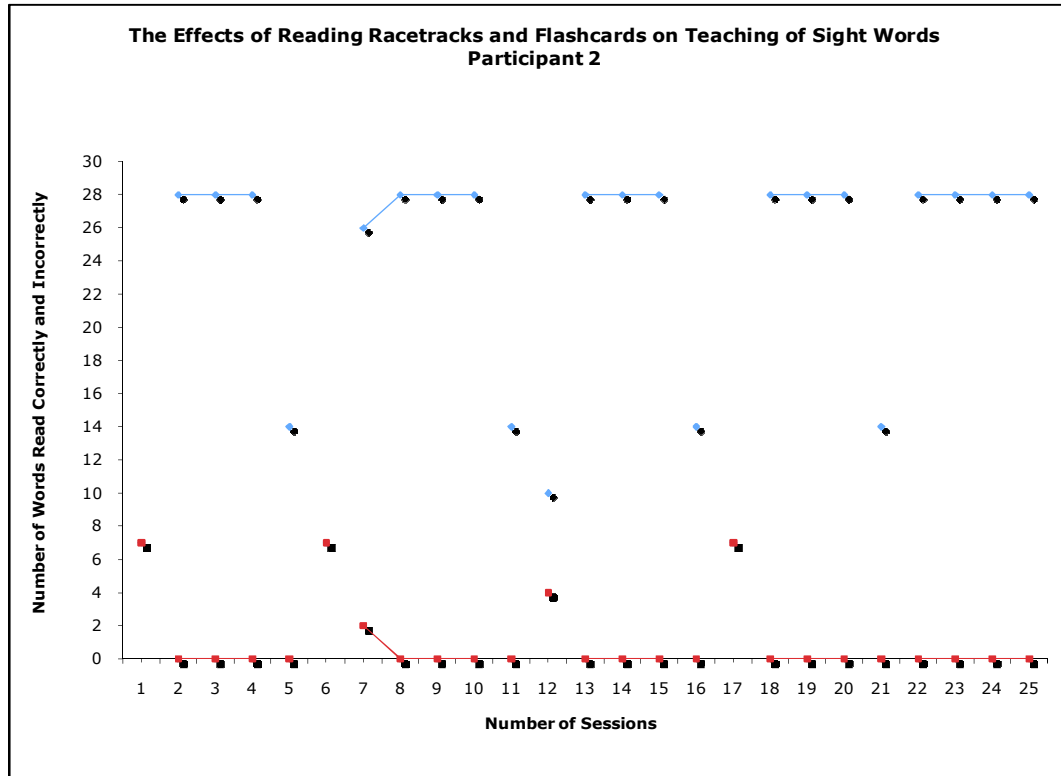


Figure 5. The number of corrects and errors for Participant 2 during baseline, reading racetracks, reversal, reading racetracks, and maintenance

ECONOMIC GROWTH AND THE ENVIRONMENT

Dimitrios Nikolaou Koumparoulis,
Professor of Economics,
UGSM-Monarch Business School,
SWITZERLAND
dnkoumparoulis@gmail.com

ABSTRACT

The relationship between economic growth and environmental quality, whether positive or negative, is not fixed along a country's development path; indeed it may change sign from positive to negative as a country reaches a level of income at which people demand and afford more efficient infrastructure and a cleaner environment. The implied inverted-U relationship between environmental degradation and economic growth came to be known as the "environmental Kuznets curve," by analogy with the income-inequality relationship postulated by Kuznets. At low levels of development, both the quantity and the intensity of environmental degradation are limited to the impacts of subsistence economic activity on the resource base and to limited quantities of biodegradable wastes. As agriculture and resource extraction intensify and industrialization takes off, both resource depletion and waste generation accelerate. At higher levels of development, structural change towards information-based industries and services, more efficient technologies, and increased demand for environmental quality result in leveling-off and a steady decline of environmental degradation.

Keywords: economic growth, population growth, environmental Kuznets curve

INTRODUCTION

It is commonly argued that we need economic growth to ensure the well-being of the economy and improve standards of living. Further, the promotion of economic growth worldwide is seen as the way to lift developing countries out of poverty. But what are the effects of economic growth on the environment? Some economists argue that economic growth will eventually lead to an improvement in the environment, despite some past increases in environmental degradation correlated with economic growth. But to what extent does economic growth promote resource depletion and increase in waste production and hence increased damage to the environment? To what extent does it damage the basic ecosystems on which we all depend? To what extent does it cause reduction of biodiversity?

In this essay, I will not attempt a comprehensive evaluation of this whole set of ideas. Rather, I will attempt just a partial exploration by studying the work surrounding what has become known as the Environmental Kuznets Curve Hypothesis. Readers interested in a general exploration of the implications of economic growth in our finite world could not do better than read the masterful analysis made by Herman Daly, formerly senior economist in the

environment department of the World Bank, in the September 2005 issue of the Scientific American magazine

Kuznets was a USA economist of Russian extraction. In 1955 he advanced the hypothesis that during the process of industrialisation of presently developed nations, income inequality in society initially increased, later ceased to increase and eventually began to decrease (Kuznets, 1955). This sequence was tied up with the gradual process of urbanisation. The hypothesis goes roughly like this.

The average per capita income of the rural population has usually been lower than that of the urban population. Now at the beginning of the process of industrialisation, the urban population was relatively small, and its income distribution was more unequal than that of the rural agricultural population. This would be particularly so when the urban population was being swelled fairly rapidly by immigrants from the rural areas and abroad. Then in urban areas there would be a full range from “low-income positions of recent entrants to the economic peaks of the established top-income groups”. So as the weight of population moved from rural to urban areas, income inequality increased. But as industrialisation proceeded, the economic position of the lower-income groups (measured by per capita income) in urban areas, improved for various reasons which Kuznets details, such as the growing political power of the urban lower-income groups, and income inequality in urban areas decreased. Since the majority of the population came to be located in urban areas, income inequality decreased nationally.

Kuznets also gave a supplementary argument which supports the above conclusion. He argued that in the early stages of the emergence of the industrial system, the agricultural and industrial revolutions, together with the rapid rise of population (caused by the rapid decline in death rates while birth rates were maintained), would have had a shattering, dislocating effect on society. But it would be the lower income groups which bore the brunt of this dislocation. In contrast, in the early stages, there were factors favouring the upper income groups – they were bolstered by gains out of new industries with a rapid rate of creation of new fortunes. These processes would have led to a widening income inequality in society. However, one “would expect these forces to be relatively stronger in the earlier phases of industrialization than in the later when the pace of industrial growth slackens”.

Overall then, Kuznets postulated that over time during the development of modern industrial economies, income inequality first rose, then leveled off and subsequently declined. However, this change must be viewed against the background of overall economic growth and the fact that average per capita income rose over time (except during catastrophic periods such as wars). So that if one plots income inequality against per capita income one gets a bell shaped, or inverted U-shaped curve (actually Kuznets did not give such a curve in his paper).

It is worthwhile now, when so much current interest is on the poverty of “developing nations”, especially in Africa, to note that Kuznets cautioned against accepting the idea that developing nations might experience the same trajectory. And for those of us who are interested in the manifold effect of population growth, Kuznets noted that the “long swing” (the name he gave to the changing relationship we have just mentioned) occurred alongside the long swing of the demographic transition: “For the older countries a long swing is observed in the rate of growth of population – the upward phase represented by acceleration in the rate of growth reflecting the early reduction in the death rate which was not offset by a

decline in the birth rate (and in some cases was accompanied by a rise in the birth rate); and the downward phase represented by a shrinking in the rate of growth reflecting the more pronounced downward trend in the birth rate". And Kuznets asks the question, is there a possible relation between these two different swings?

Now the demographic transition, mentioned above, involves two key processes, reduction in mortality and reduction in fertility. Only if the latter occurs will population growth rate eventually decline allowing the completion of the Demographic Transition. And developing countries vary a great deal in the extent that fertility has declined in recent decades. In particular, fertility has not declined very much in many African countries. It is indeed uncertain whether or not these countries will ever complete the Demographic Transition. So if Kuznets conjecture on the possible relationship between the long swing in income inequality and the Demographic Transition is correct, we may share Kuznets doubt that developing nations might experience the income inequality trajectory producing the inverted U-shaped curve. We will return later to what the future holds in store for developing nations.

Now during the 1990s several workers found evidence suggesting that with some indicators of environmental degradation (mainly indicators of atmospheric pollution), in the early stages of economic growth (with average income rising from a low level) environmental degradation increases, but at some stage in economic growth (at some income level) pollution ceases to increase and subsequently decreases. Graphically, this relationship shows an inverted U-shaped curve when degradation per capita (y axis) is plotted against GDP per capita (x axis). The resemblance of this relationship to the one studied by Kuznets led to the curve being named the Environmental Kuznets Curve (EKC). Generalizing to total environmental degradation, the hypothesis was born that environmental quality deteriorates in the early stages of economic growth but improves at later stages; further, there is a causal connection between economic growth (usually measured by income per capita) and this pathway of change of environmental quality. The hypothesis was named the EKC hypothesis.

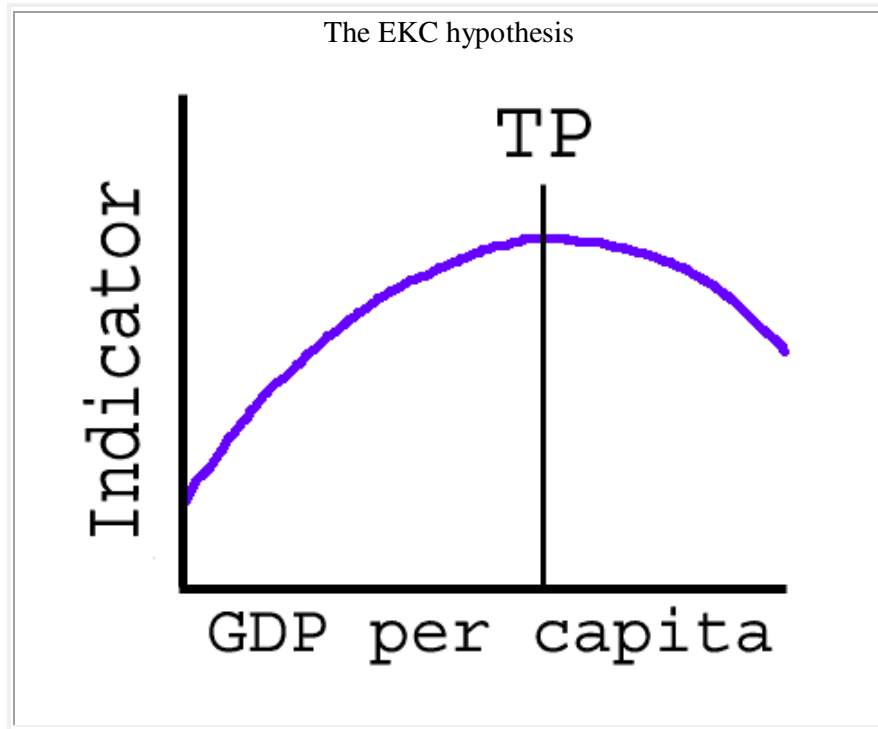
To many, the EKC hypothesis suggested that far from causing yet more serious environmental degradation, continued economic growth was the best way to ensure that this did not take place.

THE EKC HYPOTHESIS

The hypothesis states there is an inverted U-shaped relationship between some indicators of environmental damage and economic growth. So during economic growth, environmental degradation will initially increase, but eventually decrease. If one then plots an **indicator** of environmental damage against **GDP per capita**, one gets an inverted U-shaped curve with a 'turning point' (**TP**). The hypothesis implies that rising income itself is the primary cause of decreasing environmental quality at low incomes and improving environmental quality at higher incomes (Moomaw and Unruh, 1997).

What could be the mechanism or mechanisms by which the relationship between environmental degradation and income is produced? The commonest explanation advanced, according to Dinda (2004) is that "when a country achieves a sufficiently high standard of living, people attach increasing value to environmental amenities". In other words, as people become wealthier, they have more time to think about other things than mere survival, time to think about environmental conditions, and, being more wealthy, they have more clout to

influence local and national governments to take action to improve the environment. This leads to environmental legislation being enacted and new institutions designed to protect the environment (for example, Arrow et al, 1995).



Another causal factor is the phenomenon of structural change in economies. The history of industrialized countries is one of economic change from rural agricultural, to urban industrial society, with increased environmental degradation ('dark satanic mills'). But subsequent movement from an energy intensive industrial economy towards a less energy intensive service based economy leads to a reduction in environmental degradation. Also, as a country becomes more wealthy, it can afford to spend more on research and development, which leads to the development of improved technologies and thus subsequent reduced environmental impact (Canas, 2003; Dinda, *ibid*).

We shall see later that there are other causal factors.

A NOTE ON TERMINOLOGY

Readers of the EKC literature will find a number of technical terms being used. The following notes on some of these terms will help those readers who are not familiar with them.

Elasticity

'Elasticity', a much used term in economics, concerns the relationship between a dependent and an independent variable. One reads statements of the form 'the *a* elasticity of *b*'. Here, '*a*' is the independent variable, '*b*' the dependent variable. A common example in economics is the *price elasticity of demand*. This concerns how demand for some product changes with

price. Here price is the independent variable, demand is the dependent variable. Price elasticity of demand is the percentage change in quantity demanded in *response* to a percentage change in price.

Associated terms are 'elastic' and 'inelastic'. Here we are concerned with just how responsive change in the dependent variable is to change in the independent variable. Consider again price elasticity. When the % change in demand is greater than the % change in price, demand is relatively responsive to price and is called elastic. But when % change in demand is less than the % change in price, demand is relatively unresponsive to price and is called inelastic. Where the ratio of the two % changes is 1, i.e. a 1% change in a leads to an approximately 1% increase in b, then demand is 'unit elastic'. Cramer (1998) provides an example of an elasticity less than one in his study of the impact of population growth on harmful gaseous emissions. Some pollutants had an elasticity of about 0.75 to 0.8; that is, a 10% increase in population produces an increase in emissions of 7.5% to 8%.

Now for some examples of elasticities more relevant to the present essay. *Affluence elasticity of impact* "refers to the responsiveness of an impact to a change in an economic measurement of affluence, e.g. GDP per capita" (York et al 2003a). So we can have the affluence elasticity of *environmental impact*. *Population elasticity* is "the proportional change in pollution or environmental impact per given proportional change in population" (Cole and Neumayer, 2004).

Scale, technological and composition effects

Three other terms crop up frequently in the EKC literature that indicate how economic growth may affect the quality of the environment: 'scale effects', 'technological effects' and 'composition effects'.

Scale effects. Increasing output in the economy requires more input, so more natural resources used, and is accompanied by more waste production and emissions. The scale effect means economic growth has a negative (adverse) effect on the environment.

Technological effects. The damage to the environment caused by economic activity partly depends on the technologies used in resource extraction, manufacture and disposal of products, and in the ability through technical innovation to change materials used to manufacture a given product from materials demanding greater resource use to materials demanding less.

Composition effects. This refers to change in the balance between different sectors of the economy, for example, a decrease in manufacturing (major use of natural resources) and an increase in service industries (less use of natural resources). Such changes alter the overall impact of the economy on the environment.

Ecological Footprint

The Ecological Footprint may be defined as follows:

The ecological footprint of a specified population or economy can be defined as the area of ecologically productive land (and water) in various classes - cropland, pasture, forests, etc. -

that would be required on a continuous basis a) to provide all the energy/material resources consumed, and b) to absorb all the wastes discharged by that population with prevailing technology, wherever on Earth that land is located.

Readers might like to read our companion essay “How many people can the earth support? Part Two. Ecological Footprints”, for further explanation of the footprint concept.

Evidence for the Kuznets curve relationship

Although several workers found empirical evidence for the Kuznets curve relationship for environmental degradation in the early 1990s, commentators are generally agreed that the key early paper was that by Grossman and Krueger (1991) on air quality measures. These authors found the EKC relationship for ambient levels of SO₂ and dark suspended matter (smoke), and estimated the turning point per capita GDPs.

One pollutant that several workers thought showed the Kuznets curve relationship was sulphur dioxide (SO₂). We take by way of example, the work of Beckerman (1992) who studied data on ambient concentrations of SO₂ in cities in ‘low-income’, ‘middle-income’ and ‘high-income’ countries. Data for the years 1977 to 1981 showed that the country groups could be arranged, from low to high concentrations in the order: Low-income: middle-income: high-income. But about ten years later, this order was reversed. This corresponded to a decrease in SO₂ concentrations of roughly 9 per cent per annum in the high-income countries and a 3.7 per cent rise in low-income countries. Beckerman also found that another pollutant, very damaging to human health, ‘small particulate matter’ (SPM) showed similar trends although even in the earlier years low-income countries had far higher SPM concentrations than did cities in middle- and high-income countries.

Beckerman also studied other indicators of the state of the human environment. In developing countries, bad sanitation (inadequate supplies of (clean) water and the absence of proper sewage disposal systems) has a very harmful effect on human health. Beckerman wrote that at that time, about one, or one and a half billion people were affected by water-related diseases in one form or another. So sanitation provides indicators of environmental health. Beckerman studied the relevant data for developing countries and found that higher average incomes tend to be associated with a higher proportion of the population having access to water and sewage disposal.

Beckerman's paper deals with damage to the environment in so far as factors directly affecting human health are concerned. It is important to note however what the paper did not deal with, did not cover. In the first place, although changes in CO₂ concentrations were discussed by Beckerman, he did not investigate the relationship between these changes and income. Now, increased CO₂ concentrations contribute to global warming, which will in the future, and most analysts think now does, cause an increase in severe weather events, damaging the economy, causing flooding, damaging homes and infrastructure, as with the recent Los Angeles disaster, and will submerge vast areas of low lying agricultural land in the future. In other words, rising CO₂ concentrations have an indirect effect on human health. Second, Beckerman did not deal with the much wider question, how has increased income related to overall environmental damage, which must include things like decline in natural ecosystems, damage to agricultural land, pollution of rivers and seas!

So we now leave this one particular paper and find out what other workers have concluded about the validity and extent of application of the EKC hypothesis.

AN ATTEMPT AT CONSENSUS

By the middle of the 1990s a considerable amount of analysis had been carried out. However drawing valid conclusions was hampered by limitations in the available data:

Two different types of data set had been used by investigators. The first, and most used type was 'cross-sectional' - examining the actual GDP/environmental indicator relationship at some point in time across a whole set of countries. The second type of data set provides time-series within countries: how the GDP/environmental indicator relationship has changed over time in individual countries. This second type of data set is the best type for investigating the Kuznets relationship; unfortunately, such historical data sets that were then available were usually of short time length, making it difficult to draw useful conclusions from this sort of data set alone.

Now there is an assumption made in drawing conclusions from cross-sectional data sets. This is that all the countries involved will eventually show the same time trajectory of change in the GDP/environmental indicator relationship. But there is no guarantee that countries in the early stages of per capita GDP growth will eventually develop in the same way that countries in much later stages of GDP growth have already developed. Analyses based on cross-sectional data must then be treated with caution, especially if not backed up by time-series based analyses.

Vincent (1997) comments on this issue. He points out that "virtually all the low-income observations come from developing countries, while all the high-income observations come from developed countries". This lack of overlap means that conclusions about a changing relationship between GDP and environmental change could be nothing more than statistical artefacts:

"'environmental Kuznets curves'...may simply reflect the juxtaposition of a positive relationship between pollution and income in developing countries with a fundamentally different, negative one in developed countries, not a single relationship that applies to both categories of countries".

Despite these difficulties, there was a growing opinion amongst workers in the field that some legitimate conclusions could be drawn about the EKC hypothesis, and in 1994 an important cooperative initiative was taken by the Royal Swedish Academy of Sciences when they organised a workshop on the subject of this hypothesis. One outcome of this meeting was an attempt by eleven scientists from the USA, Sweden and England to establish what was the general consensus about the significance of the EKC hypothesis. Their paper was published in the journal *Science* (Arrow et al. 1995). In the same year the Institute for Ecological Economics hosted a 'forum', inviting a selection of workers to contribute papers discussing various aspects of this supposed consensus, and subsequently these papers were published in various journals.

Arrow et al noted that the inverted U-shaped relationship between some measures of environmental quality and per capita income had been used as evidence to support the general proposition that economic growth is good for the environment. However, they point out that

the inverted U-shaped curve had by then only been clearly shown to apply to a selected set of environmental pollutants (SO₂, NO_x (oxides of nitrogen), CO (carbon monoxide), suspended particulates), quality of sanitation and purity of water supplies. These are pollutants which involve local short-term costs for remediation. In contrast, the relationship had not been found at that time for pollutants or stocks of waste involving long-term and more dispersed costs such as CO₂. Further, while the curve had been found for some *emissions*, i.e. some outputs from the material economy, it had not been shown for *resource stocks* (inputs into the material economy).

The authors also note that the reduction of one pollutant in a given country might involve an increase in other pollutants in the same country or the transfer of pollutants to other countries. And finally, where emissions have declined with rising income, “the reductions have been due to local institutional reforms, such as environmental legislation and market-based incentives to reduce environmental impacts. But such reforms often ignore international and intergenerational consequences. Where the environmental costs of economic activity are borne by the poor, by future generations, or by other countries, the incentives to correct the problem are likely to be weak. The environmental consequences of growing economic activity may, accordingly, be very mixed”.

The subsequently published papers in general supported the conclusion that the Kuznets curve relationship did exist for some indicators of environment degradation but not for other indicators. For example, Barbier (1997) reached this conclusion for the papers published in the special Kuznets issue of the journal *Environment and Development Economics*. He concluded the relationship was clear for some atmospheric pollutants, especially SO₂ and to a lesser extent solid particular matter. He notes however, that several studies have suggested the Kuznets relationship may not apply to CO₂ emissions.

We turn now to some of the individual publications that appeared in this overall discussion of the Kuznets hypothesis, papers which help to build up a more in-depth and general picture of the situation.

Moomaw and Unruh (1997) surveying previous work on CO₂ concluded that different workers had reached conflicting conclusions. They also note that some workers found an N-shaped, not an inverted U-shaped curve – CO₂ emissions did decline over a mid-range of incomes but as incomes continued to rise there was a re-establishment of the upward trend in CO₂ emissions.

Moomaw and Unruh in their own work studied the relationship between CO₂ emissions and per capita GDP in countries across the world from 1950 to 1992. They found that one group of countries (‘Type 1’) showed a relationship with some resemblance to the Kuznets curve. These were a subset of OECD (industrialized) countries. ‘Type 2’ countries showed a purely positive correlation between CO₂ and GDP, but when a country suffered ‘economic contraction’ the CO₂ emissions showed a ‘backtracking’ (reduction). This group of countries was dominated by the presence of centrally planned economies and some developing countries. ‘Type 3’ countries exhibited a ‘chaotic’ relationship – they showed no consistent relationship between CO₂ and GDP over the period studied. This set of countries was dominated by developing countries that had failed to generate consistent GDP growth. So the first conclusion that can be drawn is that even if the Kuznets relationship is found, it is not found in the majority of countries.

However, the authors found a very interesting feature of the plot between CO₂ emissions and per capita GDP. The 'turning point' in the relationship did not show as a smooth curve change, as in the Kuznets curve, but as a sudden, discontinuous transition. This leads to the suspicion that the primary relationship is not between GDP and CO₂, but between some other factor and CO₂. In fact the Authors found the data on the turning point relates much better to the oil price shocks of the 1970s and the policies that governments subsequently adopted.

Schindler (1996) looked at the global situation but with a focus on events in Canada. He noted that "typically, the U-shaped relationships are based on expenditures for environmental amenities, implying that higher spending will necessarily lead to better environmental quality". However, typically, expenditures on the environment do not increase until severe environmental degradation has already occurred. It is then that time-consuming, very costly – and often ineffectual - assessment, cleanup and restoration activities are undertaken. He gives various examples such as billions of dollars spent, with little gain, for the cleanup of St. Lawrence Great Lakes. Schindler then sardonically comments "it follows that environmentally responsible economic planning would prevent U-shaped relationships from occurring at all".

The paper by Cole et al (1997) shows even more clearly how tenuous a relationship between per capita income and environmental degradation often is. They looked into pollution with chlorofluorocarbons (CFCs) and halons. We know how there has been a massive reduction in the use of these chemicals. But this is not related to any gradual increase of per capita income. It is a consequence of the Montreal Protocol committing signatories to massive reductions in use of these chemicals. The authors comment that this example illustrates the potential effectiveness of international cooperation (actually they say "a multilateral response") to an environmental problem. But they add a rider: This sort of effective response may turn out to be unusual. It was possible "because of the relative ease with which cleaner alternatives to CFCs and halons have been developed, and hence their relatively low abatement costs".

Of considerable interest is the likely change in environmental degradation in developing countries. The EKC relationship may have been found with some indicators of environmental degradation in developed countries, but will developing countries show this relationship? A subsidiary question is; will developing countries attain the level of per capita wealth at which the turning point is likely to occur?

The paper by Vincent (1997) already mentioned gives us some insight into this question. This study concerned one developing country, Malaysia, which had already gone quite a long way on the path of economic development, and Malaysia's economy had been one of the fastest-growing in the world since the 1970s. Malaysia was a good country to study because it had more, and probably better data on environmental quality than perhaps any other country. Vincent claims his study is the first such analysis of the pollution/income relationship over time for a developing country.

Vincent did two things. First for various air pollutants he compared Malaysian emission trends over 1987 – 1991 with the predictions made by some other workers (Selden and Song, 1994) from cross-sectional (across-countries) studies. Then, using data from the late 1970s into the early 1990s he looked into the pollution-income relationship for one air pollutant,

total suspended particulates (TSP), using ambient air quality data, and several water-quality parameters such as biochemical oxygen demand.

Selden and Song had studied particulates, SO_x , NO_x and CO. All except CO showed the inverted U-shape relationship. And the turning points in the curve for the three pollutants showing the relationship were in the region of 10,000 US dollars. This figure is about at the dividing line between upper-middle-income and high-income countries in 1988. But this level is well above Malaysia's per capita GDP in the 1987-91 period. Selden and Song's results then suggest that Malaysia's air pollution emissions should have been rising during 1987-91. Vincent found that the emissions did indeed rise for particulates, NO_x and CO, but the increases were much smaller than predicted by Selden and Song's estimated relationships. However, SO_x declined considerably, and for a very simple reason: emissions by power plants declined sharply during the period in question. But this was not because of some new environmental policy. It was because big natural gas reserves had been found in Malaysia; and the government decided to reduce dependence on imported fuel oil by converting power plants to natural gas. If it had not discovered natural gas, or, if it had decided to export all the gas it produced instead of raising consumption by domestic power plants, emissions of SO_x would not have declined so steeply as they in fact did, if at all. "Geology and a desire for energy independence, not rising income and associated environmental policy responses, were responsible for the decline in SO_x emissions".

In the study of changes over time for TSP and water-quality parameters, Vincent found that the inverted U-shaped relationship was not found for any of the factors investigated. Either income was not significantly associated with the factor (three water-quality parameters) or it maintained a positive relationship (TSP and two water-quality parameters) – "rising income worsened pollution".

Ayers (1995) went further than Arrow and colleagues in being sceptical over the general proposition that economic growth is good for the environment. In fact he concluded the proposition was "false and pernicious nonsense". Remember that Arrow et al had noted that the relationship had not been found for resource depletion. Now Ayres notes that economic growth is historically closely correlated with increased consumption of energy and other resources. He also notes that "most of the environmental problems of regional and global concern are directly traceable to the unsustainable use of fossil fuels and/or other materials, such as toxic heavy metals and chlorinated chemicals". Further he notes a general consequence of the basic physical law of conservation of mass – "every material extracted from the environment is a potential waste...Except for materials used in construction, raw materials (and fuels) usually become wastes or pollutants within months or a few years at most".

O'Neill et al (1996) are equally sceptical. They consider that the empirical relationship that had been discussed by Arrow (ibid), between environmental quality and GDP adopts a trivial definition of environmental quality as it is only based on a subset of pollutants in a limited number of places. This is inadequate to encompass "the complex interactions between economic growth and the environment on which that growth depends".

Such a simplification of the total environmental situation ignores the importance of "basic ecosystem services: cleaning the water, purifying the air, decomposing wastes, maintaining CO_2 balance, permitting recovery from natural disturbances, filtering ultraviolet radiation,

and providing sources of new medicines”. In fact, “discussions of economic growth often ASSUME stable, resilient ecosystems that will continue to provide these life-support services”.

The authors go on to assert that even if wealthy nations are able to reduce pollution, economic growth will impose increasing stress on ecosystems. And “total impact can be expected to increase as a function of GDP, considering cumulative depletion of resources, land use changes with implications for water quality and biodiversity, and rates of exploitation that exceed rates of replacement”.

We now turn to a comprehensive assessment of the EKC relationship that was not made in response to the paper by Arrow (ibid) and the forum of the Institute for Ecological Economics (they are not mentioned).

A SKEPTICAL ASSESSMENT IN 1997

Ekins (1997) surveyed what he saw as key past investigations of the EKC hypothesis and went on to carry out analyses of his own. He starts by noting the optimistic conclusions of some other investigators which may sometimes go so far as to “create the impression that economic growth and the environment are not only not in conflict - economic growth is necessary to improve the environment. They invite an emphasis on achieving economic growth rather than on environmental policy, because economic growth is perceived to be able to achieve both economic and environmental objectives, whereas the environmental policy may impede economic growth. This turns the 'limits to growth' argument on its head. Instead of the environment setting limits to growth, these conclusions suggest that growth is a requirement of environmental improvement”. As we will see, Ekins does not think these conclusions are valid.

Ekins notes that various workers have found evidence which they interpreted as showing the inverted U-shape between environmental indicator and income as follows:
Atmospheric pollutants: SO₂, suspended particulates, NO_{2,x}, CO, even CO₂ although at turning points so extremely high that there is little practical relevance in the result.
Water pollutants and other pollutants: fecal coliform bacteria, biological and chemical oxygen demand and nitrates. However, studies of some other indicators produced an N shaped curve, that is, at the highest income levels, the downward trend is reversed and further income increase is associated with increased environmental impact once more.

Land-based environmental degradation studies : The only one studied by more than one group of researchers was deforestation. Some workers found the EKC shape relationship, while two workers found no significant relationship with income.

However, when Ekins compared various studies he found what he concludes are serious inconsistencies. First, sometimes, for a given environmental indicator, different workers found different curve shapes or no significant relationship with income (e.g. with the pollutant cadmium). Second, where, for a given indicator, different workers have found the EKC shaped relationship, turning point incomes varied widely (for example deforestation). Third. The results always depend on the mathematical equations used in the estimations. Sometimes plausible variant equations yield very different results.

Ekins general conclusions at this point in his paper were:

“None of the pollutants unequivocally shows an inverted-U relationship where studies have been done by more than one group of researchers”. And more generally: “As a generally applicable notion, the EKC hypothesis can be deemed invalid”.

Ekins also questions the reliability of the data used by some investigators; sometimes the data has been patchy, and possibly not always adequately representative of the situation in the country concerned. This conclusion was strengthened, Ekins observed, by one study in which the relationships between income and two different sets of per capita energy consumption data were studied by regression analysis, one set of data from the United Nations Development Programme, the other from the World Bank. The former analysis yielded an inverted-U relationship, the latter, a linearly increasing relationship.

Later in his paper, Ekins adopted the classical scientific way of testing a hypothesis, namely, testing whether or not expected consequences deduced from the hypothesis correspond to what actually happens.

Ekins argues that if the EKC hypothesis was generally valid, countries which have achieved an income exceeding the turning point income (“countries already over the hump”) should exhibit an overall improvement in the environment with time. So he examined what were then fairly recent studies by both the OECD and the European Commission of member countries environments. He found that while some progress had been made with some environmental indicators, there had been little progress on many more, and in fact some new problems had emerged. He writes “despite improvements in some indicators, notably of some air pollutants, these countries seem to be experiencing continuing, serious environmental degradation on all fronts”. Such findings “seem almost completely to negate the EKC hypothesis”. “What the wider environmental assessments indicate is the complete lack of justification of conclusions that seek to use the improvements that have occurred to argue that there exists any overall correlation between income growth and increasing environmental quality”.

Ekins goes on to say that a study of OECD data by MacGillivray provides supporting evidence for this conclusion. That worker had constructed an overall measure of environmental performance based on 12 different indicators of the environment ranging from atmospheric pollutants to relative size of protected areas. MacGillivray found no strong relationship between environmental performance and income.

In a later section of his paper Ekins goes on to investigate whether or not any environmental improvements that might have taken place with rising income were necessary consequences of economic growth alone. Here he examines 1) scale effects -destructive of the environment, and 2) technological and 3) compositional effects - potentially both improving the environment. So the question about necessary consequences of economic growth becomes - will improvements brought about by 2 and 3 come about more or less automatically as part of the process of economic growth or will they require to be brought about by deliberate government policy?

Ekin's analysis of data from the G7 countries (USA , Canada , Japan , France , Germany , Italy and the UK - the world's richest nations) show that technological and compositional

effects have taken place and that a combination of these effects “is able to counteract completely the (positive) scale effect on environmental impact”.

So did the changes brought about by the technological and compositional effects arise automatically in the process of economic growth, or were they brought about by deliberate change in the policies of governments? While he did not carry out a full analysis in an attempt to answer this question, he advanced arguments which led him to believe in “the necessity of determined public policy to achieve environmental improvement in a context of rising incomes”.

In the penultimate section of his paper Ekins discusses the implications of EKC studies for the future. He notes that in almost all cases where an EKC has been claimed, “most of the world's population lies on the upward-sloping part of the EKCs that have been estimated. This implies that, even if these EKCs are valid, income growth across the global population will increase environmental damage before it reduces it”. And he notes this is same conclusion that other workers have made in the two studies that have projected EKC relationships into the future.

In his final conclusion section Ekin writes: “any improvements in environmental quality as incomes increase are likely to be a result of the enactment of environmental policy rather than endogenous changes in economic structure or technology”. And:

“...insofar as the EKC studies permit any conclusions at all, they provide evidence of unsustainable development rather than the reverse”.

ASSESSMENTS PUBLISHED IN 2004 AND OTHER RECENT EVIDENCE

Both Dinda (2004) and Yandle et al (2004) carried out surveys of the literature on the Environmental Kuznets Curve hypothesis and made their assessments of the evidence. Numerous other papers on this subject have also appeared in recent times. I here attempt to summarise main findings.

Criticisms of methodology and data sources in EKC studies

Ekins (ibid) has not been the only worker to criticise methods used and conclusions drawn in EKC studies. A useful review of criticisms made by various other workers is provided by Cole (2003) and Cole and Neumayer (2005). Cole (2003) goes on to develop a series of modelling equations for exploring just how robust the claims of a basic Kuznets curve relationship actually are, and then applies these in investigating four pollutants: Air pollutants (sulphur dioxide, nitrogen oxides and carbon dioxide), and a water pollutant (biological oxygen demand, a measure of organic water pollution)

Cole considers his analyses provide strong support for the validity of an inverted U-shaped relationship between income and emissions as far as the three air pollutants are concerned. However, with biological oxygen demand the relationship seems to be U-shaped. And Cole and Neumayer (ibid) conclude from their analyses that “the EKC may be more robust than some studies have claimed”.

Empirical evidence for the EKC relationship.

Following Dinda I divide environmental indicators into three groups:

Air quality indicators.

Local air quality indicators that have a direct effect on human health (SO₂, suspended particulate matter, CO, NO_x etc) generally show the inverted U-shaped relationship. And it seems that the turning point for *urban* air quality indicators is lower than the national aggregate level, partly because it is easier to improve urban air quality than to reduce national emissions.

In contrast, with indicators with a more global, indirect effect, like CO₂ and chlorinated fluorocarbons, concentrations usually increase monotonically with per capita income; if there is a turning point, it is at a level beyond the income level of most countries. Thus for CO₂, Lantz and Feng (2005) noted that some investigators found evidence for a strictly monotonic relationship between GDP/capita and CO₂. Other investigators found evidence supporting the existence of an EKC. But most of these investigators concluded “the CO₂-GDP/capita relationship is essentially monotonic since most countries are not expected to achieve the turning point even in the distant future”.

Water quality indicators.

Three main sub-categories have been investigated: a) concentration of pathogens in water; b) amount of heavy metals and toxic chemicals discharged in water by human activities; c) measures of deterioration of the water oxygen regime (Vincent's water-quality parameters). Here the results are more mixed than for air quality indicators. Evidence for the EKC relationship was found for some indicators, for example, arsenic, cadmium, lead, nitrates, biological and chemical oxygen demand, and fecal coliform bacteria. But conflicting results about the shape and peak of the curve were often found. And some authors found the N-shaped curve mentioned in the previous section, instead of the inverted U-shaped relationship: during economic growth, the inverted-U curve develops, but beyond a certain income level, the relationship between environmental pressure and income reverts to being positive.

Other environmental indicators.

This embraces a wide variety of indicators: municipal solid wastes, urban sanitation, access to safe drinking water, energy use and traffic volumes etc. Dinda thinks that most of these indicators do not support the EKC. But Yandle et al (ibid) note evidence has been found using cross-sectional data for an inverted U-shaped relationship between water withdrawal for agriculture and per capita income. And in India the EKC has been found for changes in crop areas (as income increases, cropland declines, allowing more room for habitat).

On the other hand, Dinda concludes: “All studies find that environmental problems having direct impact on human health (such as access to urban sanitation and clean water) tend to improve steadily with economic growth. On contrary, when environmental problems can be externalized (as in the case of municipal solid wastes) curve does not even fall at high-income levels”.

The evidence on deforestation is conflicting. And this illustrates a more general point: while the inverted U-shaped curve relationship has been found for some pollutants, the evidence for resource stocks, not clear back in 1995, as we saw earlier with Arrow et al (1995) is still not clear cut (Bhattarai and Hammig (2004). However, Yandle et al (ibid) who discuss several studies that directly or indirectly provide evidence about deforestation, seem on balance, to conclude that the evidence points to the existence of the Kuznets curve relationship at least in some areas of the world, although these authors do not make this conclusion explicit.

Finally, in their study of a much more comprehensive measure of environmental impacts, namely ecological footprints York et al (2003b) concluded: “the quadratic of GDP per capita is the opposite of what is necessary to generate an environmental Kuznets curve. The effect of GDP per capital, then, on the ecological footprint is monotonically positive within the range of observations - an increase in per capita GDP consistently leads to an increase in the ecological footprint.”.

The role of technology and changes in relative importance of different components of the economy

As a country becomes wealthier it can afford to spend more on research and development, leading to the development of improved environmental technologies. Here public spending on environmental research and development acts as a catalyst for private investment in developing new technologies. 'Dirty' and obsolete technologies are replaced by upgraded new and cleaner technologies. The consequence of such changes is that “a given amount of goods can be produced with successively reduced burdens on natural resources and the environment” (Dinda, ibid). In other words, methods of raw material extraction and manufacture of goods from these raw materials, become more efficient, as do methods of pollution abatement. This line of argument leads to the subject of 'dematerialization' which we take up in the next section of this essay.

While there is evidence that technological change has contributed to reducing environmental impact, a dissenting voice is that of Lantz and Feng (2005), who for Canada and the period 1970 to 2000 found a U-shaped (not an inverted U-shaped) relationship between CO₂ emissions and technology. The elasticities for 1970 and 2000 were -0.1 and 0.1 respectively. The turning point was in 1995. This result “may imply that technological changes have shifted from enhancing more environmentally friendly production techniques to encouraging CO₂ enhancing production techniques”.

It is worth noting at this point that technological development is a key reason for the optimism of economists of Julian Simon ilk over concerns about future resource depletion and economic growth. As we note in our earlier essay “How many people can the earth support? part 1”, the argument goes: Pursuit of some particular resource leads in the short term to falling availability and consequent rise in prices. This however has two effects. First, it stimulates people to develop better extraction technology; second, it stimulates people to find/develop substitutes for the non-renewable resource. The result is that this leaves us better off than if the original problem had never arisen. We do not share Simon's optimism.

Now numerous workers have noted that during the course of economic development, the structure of the economy changes and this brings about changes in environmental impact. “Environmental degradation tends to increase as structure of the economy changes from rural to urban or agricultural to industrial, but it starts to fall with another structural change from

energy intensive industry to services and knowledge based technology-intensive industry” (Dinda, *ibid*). So during economic development, there is initially an increase in energy intensive extractive and manufacturing industries and later a shift from these to less energy demanding industries such as services.

Quality of governance, regulation and institutions

We saw earlier an example of how regulation can very effectively reduce harmful emissions (CFCs and halogens, in that case as a result of international cooperation). And both Dinda and Yandle et al conclude that pollution grows unless environmental regulation is strengthened. Dinda also says that at the national level, social institutions tend to be strengthened by economic growth, although corruption may hinder this process. Yandle et al emphasize that strong institutions are essential if environmental regulation is to be enforced. And on the basis of work by Panayotou, they conclude that “the quality of policies and institutions in a country can significantly reduce environmental degradation at low-income levels and speed up improvements at higher-income levels”.

And we also saw earlier that Ekins in his major review of the EKC concluded that “any improvements in environmental quality as incomes increase are likely to be a result of the enactment of environmental policy rather than endogenous changes in economic structure or technology”.

In a recent important paper, Esty and Porter (2005) carried out a systematic analysis of a large array of factors that might affect a country's environmental performance as measured by levels of 1) urban particulates, 2) SO₂, 3) energy usage - energy per unit of GDP. For the latter the authors measured total energy consumption per unit of a countries GDP; high figures represent more energy consumed per unit of economic output, and thus greater economic inefficiency. Data came from a large number of countries which varied between measures dependent on availability. The array of factors investigated, that is the independent variables, were divided into two sets.

Set 1 was “environmental regulatory regime”. This consists of “measures of various aspects of a country's environmental regulatory system, including standards, implementation and enforcement mechanisms, and associated institutions. These variables capture regulatory elements that directly affect pollution control and natural resource management”.

Set 2 was “economic and legal context”. This set “contains indicator's of a country's more general administrative, political, scientific, and technical capabilities and institutions. We thus include measures of the extent to which the rule of law is respected, property rights are protected, and the country exhibits technological strength”.

For each of the three measures of environmental performance graphs was plotted of the measure (y axis) and GDP per capita (x axis). A clear pattern emerged: Richer countries (measured by GDP per capita) achieved better results than poor ones.

The data did not however reveal an inverted U-shaped curve (EKC). The authors think this “may be explained by the fact that our sample of countries contains relatively few countries in the 'early industrialization' stage of development, in which emissions and energy usage would be low and rising, especially for the air pollution measures”.

Despite the general relationship between environmental performance and level of economic development as measured by GSP per capita, there were “wide variations in environmental performance among countries at similar levels of economic development”.

And now we come to the heart of the debate about what are the factors that cause the EKC. For the authors say this suggests that “a country's income or development stage affects but does not alone determine environmental outcomes. Some rich countries seem to have learned how to advance environmental quality ahead of their economic progress; others have not”.

These findings then provide the background, the justification, for the investigation of other factors that might be involved in improving environmental performance, which make up the bulk of this paper, with results as follows.

In the regression analyses, with both energy usage and particulates, the vast majority of the independent variables were significant, had the expected negative sign and accounted for a reasonable degree of explained variance. With both measures, two of the sub-sets of Set 1, namely regulatory structure and regulatory stringency were highly significant. And with Set 2, almost all the variables were significant and accounted for a substantial degree of explained variance. With SO₂, most of the independent variables were again significant, but the degree of explained variance was generally much lower.

The authors concluded :

“the statistical analysis presented suggests that environmental results vary not only with income levels as suggested by the environmental Kuznets Curve literature but also with both the sophistication of a nations regulatory regime and, perhaps more notably, its broader economic and social context”.

As part of their overall investigation, the authors also looked at the question of the relationship between environmental performance and competitiveness. Does environmental regulatory stringency detract from or contribute to economic progress? They used an index measuring the overall regulatory regime and the World Economic Forum's Current Competitiveness index, and found a strong positive correlation between regulatory regime and competitiveness. They conclude that the evidence supports the view that environmental progress can be made without sacrificing competitiveness.

Finally, Bhattarai and Hammig (2004), in a study of deforestation of tropical natural forests find that the quality of governance is an important determinant of forest resource preservation.

Property Rights

Both Dinda and Yandle et al emphasise that Property Rights are also important for securing environmental improvement. Ownership creates the incentive to conserve and to accumulate wealth that can be traded or passed to future generations. Dinda writes: “Countries with a high degree of private ownership and proper allocation of property rights have more efficient resource allocation, which helps to increase income and decrease environmental problems”. And he concludes: “thus, the EKC may be a proxy for a property rights model that begins

with a commons and ends with private property rights”. Yandle et al say virtually the same thing in their paper.

Distribution of power, political rights and corruption

The distribution of power in the population also affects environmental trends. Torras and Boyce (1998) studied variables which may be regarded as proxies for power within a country - income inequality, literacy, political rights and civil liberties. The authors used air and water quality indicators - sulphur dioxide, smoke, heavy particles, dissolved oxygen and faecal coliform bacteria.

The results were mainly consistent with the hypothesis that greater inequality in the distribution of power leads to more pollution, but with results varying between high and low income countries. For example, with income inequality in relation to sulphur dioxide and smoke, “greater income inequality is associated with more pollution in the low-income countries, but not in the high-income countries”. Then with literacy, in both low- and high-income countries, literacy was statistically significantly associated with better environmental quality for several pollution indicators. With political rights, generally a higher rights score is associated with improvements in indicator quality, although this was stronger in low-income than in high-income countries. There were a few exceptions. Thus for example, in high-income countries the association between political rights and dissolved oxygen was in the opposite direction.

However, Cole (2003) found no evidence that the distribution of power determined pollution emissions. And York et al (2003a) who included measures of political rights and civil liberties among their independent variables in their study of impact on ecological footprints, failed to find any impact of these factors.

There is much evidence that corruption in governing elites and in powerful groups such as industrialists, and the corrupt actions of individual entrepreneurs, contributes to environmental deterioration. Such behaviour is sometimes termed 'rent-seeking' by economists. This refers to when individuals or groups, including government officials, seek to obtain goods or services, by influencing the development of government policy and other ways, at the expense of taxpayers/other consumers, that is without proper compensation. Lopez and Mitra (2000) give references for India, Indonesia and Thailand. They then go on to develop a theoretical analysis of this phenomenon.

To the authors' surprise, corruption is not likely to prevent the formation of a Kuznets curve relationship. However, the turning point in the Kuznets curve occurs at higher income and pollution levels.

The authors conclude their results are particularly significant for the larger developing countries such as China, India and Indonesia, which are experiencing explosive economic growth.

First: “Unless this growth process brings about a rapid reduction of corruption (an unlikely event given that institutions and cultural norms typically show extraordinary resilience), pollution will remain much higher in these countries than the levels reached in currently developed countries when their per capita incomes were comparable”.

Second: In the newly industrialising nations, pollution is likely to go on increasing until per capita incomes reach much higher levels than the turning point income levels of developed nations. "That is, the empirically estimated Kuznets curves are not likely to be valid for the projection of patterns of pollution for the developing countries".

Esty and Porter (2005) also find that corruption is a significant causal factor of environmental deterioration through pollution.

International trade

So far we have treated countries as if they were all self-contained and isolated. In fact all countries engage in international trade. And this trade influences the economy, the affluence and the environment of countries. And this leads us to a very contentious hypothesis – **the Pollution Haven Hypothesis (PHH)**. The argument here, based primarily on Dinda's paper, and simplified, goes like this.

We can think of countries divided into two groups. On the one hand, high income countries with considerable environmental regulation designed to limit environmental damage, and low income countries where environmental regulation is at best rudimentary. Pollution intensive production, for example, mining, is thus comparatively costly in high income countries. If we assume a certain degree of trade liberalisation, there will then be some degree of relocation of pollution intensive production from high income countries to low income countries. Consequently pollution rises in lax regulation countries and falls in countries with stringent environmental regulation. So on the global scale, the world's most pollution producing industries locate in the countries with the lowest environmental standards with the result that world pollution rises.

This hypothesis has obvious relevance to any discussion of the EKC relationship. For supposing that some environmental indicator in a wealthy country shows the Kuznets curve relationship over time, while this indicates a benefit for the country concerned, it may be associated with a consequential increased environmental degradation in some poor country or countries. Then at a global level, there is no environmental improvement.

Obviously the effects of international trade are much more complicated than this brief introduction to the PHH portrays. For example, the relocation of 'dirty' industries is associated with foreign direct investment and technology transfer which can stimulate economic development in underdeveloped countries, assist governments there to improve the efficiency of production and thus reduce pollution. Further, trade may raise income levels of people in poorer countries which can lead to demands from the public for more effective environmental protection as was mentioned in an earlier section. And Yandle et al appear to me to conclude that in general, with developing countries, environmental prospects are better in countries more open to international trade than countries closed to such trade.

As we said at the beginning, the Pollution Haven Hypothesis has proved to be very contentious, and continues to be debated. And while there is clear evidence of the sort of effect predicted by the hypothesis in some countries, this does not prove that the mechanism producing the effect is the one stated by the PHH, which depends partly on degrees of environmental regulation. Various other factors affect trade in 'dirty' goods, for example, abundance of capital, or degree of government corruption.

However, the recent work of Cole and Neumayer (2005) throws further light on the possible significance of the PHH. These authors consider the importance the 'composition effect' (see the earlier section on terminology) has had for pollution reduction in developed countries (DCs). If this composition effect has in fact made a very significant contribution to bringing about the inverted U-shaped relationship in DCs, and it has been achieved by exporting pollution intensive industries abroad, this does not augur well for future development in less developed countries (LDCs). For if the LDCs need to follow the same pollution-income path as the DCs "they will have no-one to whom they can pass their pollution-intensive industries".

So Cole and Neumayer try to isolate the effect that compositional changes have in fact had in four DCs - USA, Canada, Japan and the UK, for the period 1970-96. They say their results suggest "that composition changes have reduced air pollution emissions, particularly SO₂, CO (carbon monoxide) and SPM (suspended particulate matter), by a significant amount over the period of consideration". For example, with the UK and SPM, the emissions from manufacturing in 1996 were 11.3% lower than if the composition of production in 1996 had been the same as that in 1970.

Now export by DCs of pollution intensive industries abroad does not mean that DCs do not need the products of these industries; in fact, they import these products from LDCs. So the authors go on to investigate the importance of imports of pollution intensive products for the four presently developed countries considered.

They find evidence for the DCs that "the share of developing country imports in pollution-intensive consumption has increased over the period 1978-96". "Thus it would appear that developed country demand for pollution-intensive output is increasingly being satisfied by imports from abroad...". So "...the now rich countries have become clean at least partly by exporting the dirty production of products to other, poorer countries. This implies that the current poor countries will not be able to replicate fully this experience".

The authors then go on to the forecasting of future pollution trends in LDCs. They examine predicted changes in income levels for LDCs up to 2100, and consider these in relation to estimated turning point incomes for various pollutants made by themselves but principally by other workers. They find that for most developing countries pollution is likely to get worse for many years to come. The results are worst for Africa. There, for virtually all pollutants, pollution is forecast to continue to rise for most of the present century and frequently even beyond 2100!

I will not pursue the implications of the PHH further here, leading as it would into an extended discussion of the pros and cons of free trade and globalisation; however we will briefly return to the topic in our section below on dematerialization. Readers who would like to explore further the PHH might like to study Taylor (2005).

Prospects for the developing world

We have just seen that Cole and Neumayer adduce considerable evidence justifying a very pessimistic view about the possibility of many LDCs achieving pollution reduction during at least many decades to come. Dinda (2004), partly through the work of Vincent (1997) which I mentioned earlier, seems also to be pessimistic about LDC prospects for pollution reduction. He noted that most developing countries had not yet reached income levels high

enough to show the turning point in the Kuznets curve. And considering the world as a whole, the majority of the world population had standards of living substantially below the estimated turning points. In so far as there is any possibility then, of LDCs reducing pollution in the foreseeable future, or indeed reducing other environmental impacts, this will be unlikely to happen without considerable improvement in other factors we have considered in this section, such as regulation. And I have yet to consider properly the effects of continued human population growth, which is dealt with in a later section.

Dematerialization and delinking of environmental impacts

We mentioned that back in 1995, Arrow et al had concluded that the EKC relationship had not been shown for resource stocks. However, it was round about this time that a renewed interest was shown in 'materials flow analysis' (the analysis of the throughput of materials in the economy). Much work focused on 'dematerialization' and 'intensity of material use'.

Dematerialization refers to the absolute or relative reduction in the quantity of materials used in the economy in producing a unit of economic output (it also refers to reduction of quantity of waste produced). A common indicator of dematerialization is *intensity of material use* - this is the quantity of material used per unit of economic output. Another technical term used in this work is *de-linking*, i.e. the de-linking or decoupling of environmental impacts from economic growth. Such de-linking may be either relative (weak) or absolute (strong). In weak de-linking environmental stress *intensity* falls. But total environmental stress can still increase, although at a lower rate than the rate of growth of the economy. In strong de-linking, total environmental stress decreases over time.

However, dematerialization is quite a complicated matter. Thus one might be tempted to conclude that dematerialization at the production end in the pathway of production - use - disposal of individual units of a particular product (for example individual motor vehicles) is necessarily a good thing. But things are not as simple as that, as was pointed out by Herman et al. (1990): "The ease of manufacture of a particular product in smaller and lighter units may result in lower production cost and cheaper products of lower quality, which will be replaced rather than repaired on breaking down. Although a smaller amount of waste will be generated on a per unit basis, more units will be produced and disposed, and there may be an overall increase in waste generation at both the production and consumption end". In other words, if we think of motor vehicle production, reducing the weight (and hence resources used in manufacture) of individual cars (dematerialization on a unit basis) may in fact be accompanied by a rise in total material use in car manufacture because more cars are produced: produced not because more people are buying cars, but simply because users are discarding cars more frequently and hence purchasing new cars more frequently.

Then again, take the matter of the amount of carbon steel used in a nations economy. For the USA, and the period 1970 to 1982, the total amount of carbon steel used per year was very considerably reduced both in motor vehicle manufacture and construction. Yet data for the period 1978 to 1988 for the motor industry showed that while there was a massive decrease in the use of plain carbon steel, this was partly offset by increased use of lightweight, high strength alloys and synthetics. Nevertheless, during the same time period, adding up the weights of all materials used in car construction, there was a big reduction in total weight: The weight for a typical USA car fell from 3,569.5 to 3,167.0 pounds. Herman et al. also examine energy consumption in a selection of countries. They found what they think is clear evidence for a decrease in energy intensity in most of the countries studied.

Moving on now from Herman et al in 1990 to work published a decade later, we find that a considerable amount of work was carried out in the intervening period on material flow analysis, especially in industrialised countries, despite some remaining problems of data availability, and results were conceptualised in terms of *linking*. And coming back to the Environmental Kuznets Curve, we note that this curve is produced with both weak and strong de-linking, with GDP per capita plotted on the horizontal (x) axis. With *weak de-linking*, the environmental intensity of the economy is plotted on the vertical (y) axis. With *strong de-linking*, environmental stress or environmental stress per capita is plotted on the vertical axis (Vehmas et al, 2003).

Generally speaking, much evidence has been found to support the view that weak de-linking has been taking place in industrialised countries (Vehmas, *ibid*; Canas, 2003). Stated in different terms, the productivity of materials and energy has been increasing. If we now restrict ourselves to the European Union, the general trend over the period 1980 to 2000 has been one of weak de-linking. However, if results for individual EU countries are examined closely, and the period 1980 to 2000 divided into the two component decades, we find that the general trend for the first of these decades was weak de-linking, while in the second of these two decades there was a general trend to strong de-linking (decrease in absolute material flows) in some countries. However, in some countries, in the late 1990s, this decrease in absolute material flows stagnated, and some increase in flows took place (re-linking). And Vehmas (*ibid*) concluded, in relation to the right side of the inverted U-shaped Kuznets curve, that “the decreasing trend in material flows or material flows per capita cannot be expected to be a continuous one in any country”. In this connection they note that “the possibilities for improving environmental efficiencies may have a technological (e.g. thermodynamic) or economic upper limit”.

Now earlier in this essay (the section on International Trade and the Pollution Haven Hypothesis) we noted that through international trade environmental improvement in high income countries, that is, the industrialised countries, might have taken place at least partly at the expense of poorer countries. And we can then ask the question specifically in relation to material flows, to what extent has de-linking in the industrialised countries been achieved at the expense of poorer countries? This question was addressed by Fischer-Kowalski and Amann (2001).

These authors concur with the view that de-linking has been occurring in industrialised countries. In their words “we have been able to demonstrate that a certain reduction in material intensity during recent decades seems to have been ubiquitous among affluent industrial countries, both on an overall level and on a per capita level”. But they then go on to enquire - what are the possible explanations? They list three:

1. Technological change (driven they say by the desire for cost reduction and profitability, but we add pressure from concerned citizens).
2. “Change in consumption patterns away from materially intensive commodities towards labour intensive services”.
3. “Change in the international division of labour characterized by the externalization of the most materially intensive processes of raw material extraction and industrial production to the 'peripheral' countries of the 'south'”.

Now there is, we think, general agreement that the first and second of these causes have led to a reduction of material intensity. But Fischer-Kowalski and Amann concluded that the third explanation has also played a significant part.

THE INFLUENCE OF POPULATION GROWTH AND OTHER DEMOGRAPHIC VARIABLES

So far we have largely ignored the effects of population growth on environmental impact. Now one might expect impact to increase with population growth, simply because the more people there are, the more people there are to feed, house and provide services for, the greater the energy need. Consequently the more people there are, the greater the depletion of resources and the greater the production of pollutants and other waste products.

It is indeed indisputable, if one takes a historical view, that man's activities have caused very extensive environmental degradation on our planet and population growth has been one causal factor. If we look at degradation of the land resource, we know for example, that vast areas of once fertile land in the Indus and Euphrates rivers region were turned into desert by successive civilizations. Globally, and considering just the last 1000 years, the land area that has been degraded by man's activities has amounted to 2000 million hectares (2000Mha). "Rapid population growth and consequent expansion of agriculture on marginal lands plus mismanagement of good land has accelerated the annual loss to 5-6 Mha" (Qiguo, 1994).

But population growth need not always cause increased environmental degradation. Thus, existing degradation can stimulate the development of technology to mitigate degradation, stimulate the development and implementation of more environmentally friendly agricultural methods and positive restorative activities like re-afforestation; all these developments mediated by, or enhanced by the increased cooperation of people faced with environmental threat and their power to influence the authorities to do something about the situation. And as authorities come to realise the seriousness of the situation they may create institutions which mitigate environmental degradation.

Now it is worth noting at this point that Simon Kuznets himself, back in 1967, made an interesting exploration of the relationships between economic growth, technological social and political change, and population growth, which can serve as a backdrop to what follows. Noting that there had often been a loose association between population growth and economic growth, he wrote:

"That modern economic growth meant a striking accelerated rise not only in product per capita but also in population does not imply that the latter was a necessary condition for the former". However this economic development was primarily in present day industrialised countries. And Kuznets wrote: "'But today and in areas with conditions quite different from those that characterized the presently developed countries in their past, rapid population growth may be an obstacle to, rather than a condition of, an adequate rise in per capita product".

That is not all that Kuznets had to say on the subject in this very important analytical paper. He is fully aware of the potential of technological development to lift populations in the poorer developing countries onto the pathway of adequate economic development. For example, he notes that technological development has already gone a long way in developed,

industrialised nations, and development of new technologies is becoming progressively more expensive there. Yet at the time Kuznets was writing, even the older, "tried and true" technologies developed in the industrialised world had not been applied in the poorer countries. He speaks of the "advantages of economic backwardness that the underdeveloped countries possess"! He writes:

"If their low productivity is due to failure to exploit modern technology effectively, the accessibility of most modern knowledge and technical know-how means a large stock of tested technology, material and social, available for future exploitation".

His own detailed analysis in this paper provides the analytical underpinning to what may seem intuitively obvious - purely economic solutions to our problems are themselves inadequate. He goes on to examine the various social and political changes that must take place if the 'advantages of economic backwardness' are to bear fruit. And as far as continued population growth is concerned, he advises against expecting too much from possible population control efforts. This is not to deny the importance of population control.

Kuznets summarises this line of thinking when he writes that underdeveloped countries need a whole set of economic, political and social institutions if they are to solve their growth problems, if they are to take advantage of their economic backwardness. "But, this set of policies, if successful, would also indirectly spread population control far enough to make it really effective in the long run. The changes in social and economic structure (and in the international situation) would provide reasonable assurance to future parents that their children will profit from fewer siblings, both in terms of survival and in terms of the effective return on their better education, training and health", and so on.

Now Kuznets goes on to examine the relationship between population growth and total product growth across countries provided by a very limited available data set (it excludes Communist countries and is only for a brief post-World War Two period). To cut a long story short, he concludes that "the rate of population growth among the underdeveloped countries has no uniform effect on growth in per capita product".

However, he goes on to point out the qualifications that must apply to his analyses. In the first place, he notes that his analyses concern only one index of economic growth, output per capita. So they did not take into account other important and desirable aspects of economic growth - employment opportunities, equity of distribution of the product, and "an optimum combination of individual freedom and social responsibility". So even if growth in per capita product was not impeded by a higher rate of population increase, the latter might create other serious problems of adjustment, such as providing employment for the increasing number of people entering the employment ages of life.

In the second place, Kuznets had only explored population and economic growth of whole national populations. So this ignored any differences in the rate of population increase among various economic groups within a country.

Kuznets notes that even a moderate proportionate reduction in consumption to compensate for a higher rate of population increase would hit the poorer more than the richer groups, even if group differentials in the rate of increase in numbers were not *systematically* related to economic and social status. But in fact the evidence suggests that in underdeveloped

countries there is a negative correlation between fertility and income for families classed by income size. Since the fertility differentials are too large to be offset by plausible mortality differentials, Kuznets thinks we can assume a higher rate of natural increase for the lower income and social status groups than for the higher groups. All this makes problems for the economic advancement of the poor, for preventing economic and social inequality widening, and for ensuring an adequate upward flow of potential human talent from the lower classes.

Developed nations have solved this problem of inequality by a variety of institutional changes. Yet even here, “the problems may be accentuated when a rise in the over-all rate of population growth means a greater differential between the lower and upper economic and social groups, and acceleration in the growth of the former; or when technological changes, requiring more education and investment in human capital, may impede upward economic and social mobility that in the long run is indispensable to the efficiency of the economic society”.

The problems arising from population increase differentials between classes are more acute for underdeveloped countries with their lower overall per capita income and smaller economic reserves than for developed countries. “If a high rate of population increase would bring about an even wider income inequality than now exists in the underdeveloped countries, the consequences in the way of misery, failure of unity, and loss of political viability might indeed be dire” (Kuznets, 1967).

We will not attempt here to make any assessment of the whole economic and social picture conjured up by Kuznets. But we just note that as far as the supposed negative relationship between income and fertility is concerned, the study of Schoumaker (2004) on 25 sub-Saharan countries showed that in all the countries studied, the poorest women had a much higher fertility than the better off women, although economic status was not measured by income and expenditure, but indirectly by an index based on asset ownership and housing characteristics. Readers who wish to explore further the range of issues raised by Kuznets might like to consult Birdsall et al (2001) and Bhaskar and Glyn (Eds.) (1995). Rather, we will look at some specific research which provides evidence that population is either positively or negatively related to some forms of environmental degradation, with particular reference to work on the Kuznets curve. We start with work on agricultural and natural resources, then move on to studies on emissions and ecological footprints.

Research providing evidence on the relationship between population growth and environmental deterioration

There are numerous studies which provide evidence about the relationships of human population growth to changes in agriculture and natural resources. Focusing on rural population growth, Pender (2001) concludes that the evidence is mixed. Sometimes population growth seems to have had beneficial environmental effects; but other studies have found that population growth has been associated with various aspects of resource degradation.

Now one of the biggest studies carried out in this subject area is that by Tiffen and colleagues (Tiffen et al., 1994). And Pender, in a brief introductory paragraph, on which the paragraph above is based, takes this publication as his example of beneficial population growth effects.

As the purpose of this essay is to explore the Kuznets relationship, we will not attempt to evaluate all the studies made on population growth and environmental degradation. However, we will begin by examining the Tiffen et al work as it illustrates that positive population growth effects are sometimes not unalloyed, and because it can act as a useful prelude to the investigations we will report on subsequently.

The book by Tiffen et al (1994) concerns just one district in Kenya, the Machakos district, which lies south-east of Nairobi on the edge of the highlands, the period covered by the study being 1930 to 1990. Over many years previously, many changes had taken place through human activities leading to very severe soil erosion.

During the study period, there was a large increase in land under cultivation, largely at the expense of grazing lands. And there was a big increase in non staple (subsistence) crops - fruit and vegetables and non-food cash crops such as coffee. Agricultural incomes are now much more supplemented by non-farm work. This has partly come about through the large increase in the output of non-subsistence products that has led to the creation of jobs in marketing, processing and “the satisfaction of new consumer demands”. There is now also a much greater effort at conservation. Important here has been the evolution of self-help groups, which had already existed at the start of the study period. Churches, cooperatives and NGOs now play a much more significant role in society. And people are now much more able to pool knowledge and capital, for both private and commercial projects.

Erosion has been reduced, but has by no means ceased. On cultivated land, improved terracing has reduced erosion, although such erosion remains very variable across the district. The greater part of total soil erosion has been on grazing land, and some reduction of erosion has taken place there through land demarcation and land registration. Some of the large old erosion gullies are now vegetated, partly as a result of conservation measures on the higher valley slopes. Agricultural output, both on a per capita basis and on a per hectare basis has increased. And while there had been a wood fuel crisis at the beginning of the study period, there were more trees growing at the end of the period than at the beginning. In grazing lands in northern Machakos, there was an increased “woodiness”. But here the authors conclude this was not caused by shrub regrowth under heavy cattle grazing but to the managed regeneration of canopy trees, which protect the ground from erosion-causing rainsplash. On grazing lands, the authors conclude there is no evidence of irreversible land degradation during the study period.

All these positive changes have taken place during continued massive human population growth: The population was in the region of 240,000 to 260,000 in 1932. By 1989 the population had risen to 1,393,000. These facts are reflected in the title of the book: “More people, less erosion. Environmental recovery in Kenya”.

Yet the somewhat rosy picture created by the trends just mentioned do not alone give an accurate summary of changes in the Machakos district.

Thus the authors say that it is possible that the rate of erosion on grazing lands has decreased not only because of better management, but also because of the removal of the most easily erodible material before the study period began! And there still remain, scattered through the district, some completely bare areas. And despite what was said earlier about tree canopy development in parts of northern Machakos, there has been considerable bush encroachment

in some grazing areas, and the authors admit this threatens to reduce the value of the grazing land for cattle.

Now the Authors note that fertility losses caused by erosion are as important as the physical removal of soil. And fertility has declined in Machakos during the study period. Two approaches were used to study fertility changes. In the first, soils were studied at 30 sites and the fertility in 1977 compared with the fertility in 1990. Carbon is an indicator of organic matter. It was very low in 1977 and declined considerably by 1990. Available phosphorus was generally low both in 1977 and in 1990, which at many sites indicates “a rather acute deficiency”. There seems to have been no significant trend in nitrogen over the study period.

The second approach was to examine a series of sites in 1990, spread over three types of land. Group 1 sites were sites uncultivated for 60 years. Group 2 sites had been fallow for 20 years and were at the time of sampling used as grazing land. Group 3 sites had been under cultivation for 40-60 years or more without any known additions of fertilizer and little manuring. The nature of fertility changes in the district are then inferred from between-group comparisons. The analyses showed a definite trend of decline at every site from Group 1 to Group 3. The only exception was available phosphorus, which was deficient in all groups. The authors attach particular significance to the sharp fall in the nitrogen and carbon contents to very low levels from the uncultivated group 1 sites (a big fall 1-2 and 2-3).

Under the pressure of population growth with subdivision of the land through inheritance, farm size has fallen and by the end of the study period there was no free land for occupation, although even back in 1939, 655 holdings were already of uneconomic size in the north. “Income generation must now come from still greater intensification on an already small farm in a difficult farming environment, or the development of new occupations in the processing and servicing sectors of the economy”. And while the extent of landlessness is not known, in the Eastern Province, the authors, referring to a study which showed 7% of rural households were landless in 1975-1976 write “landlessness may have increased since then, for population growth has cut the inherited share of some to a house-sized plot, and new farm land is not available”. And in the Kangundo-Matungulu area, “from the 1930s to 1990, the population density had increased fivefold, but the price of land had increased twenty-fold in this part of the district, a sure indication of increasing land scarcity, as well as increased land productivity”.

So we think that the title of the book is misleading, and seems to reflect the authors' pre-conceived perceptions about the effects of population growth rather than a balanced assessment of the evidence. And we note also that the book does not deal with the effects of mans activities on overall plant and animal species diversity.

One resource that can be threatened by population growth is fuel wood. And we now turn to a study of a different district of Kenya and fuel wood production, which was carried out to test for the presence of a Kuznets (type) relationship for fuel wood. It should be pointed out at this juncture that the Kuznets curve refers specifically to relations between indicators of environmental deterioration and (independent variable) a measure of economic growth, usually per capita GDP. But some authors, as is the case here, use the term Kuznets curve more loosely to indicate some relationship whereby an indicator of environmental

degradation shows first an increase then later a decrease when plotted against some other independent variable.

Patel et al (1995) studied smallholder wood production and population pressure in the central section of the Murang district in Kenya, in the highlands north of Nairobi. Wood trees are grown here in woodlots, on land borders, or (intercropping) in fields of maize and beans (maize and beans are the staple food crops, but vegetables and non-food cash crops are also grown). Both wood trees and fruit trees are used for erosion control on steep slopes.

In this district there had been considerable environmental degradation: Soil erosion has long been recognised to be a serious problem, being caused by a combination of factors - high rainfall, steep slopes and intensive cultivation. At the same time, population pressure has led to farm size reduction through inheritance.

The research method involved modelling simulations based on data collected in five rounds of surveys in 1991/92 of 115 randomly selected households. In this work, number of trees is the dependent variable. The independent variables used were land area, fruit trees (which might be a proxy for the amount of highly sloped land), labour and expenditure per capita (the latter was a proxy for income).

The elasticities associated with each independent variable were: Land: 0.36; Fruit trees: 0.19; Labour: 0.4; Expenditure per capita: 0.24.

While the expenditure variable was important in size (as measured by its elasticity), it was not significant, but the other variables were significant.

As far as the land variable is concerned, households with greater land area are likely to have more trees. However, the elasticity of the expected value of the number of trees grown with respect to land is less than one, indicating that households with less land grow more trees per acre, if the other variables are held constant. The elasticity further implies, say the authors that if the other variables are held constant the number of trees per acre will increase as land is subdivided - the predominant form of land transaction.

However, the other variables are not constant as land is divided. Further investigation by the authors nevertheless suggested that with decrease in parcel size, while the expected number of trees per household falls, the expected number of trees per acre rises. Indeed, the authors say they expect to see an increase in total tree cover as farm size decreases even to one-fourth of its present level. They conclude that the results are analogous to the EKC where environmental degradation is shown to worsen, then improve, as per capita incomes improve. And their more general conclusion was:

“The existence of a persistent fuelwood 'gap', and the notion that population pressure will lead to declining tree cover, are not supported by the analysis. A simulation model indicates that as land continues to be subdivided tree cover may actually rise, a result consistent with other evidence of an 'environmental Kuznets curve'”.

However, the authors caution against being too optimistic about eventual environmental consequences. They say “there still exist at least three potential market failures that would give rise to suboptimal tree stocks in East Africa”.

First, trees are very important for preventing soil erosion in watershed management. Clearing such trees to exploit the land for more profitable crops can then have disastrous consequences. Indeed in another part of Kenya the resultant reductions in overall productivity led to ethnic tensions and violence.

Second, individual farmers, who own just a small part of an overall land slope, cannot individually effectively counteract large scale erosion. For it is not just a question of the number of trees, but also the arrangement of the trees on the whole slope. But that demands cooperation between households, and this might not be forthcoming.

“Third, while the number and arrangement of trees is critical, the composition of tree species is also important. Evidence of an 'environmental Kuznets curve' may be reassuring in terms of number of trees. But to the extent that the path implies a loss of diversity, there is reason for concern”. And in the study area there has in fact been a massive loss of tree diversity, with tree planting being mainly of two or three exotic species. “These high concentrations of exotic species increase the likelihood of disease or pest infestations that can have catastrophic results, such as cyprus blight that has plagued both Kenyan and Tanzanian highlands in recent years”.

We note here that the authors concerns about loss of diversity narrowly focus on the productivity of land for humans. But such conversion of mixed woodland or woodland savanna, disturbing the natural balance of species that evolved over millions of years - a balance which prevents pest infestations, has been a widespread feature of development in many countries, and this means a widespread reduction of tree species diversity, and diversity of associated species of other organisms, and an accelerated rate of (local) species extinction.

While studies such as those Tiffen et al and Patel et al provide valuable insights into the relationship between population growth and environmental degradation, their significance is limited by the fact that they only deal with a small part of a country. They tell us very little about what is going on elsewhere in the countries concerned. It is quite conceivable that even if environmental degradation was reversed in a district, this might be paralleled by accelerated environmental deterioration elsewhere in the same country. So while such studies illuminate mechanisms, whole country studies are more valuable for telling us about overall environmental change, especially as the sovereign state is the basic political unit responsible for the determination of environmental policies, laws and institutions. As Dietz and Rosa (1997) say of their own work: “Our unit of analysis was the nation-state because it is the principal collective actor in generating environmental impacts and in developing policies in response to them”.

The work of Cropper and Griffiths (1994) investigates the effect of population growth and other variables on deforestation across 64 countries and across continents (Africa, Asia, Latin America (Central and South America). Because deforestation is primarily a problem of developing countries these authors limit themselves to non-OECD countries. They develop an equation which allows them to investigate the following independent variables: Per-capita income; per capita income squared; percentage change in per capita income; price of tropical logs; percentage change in population; rural population density; time trend. The dependent variable is the annual rate of deforestation.

They find that only the results for Africa and Latin America are statistically significant. Their results suggest “first, that a hump-shaped relationship exists between per capita income and deforestation” (in other words, producing a Kuznets type curve). Second, that “rural population density shifts this relationship upwards”. That is to say, the turning point in the curve is at higher rates of deforestation as rural population density rises. And quantifying the effect of rural population density, the authors claim that “an increase in rural population density of 100 persons per 1,000 hectares raises the rate of deforestation by 0.33 percentage points in Africa”.

The grimness of the situation in Africa is seen by comparing Kenya and Malawi .

Kenya had a rural population density of 0.3 persons per hectare, and a peak deforestation rate of 1.91 percent per year. In contrast, Malawi had a rural population density of 0.7 persons per hectare and a peak deforestation rate of 3.21 per cent per year. Now put this information along side the fact that massive population growth is projected to continue for a long time in most sub-Saharan countries, and one realises how serious is the situation.

But there was another “disquieting” feature of the relationship between deforestation and per capita income. The levels of income at which rates of deforestation peak “are such that most of our observations fall to the left of the peak”. In other words for most of the countries, income levels were below the curve's turning point income.

Why then the lack of significance with results for Asia ? The authors note that while destruction of natural forests has been massive in Asia, there has also been, in contrast to Africa and Latin America, the development of vast tree plantations. However, an increase in the price of tropical logs is likely to speed up both destruction of natural forests and increase of plantations. If it had been possible then to separate these two types of forest in the analyses, the authors think they would have found a similar relationship for the deforestation of natural forests as they had found for forests in Africa and Latin America .

We now turn to work on emissions (atmospheric pollutants) and ecological footprints. We note to begin with, that as far as pollutants are concerned, "empirical studies which explicitly examine the link between population and pollution in a systematic quantitative manner are very few in number" (Cole and Neumayer, 2004).

As we mentioned in an earlier section, Selden and Song (1994) found evidence supporting the EKC hypothesis for some pollutants (suspended particulate matter, sulphur dioxide, oxides of nitrogen and carbon monoxide). They went on to model possible future trends in global emissions, and concluded that emissions would rise over the foreseeable future. They also note that the fastest population growth is likely to occur among countries which are on the upward -sloping portions of the emissions-GDP per capita curve, that is on the left side of the curve in the figure shown early in this essay. However these authors brought population density into their analysis and find that modelling future changes to 2050, when population density was included in the modelling, lower forecasts were obtained than if population density was not included. They concluded that:

“Intuitively, while the direct effect of greater population is to increase pollution (holding emissions per capita constant), this may be at least partially offset if increased population density causes per capita emissions to decline”.

It should however be noted that Selden and Song are very careful to point out reasons why their forecasts should be treated with caution such as the fact that no attempt was made to build into the analyses possible future changes in technology and their implications for emissions.

A number of workers have found evidence that population growth causes an increase in emissions. We start with one investigation which gives a good idea of the complexity of interactions between population growth and other variables.

Cramer (1998) studied the relationship between population growth and air quality in California in recent decades, attempting to disaggregate the relationship by 13 different source categories and five pollutants. The source categories were:

Residential, Services, Commerce	Natural Sources
Waste Burning	Passenger Vehicles
Solvent Use, Cleaning, Surfaces	Trucks, Buses
Petroleum Production	Off-Road Vehicles
Industrial Processes	Other Transport
Agricultural Processes	Equipment
Miscellaneous Processes	

The pollutants studied were reactive organic gases (ROG) and oxides of nitrogen (NO_x) (the precursors of ozone), oxides of sulphur, carbon monoxide (CO), and particulate matter.

Population growth had been unusually rapid in California. In earlier decades this was mainly due to inter-state migration. In recent decades it was due mainly to immigration from other countries and relatively high fertility of some immigrant groups. While population growth caused increases in some pollutants, “despite the population growth, air quality actually has improved since the early 1980s due to aggressive regulatory efforts”.

The effects of population growth were found to vary considerably between pollution sources. In general, population growth had a large, usually significant effect on emissions from source categories like “Residential, Services, Commerce” and “On-road Vehicles”, sources with consumption and commercial activities one would expect to be tied directly to population growth. So population growth increased emissions for such source categories. In contrast, population growth had insignificant effects on emissions from source categories related to management and economic production such as “Waste Burning” or “Industrial Processes”.

The effect of population growth was found to vary between pollutants - a large effect on ROG, NO_x and CO, but little effect on small particles and SO_x . While the effect of population growth varied between pollutants, and for a base year of 1990, Cramer found that with pollutants sensitive to population growth the overall impact of that growth had “an elasticity of about 0.75 to 0.8; that is, a 10% increase in population produces an increase in emissions of 7.5% to 8%”. They conclude that “this is a substantial impact, but..the elasticity is considerably less than unity; a doubling of population does not double pollution...”. This result stands in contrast to results with carbon dioxide we look at in some following work

It is clear that the relationship between population growth and pollution is a very complex one. But as Cramer shows, the complexity does not stop with the factors analysed above. For

example, population growth may increase emissions by stimulating residential construction, but such impact may be mitigated by the conversion of agricultural land and decline in agricultural practices: the population regression coefficients for most emissions from agricultural processes are small but negative; because in California, most residential expansion makes use of agricultural land, so population growth reduces agricultural activities.

Carbon dioxide is a pollutant commonly studied, and results for this pollutant are obviously important through the effect of CO₂ in global warming. Now the majority of investigations seem to have found that population growth causes a roughly proportional increase in CO₂ emissions, i.e. the population elasticity of emissions was roughly one, at least over the range of incomes experienced or likely to be experienced by the majority of nations as we will now see. Some investigations made use of the Impact equation (IPAT): Environmental Impact = Population × Affluence × Technology.

Dietz and Rosa (1997) used a modified version of the IPAT equation in a study of the effects of population and affluence on CO₂ emissions, in a cross-country study (over a hundred nations) using 1989 data. They found that “the impacts of population are roughly proportional to its size across the range of population sizes that will characterize most nations over the next few decades”. Only at income levels above what the overwhelming majority of nations are likely to reach in the next quarter century would the downturn of the Kuznets curve occur. And they comment “this contradicts the views of those who are complacent about population growth”.

Bruvoll and Medin (2003) studied a large array of atmospheric pollutants, including CO₂ in Norway over the period 1980 -1996 in a study of the causal factors (“driving forces”) of the EKC using a decomposition analysis model. While their investigation was not primarily into the effects of population growth, they included population growth as one of the causal factors. They found that keeping all other factors constant, the growth of the Norwegian population (seven per cent) contributed to a corresponding growth in all emissions.

York et al (2003a) also used a modified version of the IPAT equation to study CO₂ emissions and the energy footprint in a cross-nation study of 146 nations for CO₂ and 138 nations for the energy footprint, exploring a series of models of relationships. Their investigation was also not primarily to investigate the effects of population, but rather an attempt to improve methods of analysis of the anthropogenic forces of global environmental change. However, useful results on the influence of population growth were among the outcomes. They concluded:

“Population clearly appears to be a major driver of both CO₂ emissions and the energy footprint. In all six models the coefficient for population is not significantly different from 1.0, indicating that the population elasticity of impact for both CO₂ and the energy footprint is unit elastic. Thus, a change in population corresponds to a proportional change in both measures of impact”.

Now the authors also included the extent of urbanisation and the predominant latitude of each country as variables in their analysis. The former variable was included since it has been suggested that environmental impacts may follow an environmental Kuznets curve relative to urbanization rather than economic development per se. Latitude was included as an indicator of climate effects. The findings here were that urbanization monotonically increases both

CO₂ and energy impacts. And nations in non-tropical regions had higher impacts than nations in tropical regions, controlling for other factors.

York et al (2003b) again used a modified version of the IPAT equation to examine the impacts of a whole array of variables on the ecological footprint across most nations. So the ecological footprint is the dependent variable. They developed a series of analytical models in which different groups of independent variables are incorporated.

The authors concluded that population size has a roughly proportional effect on the ecological footprint. A 1% population increase caused a 0.98% increase in ecological footprint with other factors held constant. Also, the larger the proportion of a nation's population of ages between 15 and 65, i.e. the working age groups, the larger the footprint. Further, "impacts are higher in nations with more land area per capita, suggesting that resource availability and/or density influences resource demand". And, conforming a conclusion of their other 2003 paper (2003a), impacts also increased the further a nation was from the tropics.

The authors also draw attention to the fact that the various driving forces have a multiplicative effect. Now since they also found that increases in GDP consistently lead to increases in impacts, a key consequence of the multiplicative relationship "is that because of high levels of consumption in affluent nations, even a slow rate of population growth in these nations is at least as great a threat to the environment as is a rapid rate of population growth in less developed nations". So quoting from other authors "if the Chinese try to eat as much meat and eggs and drive as many cars (per capita) as the Americans the biosphere will fry", the authors point out "that a slow, but steady, growth in the American population, at current consumption levels, may equally challenge the biosphere".

I personally doubt this conclusion. My reason is this. People in developing countries aspire to the same high standard of living as is presently enjoyed by people in developed, industrial countries. They wish to attain to our level of affluence, and are moving in that direction in countries like China. Since population growth is massive in most developing countries, you have a big increase in both P and A in $I=PA$ and the multiplicative relationship holds there as elsewhere.

Shi (2003) studied the impact of population pressure on global CO₂ emissions. The data was a time-series for 93 countries for the period 1975-1996. For the 93 countries as a whole, Shi found there was an overall upward trend in emissions during this period (total increase during the period of 61.18%). Population during the same period grew by 42.82%. So a 1% rise in population gave a bigger percentage increase in emissions (1.4%) (but see the criticism of this high elasticity by Cole and Neumayer - the next paper we consider below).

Shi went on to see how country per capita income levels might affect the population - CO₂ emissions relationship. Dividing the 93 countries into four income categories, these were the findings in relation to a one percent rise in population.

Percentage increase in emissions			
low income	lower-middle income	upper-middle income	high income
1.58	1.97	1.42	0.83

In other words, in lower-middle income countries the elasticity of emissions with respect to population is nearly two, while in high income countries it is less than one.

Since developing countries have relatively low per capita incomes compared with developed countries, we see that the impact of population growth on emissions is bigger in developing than in developed countries. This conclusion with carbon dioxide stands somewhat in contrast with the conclusion of York et al (2003b) for ecological footprints, mentioned above. And we note that most future population growth will be in developing countries.

Shi's overall conclusion is that population growth has had a severe adverse effect globally on emissions over the last two decades.

Shi went on to prepare forecasts of global emissions up to 2025, using the United Nations low, medium and high population growth variant projections for population data. The 1990 global population was 5.266 billion and total carbon emissions were 6 gigatons. With the low variant projection, global CO₂ emissions will reach about 12.4 Gt of carbon. With the high variant, the figure is 14.2 Gt of carbon. The implications for global warming are terrible.

Cole and Neumayer (2004) made a study of the relationship of demographic factors to CO₂ and SO₂ emissions, : for CO₂, they worked with data from 86 countries over a period of 24 years (1975-1998); with SO₂, the data came from 54 countries and twenty years (1971 - 1990). There were important differences between the results for the two pollutants.

With CO₂, population increases were matched by proportional increases in emissions: the elasticity of emissions with respect to population were approximately unity over the entire range of country population sizes. The authors comment that their results of unit elasticity with CO₂ confirm the results of Dietz et al (1997) and York et al (2003a). They also question the validity of Shi's much higher elasticity estimates on statistical methodology grounds.

The authors also found, first that a higher urbanization rate increased emissions, a result consistent with the findings of York et al (2003a) we mentioned earlier; second that lower average household size increased emissions.

With SO₂, results were different: there was a U-shaped relationship with population. Population - emission elasticity was negative for very small populations but rose rapidly as population increased. The turning point was about 5.4 million people. So "population generates an increase in emissions for all populations over 5.4 million". Now only a quarter of all countries in the sample have a population below this threshold, so for most countries, an increase in population causes an increase in emissions. Further, urbanization and household size did not make significant contributions to change in SO₂ emissions.

What do the authors think are the reasons for the differences between the two pollutants? "The most likely explanation is that SO₂ and CO₂ emissions differ in their sources. CO₂

emissions are generated by a great variety of economic and consumption activities that are influenced by demographic factors. SO₂ emissions, in contrast, mainly derive from stationary sources and from the production of electricity in particular. On the whole, more SO₂ emissions will be generated for more people, but other demographic factors will not affect emissions".

However, they acknowledge that other "deeper" factors may be at work. Settlement patterns might change at higher population levels in such a way that countries may have to resort to lower quality energy sources. And when population growth rates are high, the resultant pressures on societies may swamp the abilities of those societies to plan and adapt in ways that could reduce the environmental impacts of energy supply.

What about the future? The authors conclude that with both pollutants, "*demographic trends suggest that a rising share of global emissions will be accounted for by developing countries*"(our bold text). The reasons are:

- Continued global population growth, which is mainly in developing countries.
- With CO₂, urbanisation will increase; currently it is on average 56% in developing countries compared with 78% in developed countries.
- Also with CO₂, in developing countries, average household size should fall, as young people are likely to move away earlier from their family home, marry at a later age and their parents increasingly live in separate homes.
- With SO₂, and remembering the low country population size of the turning point, developing countries populations are, on average, much larger than developed countries populations.

In contrast, in developed countries, population growth has slowed down considerably or stopped and urbanization and change in household size are not likely to progress much further.

Finally, Lantz and Feng (2005) made a major study of the impact of population, as well as income and technology on CO₂ emissions. They used panel data from five Canada regions for the period 1970 - 2000. In addition to a basic mathematical model, where GDP per capita is regressed against CO₂, the authors developed alternative models where they add population density and technology as variables (models 1 and 2) in a way that does not assume a linear relationship between these added variables and various measures of environmental degradation (they criticise earlier work by some authors which assumed linear relationships between dependent and independent variables).

These authors found that population has put increasing pressure on CO₂ emissions in Canada . They think their results imply population growth tends to increase fossil fuel use to support increasing demands for goods and services, although to a lesser degree as population continues to grow; thus population elasticities were 0.8 and 0.6 in 1970 and 2000 respectively. While they find evidence for an inverted U-shaped curve for population (i.e. a Kuznets type curve), the turning point occurs at 58 million - far above the then actual population of 30 million.

Summary of this section

Intuitively, one would expect population growth to cause increased environmental degradation, but in the wider environmental literature, which I have not attempted to fully assess, results on this relationship are mixed. If however, we confine ourselves to EKC and EKC-related literature, the focus of the present essay, the following main conclusions seem justified.

As far as CO₂ is concerned, population growth has been one factor causing an increase in emissions. This growth in emissions is thought by most workers to be proportional to population growth. If a inverted U-shaped relationship exists, it is at higher incomes than exist in the majority of countries today and at least in the near future. Urbanisation of the population causes increased emissions. And the greater the proportion of the population that is in the working age groups, the larger the population effect. Also average household size was found in one investigation to be a significant factor (the smaller the average household size, the larger the emissions).

Now in developing countries the trends in these demographic factors will continue, whilst there will be little change in developed countries. Combined with the fact that most future population growth will take place in developing countries, the implication is that a rising share of global emissions in the future will be attributable to developing countries. And the variation in population elasticity of CO₂ emissions between poor and rich nations reported in one investigation are consistent with this conclusion.

There is less evidence concerning other pollutants, but it seems that population growth has been one causal factor of the growth in emissions of suspended particulate matter, NO_x, CO and SO₂. For all except SO₂, there seems to be evidence for an inverted U-shaped relationship, but there is conflicting evidence with SO₂ where the relationship may be U-shaped. But for all four pollutants, most countries have average incomes that seem to imply population growth will continue to cause increased emissions for quite a while yet at least. Again, for SO₂ at least, it seems likely that a rising share of global emissions will come from developing countries, because they have a higher population growth rate than developed countries and on average developing countries are larger than developed countries.

Turning to a more comprehensive measure of environmental impact, namely the ecological footprint, population growth is a major force driving up the total footprint and the energy component of that footprint, population growth having a roughly proportional effect. Urbanization and age structure have similar effects as have been found with CO₂. Bearing in mind the multiplicative effects indicated by the IPAT equation, the high level of affluence in developed countries implies that even a small rate of population growth (from whatever cause) in these countries will mean that population growth there will continue to play a major role in increasing the global footprint.

Now the environmental indicators that have been studied in EKC literature on population influences, by no means cover the whole range of factors which contribute to environmental degradation. Strictly speaking then, we cannot generalise to a quantitative view on the influence of population growth on likely total future global environmental degradation. But whatever the influence population growth turns out to have on these other factors, we can conclude that population growth will be a major cause of further global environmental

deterioration. And even if per capita environmental degradation was to decrease with rising income, population growth, especially in developing nations, is likely to override, to swamp, the beneficial effect of this reduction on a country's total environmental degradation.

CONCLUSIONS

Despite concerns over adequacy of data sources and criticisms of methodology, it is generally agreed that an inverted U-shaped relationship (the EKC) between economic growth, usually measured as per capita GDP, and some indicators of environmental quality has been found. And the causes of this EKC have been largely unravelled. To some extent, technological improvements, and shifts in relative importance of sectors of the economy, especially the movement away from energy intensive manufacturing industries to service industries (composition effects), which have been normal elements of economic growth, have been causal factors. Economic growth then, has been a causal factor of the EKC.

But economic growth per se does not alone produce the EKC. Combinations of other factors seem to be essential for the EKC to develop. These include various aspects of a country's environmental regulatory system, including standards, implementation and enforcement mechanisms, and associated institutions. Property rights also are important. A high general administrative, political, scientific and technical capability, seems also to be a hallmark of countries where the EKC relationship has developed. On the other hand, and although the evidence is somewhat conflicting, corruption, a high degree of income inequality, low level of literacy, lack of political rights and civil liberties, may impede the development of the EKC relationship.

Environmental indicators that have shown the EKC relationship are primarily pollutants, especially air quality indicators. And these are primarily pollutants which have a direct effect on human health rather than pollutants that have little direct impact on health. Some water quality indicators have shown the EKC, but for some others an N-shaped rather than an inverted U-shaped relationship has been detected.

Leaving aside pollutants and water quality indicators, a wide variety of other environmental indicators do not show evidence of the EKC. Environmental problems having a direct impact on human health, such as access to urban sanitation and clean water, usually tend to improve steadily with economic growth, according to Dinda (2004), who also observes however, that when environmental problems can be externalized, as with municipal solid wastes, improvement may not occur even at high income levels.

It is when we come to look at indicators of resource use that we especially find a dearth of evidence for the EKC. Perhaps the most studied resource is forests, and here the evidence on deforestation is conflicting, although it seems likely that the EKC relationship may have been found in some parts of the world.

If we are interested in the global significance of EKCs, it is worth remembering that the existence of an EKC demonstrated on data from individual countries, does not necessarily mean that the beneficial effect for the particular indicator concerned applies to global levels of environmental degradation, i.e. does not necessarily imply global benefit. For it does seem to be generally agreed that there is at least some truth in the Pollution Haven Hypothesis

(PHH). However, since opinions seem still to be divided on the significance of the PHH, one should perhaps not stress its possible significance.

More important, if we are looking at the total global environmental situation, is the realisation of how limited is the extent that the EKC relationship has actually been found. Consider some aspects of this total environmental situation: reduction and degradation of natural habitats, including forests (not withstanding the possible existence of the EKC in some places as already mentioned), reduction of species diversity including extinction of species, salinization of soils, soil erosion, drastic reduction of ocean fish stocks, etc. And, recalling a comment of O'Neill et al (1996), we note that EKC analyses say little about basic ecosystem services: "cleaning the water, purifying the air, decomposing wastes, maintaining CO₂ balance, permitting recovery from natural disturbances, filtering ultraviolet radiation.". The limited known occurrence of the EKC does not then offer us much comfort about future global environmental trends.

And we also note how O'Neill et al assert that even if wealthy nations are able to reduce pollution, economic growth will impose increasing stress on ecosystems. And "total impact can be expected to increase as a function of GDP, considering cumulative depletion of resources, land use changes with implications for water quality and biodiversity, and rates of exploitation that exceed rates of replacement".

We must also remember, as Schindler (1996) observed for Canada, that generally speaking governments do not begin to commit themselves to major expenditures on the environment until environmental damage has already become very serious. It is then that time-consuming, very costly - and often ineffectual - assessment, cleanup and restoration activities are undertaken. Probably the same thing applies to the development and implementation of environmental policies.

If we approach environmental deterioration through the related concept of material flow analysis, the conclusions are not really more encouraging. In industrialized countries, a weak de-linking of environmental intensity from economic growth has taken place, but there is little evidence of any long persistence of strong de-linking. And once again, such studies do not encompass the totality of environmental degradation.

For the EKC effect to occur, a nation needs to have achieved a per capita income higher than the turning point income of the curve. Yet most developing nations still have per capita incomes corresponding to the left (degradation increasing) side of the curve. Achieving a downturn in degradation will then require considerable economic growth. Whether this will be achieved by some of the poorest nations is very doubtful. We also have to bear in mind that in so far as the export of pollution-intensive industries is an important factor for pollution reduction, developing countries are unlikely to have this option. Further, as already emphasized, economic growth (even accompanied by export of pollution-intensive industries), does not by itself produce the EKC. Other factors are important. Corruption is often rife in developing countries, democracy often shaky or absent, income inequality great, conflict sometimes common (think of sub-Saharan Africa!). All these factors will militate against the EKC relationship developing in LDCs. And as far as corruption is concerned, recall what Lopez and Mitra (2000) said with special reference to large developing countries such as China, India and Indonesia, countries that are "experiencing explosive economic growth":

“Unless this growth process brings about a rapid reduction of corruption (an unlikely event given that institutions and cultural norms typically show extraordinary resilience), pollution will remain much higher in these countries than the levels reached in currently developed countries when their per capita incomes were comparable”.

On top of all these considerations, we have the effects of human population growth which were dealt with in the previous section. With many developing countries at least, the population growth effect on environmental degradation for some indicators is likely to override, to swamp, the beneficial effects of any reduction of per capita environmental degradation for these indicators occurring as average incomes rise.

However, the general picture is not entirely one of gloom and doom. In the first place, some industrial nations have achieved strong de-linking at least for a while, despite usually modest continued population growth. Also, bearing in mind that achieving the EKC relationship seems to require the introduction of strong regulations, some have feared that the resultant increases in business costs could reduce a country's competitiveness. Yet we saw that Esty and Porter (2005) found a strong positive correlation between regulatory regime and competitiveness. They concluded that the evidence supports the view that environmental progress can be made without sacrificing competitiveness.

REFERENCES

- Arrow, K. et al. (1995). Economic growth, carrying capacity and the environment. *Ecological Economics* 15: 91-95.
- Ayres, R.U. (1995). Economic growth; politically necessary but not environmentally friendly. *Ecological Economics* 15: 97-99.
- Barbier, E.B. (1997). Environmental Kuznets Curve special issue. *Environment and Development Economics* 2: 369-381.
- Beckerman, W. (1992). Economic growth and the environment: Whose growth? Whose environment? *World Development* 20, 4: 481-496.
- Bhaskar, V. & Glyn, A. Eds. (1995). *The North, the South and the Environment. Ecological Constraints and the Economy*. Earthscan, London
- Bhattarai, M. & Hammig, M. (2004). Governance, economic policy, and the environmental Kuznets curve for natural tropical forests. *Environment and Development Economics* 9: 367-382.
- Birdsall, N. et al. (2001). *Population matters. Demographic change, economic growth, and poverty in the developing world*. Oxford University Press.
- Bruvoll, A. & Medin, H. (2003). Factors behind the Environmental Kuznets Curve. *Environmental and Resource Economics* 24: 27-48.

- Canas, A. (2003). A new environmental Kuznets curve? Relationship between direct material input and income per capita: evidence from industrialised countries. *Ecological Economics* 46, 2: 217-229.
- Cole, M.A. et al. (1997). The environmental Kuznets curve: an empirical analysis. *Environment and Development Economics* 2: 401-416.
- Cole, M.A. (2003). Development, trade, and the environment: how robust is the Environmental Kuznets curve? *Environment and Development Economics* 8: 557-580.
- Cole, M.A. & Neumayer, E. (2004). Examining the impact of demographic factors on air pollution. *Population and Environment* 26, 1: 5-21.
- Cole, M.A. & Neumayer, E. (2005). Environmental policy and the environmental Kuznets curve: can developing countries escape the detrimental consequences of economic growth?. In "Handbook of global environmental politics" (ed. P. Dauvergne). Edward Elgar.
- Cramer, J.C. (1998). Population growth and air quality in California. *Demography* 35, 1: 45-56.
- Cropper, M. & Griffiths, C. (1994). The interaction of population growth and environmental quality. *The American Economic Review* 84, 2: 250-254.
- Dietz, T. & Rosa, E.A. (1997). Effects of population and affluence on CO₂ emissions. *Proceedings of the National Academy of Sciences of the USA* 94: 175-179
- Dinda, S. (2004). Environmental Kuznets Curve hypothesis; a survey. *Ecological Economics* 49, 4: 431-455.
- Dinda, S. (2005). A theoretical basis for the Environmental Kuznets Curve. *Ecological Economics* 53, 3: 403-413.
- Ekins, P. (1997). The Kuznets curve for the environment and economic growth; examining the evidence. *Environment and Planning A* 29: 805-830.
- Esty, D.C. & Porter, M.E. (2005). National environmental performance: an empirical analysis of policy results and determinants. *Environment and Development Economics* 10: 391-434.
- Fischer-Kowalski, M. & Amann, C. (2001). Beyond IPAT and Kuznets Curves: Globalization as a vital factor in analysing the environmental impact of socio-economic metabolism. *Population and Environment* 23, 1: 7-47.
- Grossman, G.M. & Krueger, A.B. (1991). Environmental impact of a North American free trade agreement. Working paper 3914, National Bureau of Economic Research, Cambridge, MA.
- Herman, R. et al. (1990). Dematerialization. *Technological Forecasting and Social Change* 38: 333-347.
- Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review* 45, 1: 1-28.

Kuznets, S. (1967). Population and economic growth. *Proceedings of the American Philosophical Society* 111, 3: 170-193.

Lantz, V. & Feng, Q. (2005). Assessing income, population, and technology impacts on CO₂ emissions in Canada: Where's the EKC? *Ecological Economics*. In Press, available online 13 June 2005.

Lopez, R. & Mitra, S. (2000). Corruption, pollution and the Kuznets environment curve. *Journal of Environmental Economics and Management* 40:137-150.

Moomaw, W.R. & Unruh, G.C. (1997). Are environmental Kuznets curves misleading us? The case of CO₂ emissions. *Environment and Development Economics* 2: 451-463.

O'Neill, R.V. et al. (1996). Economic growth and sustainability: a new challenge. *Ecological Applications* 6, 1: 23-24.

Patel, S.H. et al. (1995). Smallholder wood production and population pressure in East Africa: evidence of an environmental Kuznets curve? *Land Economics* 71, 4: 516-530.

Pender, J. (2001). Rural Population growth, agricultural change, and natural resource management in developing countries: a review of hypotheses and some evidence from Honduras. In: *Population Matters. demographic change, economic growth, and poverty in the developing world*. Birdsall, N. et al (Eds.) Oxford University Press.

Qiguo, Z. (1994). Land degradation and improvement. In: *Population - the complex reality*. The Royal Society.

Schindler, D.W. (1996). The environment, carrying capacity and economic growth. *Ecological applications* 6, 1: 17-19.

Selden, T.M. & Song, D. (1994). Environmental quality and development: Is there a Kuznets curve for air pollution emissions? *Journal of Environmental Economics and Management* 27: 147-162.

Shi, A. (2003). The impact of population pressure on global carbon dioxide emissions, 1975-1996: evidence from pooled cross-country data. *Ecological Economics* 44: 29-42.

Taylor, M.S. (2005). Unbundling the pollution haven hypothesis. University of Calgary Department of Economics Discussion Paper 2005-15.

Tiffen, M. et al. (1994). *More people, less erosion: environmental recovery in Kenya*. J.Wiley, Chichester, New York.

Torras, M. & Boyce, J.K. (1998). Income, inequality, and pollution: a reassessment of the environmental Kuznets curve. *Ecological Economics* 25: 147-160.

Vehmas, J. et al. (2003). Material flows and economic growth. Linking analyses and environmental Kuznets curves for the EU-15 member countries in 1980-2000. Tutu publications 8/2003, Turku School of Economics and Business Administration, Finland.

Vincent, J.R. (1997). Testing for environmental Kuznets curves within a developing country. *Environment and Development Economics* 2: 417-431.

Yandle, B. et al. (2004). Environmental Kuznets Curves: A review of findings, methods, and policy implications. Research study 02-1 update April 2004, The Property and Environment Research Centre.

York, R. et al. (2003a). STIRPAT, IPAT and ImPACT: analytic tools for unpacking the driving forces of environmental impacts. *Ecological Economics* 46: 351- 365.

York, R. et al. (2003b). Footprints on the earth: the environmental consequences of modernity. *American Sociological Review* 68: 279-300.

WRITING APPREHENSION IN ENGLISH AMONG JORDANIAN POSTGRADUATE STUDENTS AT UNIVERSITI UTARA MALAYSIA (UUM)

Ibrahim Fathi Huwari

Universiti Utara
MALAYSIA

ibrahimhuwari@yahoo.com

Dr. Noor Hashima Abd Aziz

Universiti Utara
MALAYSIA

noor934@uum.edu.my

ABSTRACT

This research investigated writing apprehension among Jordanian postgraduate students studying at University Utara Malaysia (UUM). Jordanian students lack the ability to write in English at schools or universities level in Jordan because they do very little writing in English. This study had three main objectives: (1) to investigate the levels of Writing Apprehension among the Jordanian postgraduate students when writing in English at UUM (2) to investigate the relationship between age and socio-economic status with writing apprehension (3) to discover the writing situation that make the Jordanian postgraduate students feel most apprehensive when writing in English (writing a thesis, writing assignments, or writing journals). This study used a survey research design. The sampling of this study consisted of one hundred and three Jordanian postgraduate students at UUM. The instrument used in this study was Writing Apprehension Test (WAT) developed by Daly and Miller (1975) to measure writing apprehension. The results of this study showed that majority of the Jordanian postgraduate students experienced high level of writing apprehension. There was a significant relationship between age, socio-economic status and writing apprehension. For the open-ended question, majority of the respondents said that they experienced apprehension in writing a thesis more than writing assignments, or writing journals.

Keywords: Writing Apprehension, Survey Research Design, Jordanian Postgraduate Students, EFL.

INTRODUCTION

Writing is a demanding task especially for second or foreign language learners. It has been found that most language learners at all levels believe that writing is one of the most difficult language skills to master (MacIntyre & Gardner, 1989; Kurk & Atay, 2007; Latif, 2007) or a sophisticated skill compared with other skills (Daud et al., 2005; and Abu Shawish & Atea, 2010). The process of writing in English can be divided into three stages: pre-writing, free-writing, and re-writing (Hughes et al., 1983). However, Zamel (1983) describes the process of writing as nonlinear, exploratory, and generative whereby writers discover and generate ideas as they attempt to approximate meaning. The process of writing involves sub-processes of planning, collecting data, drafting, revising, rewriting and editing. These sub-processes of writing are dynamic, non-sequential and interactive processes not as sequential stages.

Arab learners of English which include Jordanians and Egyptians encounter major problems in writing. This problem has been discussed by many researchers such as Abdul Haq (1982); Abbad (1988); Wahba (1998); Rabab'ah (2005); and Huwari and Noor Hashima (2010). In fact, Salem (2007) states that second/ foreign learners face difficulties to write effectively because of the limited number

of vocabulary, idioms, cultural knowledge, less experience with second language rhetorical strategies, and the apprehension of writing. A study conducted by Salem (2007) explored the views of 50 male undergraduate students majoring in English in relation to writing in English at the University of Al-Azhar, Egypt. Most of the students felt overwhelmed when they were required to write on a certain topic. They did not know how to start, how to develop their ideas or how to conclude the essay. They also lacked the technical skills of writing acceptable compositions in English. They often repeated their ideas, reported few if any valid points, made serious mistakes in grammar and punctuation, and included irrelevant information.

Researchers such as Gungl & Taylor (1989); Cheng, Horwitz & Schallert (1999); Cornwell & McKay (1999); Hassan (2001); Al-Ahmad (2003); Cheng (2004); Daud et al. (2005); Rankin-Brown (2006); Atay & Kurt (2007); and Salem (2007) claim that most of the research on writing apprehension focused on native English learners. Little research has been focused on writing apprehension among second or foreign language learners. Latif (2007) suggests a need to investigate writing apprehension in specific second / foreign language contexts such as that of the Arabic EFL learners. From the researcher's observation, students in Jordan lack the ability to write in English at schools and universities level because they do very little writing in English. This has prompted the researcher to discover how the PhD Jordanian students studying abroad cope with writing in English.

Al-Ahmad (2003) asserts that "All the remarks of researchers in ESL/EFL field indicated that writing apprehension is a real problem facing ESL/EFL students' apprehension, and something should be done to reduce students' apprehension" (p. 33). He proceeds to mention that writing apprehension in the ESL/EFL holds more of a challenge as it affects the learners' writings more in a negative way. Researchers such as Jones, 1985; Gungl & Taylor, 1989; Masny & Foxall, 1992; Cornwell & McKay, 1999; and Al-Ahmad, 2003 assert that researchers give more attention to L2 context because of the complexity of the condition in second/foreign language. This study aims to investigate the levels of writing apprehension among Jordanian postgraduate students when writing in English at UUM. In addition, it intends to investigate the relationship between age, and socioeconomic status and writing apprehension. It also tries to discover the writing situation that led the Jordanian postgraduate students to feel most apprehensive when writing in English (writing a thesis, writing assignments, or writing journals).

Writing Apprehension

Writing apprehension is a serious problem that can hinder the performance of both native and nonnative learners. Daly and Miller (1975) introduced the term writing apprehension. Daly and Miller (1975, p. 11) defined writing apprehension as "A subjective complex of attitudinal, emotional, and behavioral interaction which reinforce each other". Researchers have used many terms to refer to writing apprehension such as anxiety and blocking (Rose, 1980, 1983; Gungl and Taylor, 1989; and Al-Ahmad, 2003). Daly and Miller (1975) regard writing apprehension as a complex term because of the complexity of writing. Writing tasks tend to increase students' anxiety levels because anxiety can lead students to be demotivated in writing, which in turn may cause them to have negative attitudes towards writing.

Daly and Miller (1975) suggest three levels of writing apprehension, ranging from high, moderate, and low level. A study conducted by Hanna (2010) found that writing apprehension might influence students at all levels even after they had graduated from the universities. In addition, students with high level of writing apprehension produced a paper of less quality than low apprehensive writers, avoided writing tasks whenever possible and procrastinated in their work (Hanna, 2010).

High level apprehensive students can be characterized as follows: (1) Write less (Smith, 1984; and Tighe, 1987), (2) Avoid writing classes (Daly and Miller, 1975; Book, 1976; Smith, 1984; Raimes, 1985; Tighe, 1987; Reeves, 1997; Salem, 2007; and Waston, 2007), (3) Use less intense language (Daly & Miller, 1975), (4) Face difficulties in choosing topics to write about, write fewer statements,

words in general and short essays, develop their ideas incompletely, lack knowledge of usage and grammar such as using fewer -ly words, comma, and less punctuation compared with low apprehensive writers (Book, 1976; Daly, 1977; Rose, 1980, 1983; Faigley et al., 1981; and Reeves, 1997), (5) Like to procrastinate in their works (Bloom, 1981; Faigley et al., 1981; Reeves, 1997; and Salem, 2007), (6) May behave destructively (Bloom, 1981), (7) Less confident and less successful (Daly and Miller, 1975; Daly, 1979; Rose, 1980, 1983; and Waston, 2007), (8) Have lower self esteem (Reeves, 1997; and Salem, 2007), (9) Like to choose courses and careers that they believe involve little writing (Reeves, 1997), (10) Have a few writing role models at home, in school, and in the society at large (Reeves, 1997), (11) Write very little out of class (Raimes, 1985; and Reeves, 1997), (12) Score lower on tests of verbal ability (SAT), reading comprehension, and standardized tests of writing ability used for college placement (Daly, 1978; and Reeves, 1997), and (13) Lack of motivation in writing (Reeves, 1997).

Research done on apprehensive graduate students discovered that students with high level of writing apprehension had written a paper or proposal that was undeveloped compared to those with low level of writing apprehension (Onwuegbuzie and Collins, 2001). A study conducted by Erkan and Saban (2011) on EFL context in Çukurova University (YADIM), Turkey discovered that many of the students left the classroom without trying to write even a few sentences when it came to the writing sections of the examinations. This suggests that the students were extremely apprehensive. It is reasonable to speculate that success in writing in a foreign language may be related to attitudes towards writing, apprehension about writing, and self-efficacy in writing (Erkan and Saban, 2011). Phillips (1968, p. 42) says that "highly apprehensive individuals will avoid communication situations or react in some anxious manner if forced into them because they foresee primarily negative consequences from such engagements". Daly & Miller (1975) discover that writing apprehension can be associated with the tendency of people to approach or avoid writing. Highly apprehensive students will avoid writing whenever possible.

Abu Shawish and Atea (2010) conducted a study which involved 265 undergraduate students at three universities: Al-Aqsa University, Al-Quds University, and Islamic University. The study found that gender had no significant role in writing apprehension for the following factors (affective, cognitive, linguistics, teaching practice, students' behavior) except feedback. Females were found to be more sensitive to the teachers' feedback compared to males. In terms of students' academic level, i.e. sophomore, junior or senior, it was found not to have any influence on writing apprehension or the estimates of the remedies of writing apprehension except for linguistic factor where the difference was in favor of juniors. It was found that Islamic University of Gaza students were more apprehensive than those of Al-Quds Open University and Al-Aqsa University, particularly in teaching practices. A statistically significant difference in favor of the same group of students was also found in their estimates of the writing apprehension remedies. In addition, high achievers in writing classes displayed high apprehensiveness compared to low achievers and no difference was found between their estimates of the remedies of writing apprehension. Computer use in writing was found not to play any significant role in the students' estimates of the causes as well as the remedies of writing apprehension.

In summary, researchers believe that writing apprehension is a complex term and also a critical problem which may be faced by both native and non-native English learners. Writing apprehension will eventually impact the learners' learning process. Researchers have considered writing apprehension as synonymous with writing anxiety or blocks while others have categorized it into two main levels i.e. high apprehensive writers and low apprehensive writers.

METHODOLOGY

A survey research design was employed in this study because it collects quantitative, numbered data using a questionnaire and statistically analyses the data to describe trends about responses to questions

(Creswell, 2008). This method is suitable to fulfill the objectives of this study. The Writing Apprehension Test (WAT) developed by Daly and Miller (1975) was used to collect the data for this study. The total number of Jordanian postgraduate students at UUM for academic year 2011-2012 was 125 students. The sample size for this study was one hundred and three Jordanian postgraduate students at UUM. The students were selected using simple random sampling. According to Creswell (2008), this type of sampling enables the individuals in the selected population to obtain equal chance to participate in a study.

INSTRUMENT

In order to achieve the objectives and goals of this quantitative research, the researcher used one instrument, that is, the Writing Apprehension Test (WAT) which was developed by Daly and Miller (1975). The researcher divided the questionnaire into two parts: Part A consisted of demographic information such as age and socio-economic status. Part B consisted of 26 questions. The WAT (26 items) is a Likert-type self-report scale with five possible answers for each item from (1) strongly agree to (5) strongly disagree. Examples of the items are like: "I am not good at writing", "I look forward to writing down my ideas", "Expressing ideas through writing seems to be a waste of time", "Discussing my writing with others is an enjoyable experience", and "I don't like my compositions to be evaluated".

DATA ANALYSIS

This research used three techniques to answer the research questions. Hierarchical cluster was used to answer the first research question. The second research question used ANOVA. Lastly, the third research question used frequency. The quantitative data collected from WAT was analyzed using the SPSS (Statistical Package for Social Sciences).

RESULTS AND DISCUSSIONS

The results of this study are presented based on the research questions. The first question is: What are the levels of Writing Apprehension among the Jordanian postgraduate students when writing in English at UUM? The result of this study showed that majority of the Jordanian postgraduate students at UUM faced high level of writing apprehension, that is 74 (71.8%); followed by moderate level of writing apprehension, that is 27 (26.2%); the rest of the respondents experienced low level of writing apprehension, that is 2 (1.9%).

Table 1: Average Linkage (Between Groups)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	74	71.8	71.8	71.8
	2	27	26.2	26.2	98.1
	3	2	1.9	1.9	100.0
Total		103	100.0	100.0	

The finding of this study supports other findings in ESL/EFL context. Researchers such as Stapa, 1994, 1998; Cornwell & McKay, 1999; Hassan, 2001; Al-Ahmad, 2003; Salem, 2007; Latif, 2007; and Takahashi, 2009 discovered in their studies that the ESL/EFL students experienced high level of writing apprehension. This study shows that the Jordanian postgraduate students at UUM faced apprehension when writing in English. Teachers or lecturers need to be aware of high apprehensive learners in writing. The respondents of this study experienced some characteristics when writing in English such as avoiding writing, less writing outside the classes, and facing difficulties in choosing a topic to write. This finding on characteristics is similar to other studies such as avoided writing classes (Daly and Miller, 1975; Book, 1976; Smith, 1984; Raimes, 1985; Tighe, 1987; Reeves, 1997;

Salem, 2007; and Waston, 2007), did not often practice writing outside the classroom (Smith, 1984; and Tighe, 1987), experienced difficulties in choosing topics to write about and always came up with short essays (Book, 1976; Daly, 1977; Rose, 1980, 1983; Hays, 1981; Faigley et al., 1981; and Reeves, 1997).

The second question for this study is: Is there a relationship between age, Socio-Economic status with writing apprehension? The result shows that the relationship between age and writing apprehension is significant. A two-way between groups analysis of variance was conducted to explore the impact of age on writing apprehension, as measured by Writing Apprehension Test (WAT). Respondents were divided into three groups according to their age: Group 1: 21-30 years, i.e. 53 respondents (50.5%); Group 2: 31-40 years, i.e. 35 respondents (33.3%); Group 3: 41-50 years, i.e. 15 respondents (13.3%). The interaction effect between age groups and writing apprehension is statistically significant, $F(192.425)$, $p = (0.000)$.

Table 2
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.600	2	16.800	192.425	.000
Within Groups	8.731	100	.087		
Total	42.330	102			

Table 3
Descriptive

Age Group	N	Mean	Std. Deviation	Percent
21-30	53	3.1358	.28561	50.5
31-40	35	4.0314	.30367	33.3
41-50	15	4.6333	.31091	13.3
Total	103	3.6583	.64421	100.0

The first variable in this study is age. The result shows that there is a significant relationship between age and writing apprehension. Research has shown that age is one of the variables that affect writing apprehension. In other words, age can affect a writer's product. Usually, younger writers are more apprehensive than older ones due to the lack of experience.

The second variable in this study is socio-economic status, a two-way between groups analysis of variance was conducted to explore the impact of Socio-Economic Status on writing apprehension, as measured by Writing Apprehension Test (WAT). Respondents were divided into three groups according to their Socio-Economic status (Group 1: Low income group, i.e. 28 respondents (26.7%); Group 2: Middle income group, i.e. 60 respondents (57.1%); Group 3: High income group, i.e. 15 respondents (14.3%)). The interaction effect between Socio-Economic status and writing apprehension is statistically significant, $F(8.669)$, $p = (0.000)$. This study shows that there is a significant relationship between socio-economic status and writing apprehension. Researchers have shown that socio-economic status is one of the variables that affect writing apprehension. Usually, poor or low socio-economic status writers are more apprehensive than those with high socio-economic status.

Table 4
ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6.255	2	3.128	8.669	.000
Within Groups	36.075	100	.361		
Total	42.330	102			

The third question in this study is an open-ended question: What situation make you feel most apprehensive when writing in English (Writing a thesis, Writing assignments, or Writing Journals)?. Majority of the respondents in this study stated that they felt apprehensive when writing a thesis more i.e. 53 (51.5%), than writing journals, i.e. 30 (29.1%) or writing assignments, i.e. 20 (19.4%). This result is similar to Gurel's (2010) study. He claims that most research have been done on dissertation writing of advanced academic writing students which focus on the structural analysis of dissertation sections, across disciplines, tracing the course of dissertation writing, and thesis/dissertation supervision. So, there is a need for more studies to investigate the apprehension of writing dissertations among ESL/EFL contexts. The present study has shown that Jordanian postgraduate students experienced apprehension in writing a thesis or dissertation. It is important for the supervisors of the Jordanian postgraduate students at UUM specifically to be aware of their students' problems in writing in English language.

Table 5
Situations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Thesis	53	51.5	51.5	51.5
	Assignments	20	19.4	19.4	70.9
	Journals	30	29.1	29.1	100.0
	Total	103	100.0	100.0	

CONCLUSION

The objectives of this study were (1) To investigate the levels of Writing Apprehension among the Jordanian postgraduate students when writing in English at UUM, (2) to investigate the relationship between age and socio-economic status with writing apprehension, (3) to discover the writing situation that make the Jordanian postgraduate students feel most apprehensive when writing in English (writing a thesis, writing assignments, or writing journals).

The result of this study shows that majority of the Jordanian postgraduate students in UUM experienced high level of writing apprehension. This study also indicates that there is a positive relationship between age and socio-economic status with writing apprehension. Lastly, it discovers that majority of the respondents expressed most apprehensive when writing a thesis compared to writing assignments or writing journals.

FURTHER RESEARCH

It is suggested that more studies should be done on writing apprehension in ESL/EFL context. There is a need to investigate the causes of apprehension when writing a thesis. Research can also be done on strategies that students use to reduce their high level of writing apprehension. More research on writing apprehension using qualitative research methodology need to be done because most of the research on writing apprehension used quantitative research.

REFERENCES

1. Abbad, A. T. (1988). *An analysis of communicative competence features in English language texts in Yemen Arab republic*. Unpublished doctoral dissertation, University of Illinois Urbana-Champaign.
2. Abdul Haq, F. (1982). *An analysis of syntactic errors in the composition of Jordanian secondary students*. Unpublished master's Thesis, University of Yarmouk, Irbid, Jordan.

3. Abu Shawish, J., & Atea, M. (2010). *An Investigation of Palestinian EFL Majors' Writing Apprehension: Causes and Remedies*. Proceedings of the First National Conference on: Improving TEFL Methods & Practices at Palestinian Universities, Oct. 20, 2010.
4. Al-Ahmad, S. (2003). *The impact of collaborative learning on L1 and L2 college students' apprehension about and attitudes toward writing*. Unpublished doctoral dissertation, Indiana University of Pennsylvania.
5. Atay, D., & Kurt, G. (2007). Prospective teachers and L2 writing anxiety. *The Asian EFL Journal Quarterly December 2006 Volume 8, Issue 4*, 8(4), 100.
6. Bloom, L. (1981). Why graduate students can't write: Implications of research on writing anxiety for graduate education. *Journal of Advanced Composition*, 2.1-2.
7. Book, V. (1976). *Some Effects of Apprehension on Writing Performance*. Paper presented at Annual meeting of the American Business Communication Association, December 28-30, Diego, USA.
8. Cheng, Y., Horwitz, E. K., & Schallert, D. L. (1999). Language anxiety: Differentiating writing and speaking components. *Language Learning*, 49(3), 417-446.
9. Cheng, Y. S. (2004). A measure of second language writing anxiety: Scale development and preliminary validation. *Journal of Second Language Writing*, 13(4), 313-335.
10. Cornwell, S., & McKay, T. (1999). *Measuring Writing Apprehension in Japan*. Paper presented at the Annual Meeting of the Japan Association of Language Teachers.
11. Creswell, J. W. (2008). *Educational research: planning, conducting, and evaluating quantitative and qualitative research*. (3rd ed.). New Jersey: Pearson Education
12. Daly, J. A. (1977). The Effects of Writing Apprehension on Message Encoding. *Journalism Quarterly*, 54(3), 566-572.
13. Daly, J. A. (1979). Writing apprehension in the classroom: Teacher role expectancies of the apprehensive writer. *Research in the Teaching of English*, 13(1), 37-44.
14. Daly, J. A., & Miller, M. D. (1975). Apprehension of writing as a predictor of message intensity. *The Journal of Psychology*, 89(2), 175-177.
15. Daud, N. M., Daud, N. M., & Kassim, N. L. A. (2005). Second Language Writing Anxiety: Cause or Effect? . *Malaysian Journal of ELT*, 1-19.
16. Erkan, D. Y., & Saban, A. (2011). Writing Performance Relative to Writing Apprehension, Self-Efficacy in Writing, and Attitudes towards Writing: A Correlational Study in Turkish Tertiary-Level EFL. *The Asian EFL Journal Quarterly*, 13(1), 164-192.
17. Faigley, L., Daly, J. A., & Witte, S. P. (1981). The role of writing apprehension in writing performance and competence. *The Journal of Educational Research*, 75(1), 16-21.
18. Graves, D. H. (1984). *A researcher learns to write: Selected articles and monographs*. Exeter, New Hampshire: Heinemann Educational Books.
19. Gurel, N. (2010). *An examination of linguistic and sociocultural variables in writing a dissertation among Turkish doctoral students*. Ph.D Dissertation, University of New York Buffalo.
20. Hanna, K. J. (2010). *Student perceptions of teacher comments: Relationships between specific aspects of teacher comments and writing apprehension*. Ph.D Dissertation, The University of North Dakota.
21. Hassan, B. A. (2001). The Relationship of Writing Apprehension and Self-Esteem to the Writing Quality and Quantity of EFL University Students. *ERIC Document, ED45167*.
22. Hughey, J. B., Wormuth, D. R., Hartfiel, V. F., & Jacobs, H. L. (1983). *Teaching ESL*

- composition: Principles and techniques*. Rowley, Massachusetts: Newbury House.
23. Huwari, I., & Hashima, N. (2010). *Oral Communication Apprehension in English among Jordanian Postgraduate Students in Universiti Utara Malaysia*. In Proceedings of the 3rd International Conference on International Studies (ICIS), 1-2 December, Kuala Lumpur, Malaysia.
 24. Jones, S. (1985). Problems with monitor use in second language composing. *Studies in writer's block and other composing process problems*, 96-118.
 25. Kurk, G., & Atay, D. (2007). Students' Writing Apprehension. *Journal of Theory and Practice in Education*, 3(1), 12-23.
 26. Latif, M. A. (2007). The factors accounting for the Egyptian EFL university students' negative writing affect. *Essex Graduate Student Papers in Language & Linguistics.*, 9, 57-82.
 27. MacIntyre, P. D., & Gardner, R. C. (1989). Anxiety and Second Language Learning: Toward a Theoretical Clarification. *Language Learning*, 39(2), 251-275.
 28. Masny, D., & Foxall, J. (1992). Writing Apprehension in L1. *ERIC Document Reproduction*.
 29. Onwuegbuzie, A. J., & Collins, K. (2001). Writing apprehension and academic procrastination among graduate students. *Perceptual and motor skills*, 92(2), 560.
 30. Phillips, G. M. (1968). Reticence: Pathology of the normal speaker. *Communication Monographs*, 35(1), 39-49.
 31. Rabab'ah, G. (2005). Communication problems facing Arab learners of English: A personal perspective. *TEFL web journal*, 2(1), 15-30.
 32. Raimes, A. (1985). What unskilled ESL students do as they write: A classroom study of composing. *TESOL Quarterly*, 19(2), 229-258.
 33. Rankin-Brown, M. (2006). *Addressing Writing Apprehension in Adult English Language Learners*. In Proceedings of the CATESOL State Conference, 2006, Pacific Union College.
 34. Reeves, L. V. L. (1997). Minimizing writing apprehension in the learner-centered classroom. *The English Journal*, 86(6), 38-45.
 35. Rose, M. (1980). Rigid rules, inflexible plans, and the stifling of language: A cognitivist analysis of writer's block. *College Composition and Communication*, 31(4), 389-401.
 36. Rose, M. (1983). *Writer's block: The cognitive dimension*. Southern Illinois University Press.
 37. Salem, M. S. A. S. (2007). *The effect of journal writing on written performance, writing apprehension, and attitudes of Egyptian English majors*. Ph.D Dissertation, The Pennsylvania State University.
 38. Smith, M. (1984). Reducing Writing Apprehension. East Lansing: MI: National Council of Teachers of English. *ERIC Document of Research and Development in Education*, 13, 378-388.
 39. Stapa, S. (1998). *The Process Approach to ESL Writing*. Bangi, Selangor: Faculty of Language Studies, Universiti Kebangsaan Malaysia.
 40. Stapa, S. H. (1994). *The effects of the process approach on writing apprehension and writing quality among ESL students at university level in Malaysia*. Ph.D Dissertation, University of Glasgow.
 41. Takahashi, A. (2009). Self-perception of English Ability: Is it related to proficiency and/or class performance? *Niigata Studies in Foreign Languages and Cultures*, 14, 39-48.
 42. Tighe, M. A. (1987). *Reducing Writing Apprehension in English Classes*. Paper presented at the Annual Meeting of the National Council of Teachers of English Spring Conference,

March 26-28, 1987, Louisville.

43. Wahba, E. (1998). Teaching pronunciation-why? *Language Teaching Forum*, 36(3).
44. Watson, B. R. (2007). *Speaking up in the 21st century: The effects of communication apprehension and Internet self-efficacy on use of social networking websites*. Ph.D Dissertation, University of Missouri.
45. Zamel, V. (1983). The composing processes of advanced ESL students: Six case studies. *TESOL Quarterly*, 17(2), 165-187.

THE PSYCHOSOCIAL IMPACT ON THE LINGUISTIC AND COMMUNICATIVE COMPETENCE OF TEACHERS AT COLLEGE LEVEL IN DISTRICT MARDAN, PAKISTAN

Mir Alam Said,
Department of Education,
Abdul Wali Khan, University, Mardan,
PAKISTAN.
miralamsss@yahoo.co.uk

ABSTRACT

The study explores the Psychosocial Impact on the linguistic and communicative competence of the teachers at college level in District Mardan, Pakistan. It is an analysis of the opinion of the college teachers about the linguistic and communicative competence and behaviour of the teachers. The population of the study consisted of all the teachers of the public and private colleges in District Mardan. The samples for the study were the randomly selected teachers from the given 45 colleges in District Mardan. Data were collected from the randomly selected teachers of these colleges of the district. Thus, all the sample size of teachers and teachers was 135. Out of 200 questionnaires distributed among the target respondents, only 120 responses were received. The data have statistically been tested and tabulated applying mean, mean differences, percentages and chi square. The study found that most of the teachers agreed on the psychosocial impact on their linguistic and communicative behaviour, and most of them had the syndromes of the affected behaviour in this regard. The study recommends that continuing such studies in future may earn more accurate appraisal of the problem.

Keywords: Psychosocial Impact, linguistic and communicative competence, Behaviour

INTRODUCTION

This study is an analysis of the psychosocial impact on the linguistic and communicative competence of the teachers. The psychosocial aspect of learning has a lasting impact on the ability of interacting in a particular language. This communicative competence of the learner is a responsible variable for the behavioural and attitudinal changes and is largely associated with the psychosocial aspects of personality. This study explores the problem in depth and suggests strategies how to facilitate teachers in developing better communicative behaviour and linguistic competence. It is also obvious if the teachers have a progressive and supporting environment inside the educational institutions, they can improve their linguistic competence.

Each teacher is privileged to have access to freedoms and social rights but if it is denied, it has a negative impact on personality and adversely affects communicative behaviour and linguistic competence. At all stages, the communicative ability is a difficult skill, and to analyse it is more complex because of the complex behaviour of human beings.

The typical English language teaching-learning experience in Pakistan is almost devoid of any speaking practice at all, and indeed this is reflected in the examinations having no provision for language competence. It is good to criticize the whole education and social system for the reason.

Linguistic Competence

Linguistic competence was defined in 1965 by Noam Chomsky as the system of linguistic knowledge possessed by native speakers of a language. In linguistics, linguistic competencies the implicit and internalized knowledge of the rules of language a speaker uses. This is a system of knowledge that makes it possible to produce and understand an sentences in a language. Grammar is considered to be the basic thing in linguistic competence. With the help of *phonetics*, *phonology*, *morphology*, *semantics* and *syntax*, the linguistic competence can be assessed.

Communicative Behaviour

Communicative behaviour is the capacity to communicate with others. Humans use language, ideas, feelings, creativity and movement to let others know about them. Through that communication, they also develop a capacity to understand others.

Sociolinguistic and Psycholinguistic Factors

Sociolinguistics studies the *linguistic competence* and *communication skills* in social context. Communicative behaviour and linguistic competence also have a deep relation with human psychology which leads to psycholinguistics. Keeping psychosocial impact in view, there are some factors affecting communicative behaviour and linguistic competence of teachers as well as other learners, such as *stress and stressors* like: (a) Personality stress, (b) Situation and conditions, (c) Interviews and tasks, and (d) Oversensitivity to direct intuition and responses.

Behavioral problems, such as: (a) Withdrawal, shyness, fear, anxiety and emotional instability; (b) Reaction and undesirable responses, and (c) Habits, attitudes, disposition and temperament.

Intelligence and oral skills, such as: (a) Normal I.Q Average and (b) Abnormal I.Q (Above normal / below normal.)

Motivation, reinforcement and oral tests; Guidance and counseling as factors; and the mental health of the teacher or examiner.

Socio-cultural Dynamics

Society and language go side by side and due to their interdependence and interconnectedness, they progress. These interacting and dynamic aspects of society and language include the factors that affect the communicative behaviour, like: *Trends of the people, family background, discouraging environment, traditions, customs, rituals, social interactions and the awkward social division or classes.*

Educational Dynamics

No layman can deny of the important role that education plays in language learning. Education is not only language learning but it also nourishes the whole behaviour and mind of an individual. It influences in the following way:

Management as a factor

like lack of physical facilities, lack of proper planning, indiscipline and disorganization, scarcity of teaching material and aids, only certificates and degrees, attitude toward labour, exertion and hard work, no check and supervision, and discouragement and disinterestedness

Curriculum as a factor,

Like rote-memorization and cramming, reading and writing skill only, lacking language books, no language teaching programmes, not objective oriented, traditional, faulty, and old curriculum, and theoretical and inappropriate.

Teacher's personality,

Like teachers' attitudes of teachers towards changes, scarcity of trained and skilled teachers, reactive and non responsive teacher, worried and disturbed teachers, and poor communication skills

Methodology factor,

Like: traditional and typical, not learner centred, no activity based, lecturing and reading, translation and grammar, faulty and one way of communication, and medium of instruction.

Assessment factor,

Like lacking to assess the linguistic skill, no value or marks for pronunciation, no already designed assessment programmes and activities, subject oriented no language oriented , and poor linguistic competence of the examiners

This study critically and explicitly investigates the communicative behaviour and linguistic competence of teachers. It examines their background of the problem. It analyses the teachers' abilities regarding language. It gives stress on the need for the awareness about teachers' interactive abilities and insists on the significance of the appropriate attitudes of all the concerned.

OBJECTIVES

The objectives of are:

- i) To inquire about the psychosocial impact on communicative competence;
- ii) To identify the reality behind the psychosocial effects on communicative behaviour of the learners of English in Pakistan
- iii) To investigate how happy and sound psychosocial life, an individual can lead;
- iv) To suggest how to manage the flaws in language learning.

HYPOTHESES

- i) Teachers' democratic rights are acknowledged and safeguarded in the policy document but not accessible to teachers in Pakistan.
- ii) The negative attitudes of the educational managers halt the proper facilitation and practice of teachers' democratic rights in Pakistan

METHODOLOGY

This study on 'the psychosocial impact on the communicative behaviour and linguistic competence of teachers' introduces the strategies for realizing the reality of the problem and its impact on college teachers in Khyber Pakhtun Khwa, Pakistan. The need was determined by asking the opinions of the selected teachers and managers of the colleges, public and private; graduate and post graduate in the district.

Population

The population of this study represents all the colleges of Khyber Pakhtun Khwa, Pakistan. However,

data for the study was collected from the randomly selected managers and teachers of the public and private colleges of District Mardan, Khyber Pakhtun Khwa, Pakistan. The time the study is being conducted, the district has 45 Public and Private Colleges i.e. 12 Public and 33 Private colleges. Of 9 Public Degree Colleges, 8 colleges are for Boys and 1 for Girls, and of 3 Post Graduate Colleges 2 colleges are for boys and 1 for Girls. In the Private Sector, there are 13 Inter, 5 Degree, 10 Post graduate and 5 other colleges in various disciplines i.e. 7 colleges for Girls and 26, combined.

Sample

The sample of the study consists of the educational managers and teachers, of both public and private colleges, of the selected population of District Mardan in Khyber Pakhtun Khwa, Pakistan. The subjects for the study were 2 college teachers and one college manager from each college i.e. 90 teachers randomly selected from 45 colleges of the district. Thus, all the sample size of teachers and managers was 135.

DATA COLLECTION

Data were collected through questionnaires and survey was conducted in three dimensions as: social survey, public opinion survey, and college survey. Interviews, mail, email, personal contacts were also used. Trend studies, and document and content analysis were also manipulated. The data was analysed and assessed statistically and systematically using descriptive statistics. However, Chi-square test was applied to check the association between two criteria in contingency tables.

RESULTS

This study is based on the opinions of teachers and educational managers and introduces the strategies for improving the communicative behaviour and linguistic competence of the teachers at college level in Khyber Pakhtun Khwa of Pakistan.

The overall results of the questionnaires (Table No.1) showed that the teachers faced the problem at level. The percentage in the commutative table shows various dimensions of the psychosocial impact on the communicative behaviour of the teachers at postgraduate level in public and private colleges of District Mardan, Khyber Pakhtun Khwa, Pakistan.

Table No. 1 *Summary of the responses of teachers and managers regarding the psych-social impact on teachers' behavioural and linguistic competence*

Table No.	Opinion	Yes	No	Yes %	No %
01	Teachers' awareness and psychosocial impact	30	90	25%	75%
02	Social environment for communicative behaviour	20	100	16.66%	83.33%
03	Teachers' attitudes in the postgraduate	50	70	41.66%	48.33%
04	The college managers and socio-cultural activities	30	90	25%	75%
05	Pakistani society and its significant role	10	110	8.33%	91.66%
06	The college teachers and successful roles	40	80	33.33%	66.66%
07	Literary and English Speaking Societies	24	96	20%	80%
08	Pakistani culture and communicative competence	36	84	30%	70%
09	A low social interaction as a psychological factor	110	10	91%	09%

10	Schooling and poor communicative competence	92	28	76.66%	23.33%
11	Family impact and communicative competence	86	34	71.66%	28.33%
12	Attitudes of the religious people	74	46	61.66%	38.33%
13	Socio-cultural problems and behaviour	64	56	53.33%	46.66%
14	Prejudices inside the educational institutions	70	50	58.33%	41.66%
15	Traditional education and methodologies	100	20	83.33%	16.66%
16	Teachers' access to social projects	52	68	43.33%	56.66%

Most of the psychosocial factors as were observed, and disturbed the attitudes of the teachers in our society regarding communicative and verbal behaviour of the teachers at college level. were: negative criticism (56.66%), social discrimination (80%), drug abuses (25%), bullying (58.33%), extremism (63.33%), migration (53.33%), crowded families (75%), poverty (81.66%), sexism (68.33%) and politicization (75%).

The responses of the participants (Table No. 2 below) showed that teachers had the syndromes of the affected behaviour regarding communicative behaviour and linguistic competence at college level.

Table No.2 *Perceptions of teachers and heads regarding psychosocial impact on Teachers' communicative and linguistic competence*

Ho: Opinions of teachers and managers are uniform

HI: Opinions of teachers and managers are different

Capacity	SA-5	A-4	U-3	DA-2	S D -1	Total
Observed	10	50	40	15	05	120
Expected	24	24	24	24	24	120
O-E	-14	26	16	-09	-19	----
(O-E) ²	196	676	256	81	361	-----
(O-E) ² /E (fo- fe) ² / fe	8.16	28.16	10.66	3.37	15.04	$\chi^2 = 65.39$

The critical region is $\chi^2 > \chi^2_{0.05(4)} = 65.39$

The calculated value of $\chi^2 = 65.39$ does not fall in the critical region of rejecting the hypothesis Ho. According to the data, majority of the respondents agreed that most of the college teachers were psychosocially affected and its impact was obvious regarding their communicative and linguistic competence.

DISCUSSION

The study shows the psychosocial impact on the communicative competence of the teachers in various educational institutions in Pakistan. The study was conducted on the representative sample population of various teachers and teachers randomly selected from 45 public and private colleges of District Mardan, Pakistan.

This study entails the idea to analyse the opinion of the target subjects in their own view point commenting critically on the current situation about the communicative behaviour and linguistic

competence of teachers across the country. It was intended to interpret the reasons behind the behaviour of communication and to suggest strategies for attitudinal change; sense of responsibility and psychosocial competence at large. This research appraisal gives the following considerations on the problem:

- The Awareness level about the psychosocial impact was low;
- Teachers were found victims of the psychosocial problem;
- The crisis in education caused teachers' attitudes in Pakistan;
- The efforts and struggles for teachers' effective roles were unsatisfactory;
- No facilitation for teachers' communicative behaviour and linguistic competence
- Existence of multidimensional psychosocial factors regarding the communicative competence and linguistic competence

CONCLUSION AND RECOMMENDATIONS

1. Strategies for the awareness of teachers like seminars, symposiums, open discussions and debates may be launched inside and outside the institutes.
2. Orientation programmes to persuade teachers toward active participation in the competence building activities may be launched at all levels.
3. Guidance and Counseling cells may be established in all educational institutes for resolving the problem of psychological disorders.
4. To enhance the leadership qualities in teachers, special courses and training may be arranged for overcoming the problem.
5. Educators and experts may extend their helping hand to the teachers for strengthening their competence.
6. Courses on interactive English at postgraduate level should be taken as a means for promoting verbal and communicative competence in English.
7. The community, educational managers and teachers may work in harmony and coordination to control and resolve the problem.
8. The teachers may be good listeners and provided with books, music, and even videos in the target language.
9. Bilingualism may be adopted like a natural and unremarkable part of family life.
10. Languages may not be mixed in the same conversation.
11. Courses on sociolinguistics and psycholinguistics may be compulsory part of teachers training programmes.
12. College teachers may also be given training like school teachers.
13. Teachers may have awareness of individual differences and their role in language learning.

REFERENCES

Chomsky, Noam. (1965) Aspects of the Theory of Syntax. Cambridge, MA: MIT Press)

Gross, F. L. (1987). Introducing Erik Erikson: An invitation to his thinking. Lanham, MD: University Press of America. p. 39.

INTERNET SOURCES

www.staff.ncl.ac.uk/daniel.nettle/lingua, Accessed on 10/12/2009

www.criticalreading.com, Accessed on 26/12/2009

www.acampbell.org.uk. Accessed on 27/12/2009

http://en.wikipedia.org/wiki/Constructivism_learning_theory, Accessed on 23/12/2009

<http://www.brainy-child.com/article/bilingual.html>

<http://www.brainy-child.com/article/bilingual.html>, Accessed on 12/12/2009

http://en.wikipedia.org/wiki/Constructivism_learning_theory, Accessed on 23/12/2009

www.staff.ncl.ac.uk/daniel.nettle/lingua, Accessed on 10/12/2009

www.brighthub.com/education/language/articles, Accessed on 28/12/2009

REPOSITIONING EARLY CHILDHOOD EDUCATION IN NIGERIA: THE CHILDREN'S THEATRE APPROACH

Osakue Stevenson Omoera

Department of Theatre and Media Arts,
Ambrose Alli University, Ekpoma,
NIGERIA
omoera@yahoo.com

ABSTRACT

Education in the 21st century is a basic need. Interestingly many people perceive education as a right of both children and adults. As regards the issue of quality delivery, the foundation level of education is crucial anywhere in the world. In Nigeria, the educational system has witnessed a catalogue of changes in policies and programmes. Some of the changes have appeared to a number of people as desirable while one continues to wonder why some of the other changes were ever initiated. This has resulted in a series of policy somersaults and disruption of academic calendars at all levels of learning throughout the country. Worse hit by all these is the pre-primary level of education where there is no visible government involvement whether in supervision, inspection or funding. It is against this background the paper explores the potentiality of children's theatre in repositioning early childhood education in Nigeria. In doing this, it deploys the analytical methodology to explain issues and raise some vital suggestions on how to make that level of education work for better quality delivery. The paper concludes that since children's theatre is both recreational and educational, it should be better placed to reinforce all others aspects of preschool's curriculum as well as make teaching and learning fun for both the teachers and pupils at the pre-primary education level in Nigeria.

Keywords: children's theatre, preschoolers, NPE, early childhood education facilities, TIE,

INTRODUCTION

A child is a young human being between birth and puberty; a son or daughter of human parents (Encarta, 2009). It follows therefore that whatever a child experiences between birth and puberty constitute his/her childhood. Naturally too, we have early childhood (birth to about 5 years), mid childhood (6 to about 11 years) and late childhood (12 to about 18 years) phases of children's growth and development. Scientists agree that the early childhood stage of life is crucial to the all round development of any human being. In this regard, Awake! (2004) asserts that "studies indicate that early childhood is a critical time for developing the brain functions necessary to handle information, express emotions normally, and become proficient in language". The form of education given to a child at this phase of development is called the early childhood/preschool/pre-primary education.

At this stage, a child's health, intellect, personality, character, emotional stability, to mention a few, is moulded. Hence, the necessity of adopting adequate/appropriate teaching methods in teaching children in the first five years of life is incontrovertible. Like young plants, children develop and thrive when nurtured with regular, loving attention. Water and sunlight nourish a young plant and stimulate healthy and stable growth. By the same token, a child who is showered with verbal and physical expressions of love/training would enjoy stable mental and emotional growth. Some child-

development scholars have identified and associated this type of early childhood training with counselling. Perhaps, this is because teaching involves some level of counselling. In fact, they conceptualize counselling as a process in which one person (a teacher or a childminder or even a parent) assist another person (a child) in a person-to-person or face-to-face encounter (Eduwen, 1994; Aluede, McEachern and Kenny, 2005). They further posit that this assistance may take many forms: it may be vocational, social, recreational, emotional and/or moral. Whatever form it takes, the idea of “play” is central when it comes to early childhood training. This is probably why the National Policy on Education (NPE) in Nigeria stressed the deployment of the “play” concept in the passing of instructions to preschoolers/pupils at the pre-primary level of education. It recommends that early childhood education facility providers must ensure that the main method of teaching at this level should be through play (2004).

Unfortunately, there is no organized pre-primary education sector in Nigeria and the few agencies/organizations that currently run pre-primary education facilities operate without putting the tender age of the children into consideration. The children are constantly exposed to materials that are way beyond their abilities and capabilities. To worsen the issue the government does not even play the critical supervisory role it ought to play at this level of education. In this regard, the Communiqué of the National Forum for Policy Development Workshop on National Education Reforms (2007) notes that: At this level, there is no government involvement in supervision and funding. Children aged between 2 and 5 years who should be in school at the pre-primary level are about sixteen (16) million but only 1 million are in school, representing 6.25%.

Though the primary, post primary and tertiary levels of education receive some attention, the negative rub off from the pre-primary level which is the foundation tend to adversely affect learning activities at these other higher levels of education. Besides, the inconsistencies in educational policies and programmes have also taken its toll on the educational infrastructure in Nigeria. This may have informed the lamentation of Aluede (2006) that the many changes in educational policies in Nigeria are products of confusion. There is therefore, a high level of uncertainties which is beclouding meaningful planning in Nigeria’s educational system. This could be very dangerous, particularly as the future of Nigeria and Nigerians will ultimately be determined by the level of education its nationals have acquired. However, this paper is primarily concerned with the foundation level of education which is usually called the pre- primary or early childhood education sector in Nigeria. It adopts the analytical approach to examine the activities in this sector vis-a-vis government’s nonchalance and canvasses the need to reposition the sector using the children’s theatre approach. The paper concludes that such an option would not only supplement existing curriculum to make that level of education work for better quality delivery, it would make teaching and learning pleasurable and entertaining for both the teachers and the children . As a way of furthering this discussion, it is germane that we examine the nature and purpose of early childhood education in Nigeria.

Early Childhood Education in Nigeria: Basis and Matters Arising

Early childhood/pre-primary education is designed for preschoolers or those children who are not up to primary school age in Nigeria. Asaya, Ehigie and Igbinohe (2006) assert that it is the education which is given in an educational institution to children aged 2 to 5 plus prior to their entering the primary school. Although this assertion is, to a great extent, consistent with that of the National Policy on Education (NPE) in Nigeria, some pre-primary education facility providers admit less than 6-month old children into their schools. In fact, there are basically three forms of pre-primary education in the Nigerian context. These are: the crèche, the nursery and the kindergarten (NPE, 2004). It may not be superfluous if we briefly examine them.

The Crèche: This is a preschool facility which provides care and other support services for tender children while their parents or guardians are at work. It also designates “a place where small children are looked after while their parents are working or busy with other tasks” (Encarta, 2009). In many areas in Nigeria, the typical working hours are from 8:00 am to 4:00 pm or 8:00am to 2:00 pm, and preschoolers are taken care of during these periods at the crèche depending on the needs of the parents

or the services and policies of the preschool facility providers. Most of the crèches in Nigeria are run by churches, consortia and other private individuals who seldom employ specialist teachers in early childhood education but are all out to make profit.

The Nursery: This is a pre kindergarten school for children between the ages of three and five, staffed wholly by trained preschool teachers who encourage and supervise educational play rather than simply providing childcare. Asaya, Ehigie and Igbinohe (2006) affirm that nursery schools are generally credited with being more educational than childcare centres. In Nigerian, virtually all the nursery schools are privately owned and run by interested individuals or business concerns whose tuition fees are prohibitively expensive. There is no government or publicly run nursery programmes to cater for the larger populace which do not belong to the upper-income families bracket. Besides, these preschool facilities operate at the whims and caprices of the owners who may not be abreast with best global practices in that level of education. More often than not children are coerced into learning concepts well beyond their age and capacities in these nursery schools all in the name to grow intelligent pupils.

The Kindergarten: This type of preschool in Nigeria is sometimes interchangeably used with the nursery school. However, it essentially means a school or class for young children, usually between the ages of four and six, immediately before they begin primary education. Practically, all the kindergartens in Nigeria are owned by private bodies or quasi government agencies.

A careful look at the Nigerian situation would reveal that a majority of these preschools are poorly run. Besides the dangerous trend of pushing small children too hard, too fast to grasp concepts and the “nuisance” of unqualified and inexperienced teachers in most of these educational centres, the learning environment, which is called the third teacher in the Reggio Emilia schools (Gandini, 2002), is hardly put into consideration in Nigeria. This is against the backdrop of the fact that researches indicating that the physical environment of preschools has an important influence on the education and development of children are resonating globally (Greenman, 1988; Bailey and Wolery, 1992; Caples, 1996; Inan, 2009). In many early childhood education centres in Nigeria, the physical/learning environment is poorly designed, without ample space, furniture, toys, wholesome pictures and other materials which a child needs for stimulation, exploration and simulation. This is particularly regrettable because a critical element in the pre-primary education philosophy is the idea of educational play. And, of course, the physical environment and the curriculum together enhance and support the child’s ability to play —do something himself/herself, initiate and complete activities, take control of his/her own actions and responsibilities, communicate and interact with others easily, and have better perceptual and motor skills (Inan, 2009).

The Nigerian situation is made worse as experience has shown that the government does not play the critical supervisory, funding and regulatory roles assigned it by the NPE. There is no government run preschool centres in Nigeria and the ones owned by private hands are not closely monitored or supervised by a designated government agency. In fact, there is no organized government regulatory body charged with this all important responsibility as it obtains at the primary level where the National Primary Education Commission (NPEC) supervises at the national level while the State Primary Education Board (SPEB) supervises at the state and local government levels. Hence, early childhood education as become an “all comers’ affair”, which is a metaphoric ill wind that blows no one any good. However, the purpose and philosophy underpinning pre-primary education is spelt out by the NPE in Nigeria (2004). This we may outline and discuss as follows:

- (a) To effect a smooth transition from the home to the school;

Since this is the first time the child is beginning to leave the home and spend a few hours in the absence of mummy, daddy and other relatives, it is always not too comfortable for the child. As he/she continues to leave the home and come back each day he/she becomes accustomed to it. By the time he/she gets into the primary school he/she would have become used to it. In fact, the first day in primary school will just be like another day.

- (b) To prepare the child for the primary level of education;

The foundation for primary level of education is laid at the pre-primary level. The early childhood level serves as a preparatory ground for the primary level. The curriculum of this introductory level prepares the child for basic education.

(c) To provide adequate care and supervision for the children while their parents are at work (on the farm, in the markets, offices, etc);

The economy of Nigeria is in a bad shape, hence, an increasing number of housewives are now joining their husbands to fend for/contribute to the family income and upkeep. When mothers go to work there is the need for someone to take care of the children. House helps and nannies are not easy to come by these days. As a result of this, mothers/families are compelled to take their children to day care and other pre-primary school facilities in order to have the opportunity to go about their jobs.

(d) To inculcate social norms;

Every society has its own etiquette, savoir-fair, savoir-vivre and other mores which it necessarily bequeaths to its younger generations. The process of imparting all these social skills into children starts at the early childhood education level in Nigeria.

(e) To inculcate in the child the spirit of enquiry and creativity through the exploration of nature, the environment, art, music and playing with toys, etc;

At this stage the child ought to explore his/her environment and ask questions as far as his/her intellect allows him/her. Answers should always be given to all his/her questions no matter how stupid they may seem. Correspondingly too, the child must be given the opportunity to play and experiment with as many toys as can be provided.

(f) To develop a sense of co-operation and team spirit;

Children have the opportunity of playing together at the foundation level of education. As they do this, they learn to cooperate with one another. And, of course, since many of them come from different homes they also learn how to tolerate one another.

(g) To learn good habits, especially good health habits;

Children are taught good habits at this level of education. They ought to be taught to say good morning sir to daddy, good morning ma'am to mummy, among others. They also ought to be taught that it is unhygienic to pick things from the ground and put them in the mouth.

(h) To teach the rudiments of numbers, letters, colours, shapes, forms, etc, through play.

At this elementary level the child should be taught counting of numbers and reading of alphabets with fun. In fact, it is not uncommon to see a child at this stage count 1-10 without being able to recognize any of the numbers or read A-Z even though he/she cannot recognize any of the alphabets.

A quick review of the foregoing shows that the curriculum philosophy anchoring early childhood education in Nigeria is hinged on the concept of "pleasurable activity", hence, the NPE (2004) specifies that the main method of teaching at the pre-primary education level should be through play. This is consistent with the observation of Garvey (1990) which holds that a curriculum philosophy which is based on play might imply to us; (a) supply materials and toys, and (b) give the child time to interact with them and play. This implies that preschool curriculum should be based on the Whole Child principle. Inan (2009) while expatiating on the Whole Child principle draws on the findings of Bowe (2000) which suggest that to enhance the development of the child, the teacher should attend to, assess, and intervene in all the 5 domains, namely, the adaptive, cognitive, communication, physical, and social/emotional domains. Bowe asserts that "by looking at the whole child, the preschool special educator can help a child develop strengths — not just improve on areas of weakness". In every domain attention is given to the play concept. This "attention" is probably best explained with the analogy of the human brain which is likened to the computer memory in the central processing unit (CPU). If one gives the right command, it does what one desires the right way. If one gives a wrong command, it either produces negative results or refuses to do anything at all. In like manner, if one

overloads the brain (a child's brain) with information, it gets confused and ends up reproducing nothing. Therefore, it is imperative that the adult positioned to educate/train young minds understands the children and allows them to develop at their own pace with some assistance.

Along this line, Ojuederie (2007) contends that: While it might be convenient to make a naturally intelligent child to assimilate much within a short time, it is dangerous to do the same with a less intelligent child without putting the child in a confused state from which he/she may not be able to recover. It is germane to remark here that some parents and preschool teachers tend to push their tender children and wards too hard by making them to start serious learning between ages 2 and 4 years simply because early traits of intelligence is noticed in them. Some other parents/preschool teachers make their growing children and wards to read much more than their brain can assimilate because they are anxious to see the children climb quickly the educational ladder. Such parents/preschool teachers do their children/wards more harm than good. A retrospective look at the evolution of early childhood education across the globe could be very profiting as regards the essence of preschool.

When two British sisters, Rachel and Margaret McMillan, opened the first ever nursery school for children between the ages of 2 and 5 years in 1911, the intention was to provide an environment that would enable the children develop well in physical and mental health. Emphasis was on providing adequate space (indoors and outdoors) for them to move and run around freely and develop naturally. It was felt that serious learning (academic work) at this stage could interfere with normal development process of a child. Overtime, similar preschools were opened in the Union of Soviet Socialist Republic (USSR), United States of America (USA) and France. The ideal learning age recommended by these countries ranged from 5 – 8 years. England prescribed 5 years, USSR, the Scandinavian countries, Czechoslovakia and the Netherlands prescribed 7 years, while in the USA it varied from state to state between 6 and 8 years. In England, for example, children of ages 5 and 6 are put in infant schools where they spend a great deal of their time playing, modelling and painting (Ojuederie, 2007). Learning proper starts at 7 years, at which stage an English child is expected to be able to read and write as well as do simple arithmetic of addition and subtraction of whole numbers. Even so, it was discovered that some 7-year-old children were unable to read and write in England, USA and several other countries (Ojuederie, 2007). This is obviously because of the varying level of mental development of the children as the level of development of the brain varies from person to person. However, as noted earlier, experience has shown that this is not the case with most early childhood education centres in Nigeria.

Repositioning Preschools in Nigeria: The Children's Theatre Approach

So far, "educational play" has been identified as a critical component in the wholesome teaching/training of preschoolers. The way it has been flagrantly undermined in many Nigerian preschools has also been examined. In this section of the paper, we shall conceptualize and canvass for the use of children's theatre approach in reinforcing preschool's curriculum philosophy of "educational play" and discuss the benefits there-from. Children's theatre is an educational instructional approach which focuses on development through drama; it is a relaxed kind of theatre that is geared towards developing the participants. Its main objective is to enhance learning and intellectual development rather than entertainment of the audience. Onyeisi (2006) rightly observes that while children's drama is informed by many of the ideals and practices of theatre arts, it is principally valued as a learning medium rather than as an art form that is governed and validated through criteria other than aesthetics. Its objectives are manifold. But they are all directed towards the growth and development of the participant (the children) rather than the entertainment of the observer.

As a recreational activity, children's theatre is an exciting aspect of Theatre-in-Education (TIE) which designates all group activities designed, structured and guided by a teacher or a leader to involve children in a process of creating, improvising and experiencing theatre or drama as an art as well as a learning tool (Iyeh, 2006). This participatory approach to teaching and learning with dramatic methods, creative innovations is best begun in the pre-primary education stage. In this connection, Duruaku (2003) observes that the tender age of children makes it the more compelling

that attention should be paid to the development of effective, cognitive, and psychomotor spheres of children's growth as they participate actively and observe processes and events in dramatic exercises which lead to learning. In fact, the concept of TIE is more of a classroom exercise and has no audience in the real sense. It is more of teaching than a distinct art. This art is essentially laced with learning activities. And, of course, this is what education should be all about at the preschoolers' level in Nigeria. This is in the understanding of the fact that the basic aim of education is to cultivate the full personality through the processes of discovery and fostering of natural talents in man (Iyeh, 2006).

Here lies the interface between education and the theatre (drama) as indicated by Vallins (1971) who posited that the general purpose of education is to foster the growth of what is individual in each human being, at the same time harmonizing the individuality thus educed with the organic unity of the social group to which the individual belongs. At the childhood education level, these "inherent talents" find expression when the preschoolers are engaged in theatrical activities such as dramatic skits and sketches, dancing, singing, mime or pantomime or other sporting activities that are not necessary workaday. Child development scholars affirm that spontaneous play stimulates creativity and develops a child's social, mental, and emotional skills (Awake!, 2004). Engaging in role playing activities or improvised dramas could be beneficial to children in a number of ways. It provides a child with the opportunity to use images and impulses to believe and adapt to his/her actions and the actions of others. Duruaku (2003) hinted this, though in a slightly different context, when he asserts that ordinary, drama refers to a play as one may see in a theatre; it can also refer to a story written for acting on the stage, or given space. Drama may also refer to the act of writing, acting or producing plays. It can also refer to a part of real life that seems to have been planned like a story or play. One thing binds all these together excitement and uniqueness of situation. It is because of this refreshing sense of uniqueness and excitement which the theatre brings we are suggesting that it should be used to strengthen the early childhood education curricula in Nigeria.

As an organized and scientific application of drama/theatre in formal educational communication, children's theatre involves young ones in creative dramatics which enables them to derive some benefits and values inherent in the art form. The following are some of the benefits that could be derived in reinforcing early childhood education with theatrical activities/children dramatics in Nigeria:

- **The development of individual personal resources**
Teaching through theatre would encourage the development of individual personal resources of preschoolers. These resources according to Vallins (1971) are those of sensory perception, intellect, imagination, powers of concentration, physical and verbal skills and emotional control. He goes further to contend that it is only through the theatre medium that all these resources could be brought into play and exercised in conjunction with one another. As the children grow they would develop worthwhile values and attitudes which in turn will enable them to have insights to basic principles and concepts of education and life.
- **Promotion of pupils' social development**
Social interaction is improved by theatre participation. Theatre requires team-work and close relationship with others through periods of stress, work and relaxation. Educational play as actualised through the instrumentality of the theatre stimulates interest and provides variety within and outside the classroom. The competitive spirit is also developed because the actors'/pupils' ultimate goals are to receive appreciation. Besides, using the theatre approach to train preschoolers would assist the teachers to learn, first hand, some of the complexities in the emotional, physical and social development of children.
- **Promotion of physical health**
Theatre/drama recreates the human body and mind. Hence, when preschoolers are constantly encouraged to learn the ropes of education and life through physical activities such as dramatization games, role playing, drawing and painting, merry-go-round activities,

improvised acting, rhyme recitation, singing, seesaw riding and so on, the experience got contributes to their physical fitness and creates joy and happiness in them

- **Development of creativity**
Creativity is inborn, but the discipline and order involved in creative work, be it improvised or not may be acquired within organized theatre programme as offered in TIE. This may have prompted Ebi (2005) to note that dramatic arts education is an important means of stimulating creativity in children. Preschoolers through the agency of drama could begin to use their initiative in the creation of art and things of beauty. A talented kid may not be able to activate his creative energy and direct it, but theatre participation brings the talent to the fore and gives it the opportunity for full expression even at the foundation level of education.
- **Moral and spiritual development**
Children's involvement in TIE helps them develop and improve their understanding and appreciation of morality. The level of an individual's attainment of sound moral personality depends largely on the attitude he/she acquires during his/her early childhood. Therefore, engaging children in creative dramatics activity helps them in developing moral and healthy attitudes towards themselves and others. For, example, the Holy Bible of the Christians emphasizes the importance of early moral training to child's personality development. It admonishes a Christian to "Train up a child in the way he should grow, and when he is old, he will not depart from it" (Proverb 22:6). At the preschoolers' level, theatre provides a fun filled template on which the moral moorings of children can be set.
- **Appreciation of who they are and the development of skills to cope with the wider society**
Children's participation in creative dramatics opens the windows of their mind towards the appreciation of who they are through the exploration of oneself, others as well as the larger world. Drama involves the re-enactment of life on stage as lived or imagined. In this case, drama has to do with collection of life experiences concerning human existence. As preschoolers, they could be guided on how to appreciate the importance of drama in understanding the world. Being a social activity, the theatre demands from the participants (in this case, children) a group sensitivity and group awareness which readily leads towards integration into the wider society. Overtime, a sense of self worth would become ingrained in the young ones as they deploy the acquired communication skills in peer relations as well as other social intercourses.

There is perhaps no more powerful tool than theatre to reach children. It taps into the instinct with which they are born, the instinct to explore by pretending - the instinct that, unfortunately, all too often is attacked by a world that pushes them to focus more on how they measure up than on who they truly are and can be. Through theatre all children are equal and free to explore. There are no wrong answers to fear and no competition to fall short of - only the chance to try on being someone else and, by doing so, to discover a little more of themselves. What a beautiful pedestal to start building the educational dream of all and sundry. However, it must be noted that the success of the theatre approach in supporting early childhood education depends largely on the teacher's imaginative and organizational abilities. He or she must assume the status of a life coach who must have tons of enduring patience which the children will often tax to the limits. The teacher must see his/her job as a helping profession so as to be able to instil confidence and make learning a fascinating challenge to children (Awake!, 2002).

CONCLUSION

This paper has examined early childhood education from the Nigerian perspective. It observed that many parents and preschool teachers/early childhood education facility providers in Nigeria tend to push their tender children and wards too hard by making them to start serious learning between ages 2 and 4 years simply because early traits of intelligence is noticed in them. While frowning at this untoward phenomenon, the paper lays the greatest blame at the doorsteps of the Nigerian government which has refused to play its supervisory, funding and inspection roles effectively at that level of education. It further backs up its claims by reviewing standard examples from other countries and submits that there is an urgent need to reposition the Nigerian early childhood education sector. As part of the panoply of strategies to comprehensively reposition the foundation levels of education in Nigeria, the paper suggested the deployment of drama/theatre which is a veritable instrument in the development of children, especially those at the pre- primary level whose curriculum philosophy revolves round the concept of educational play. Besides, an effective application of theatrical principles and concepts in teaching/training children promises to recreate, enliven and broaden the horizons of both the preschool teachers and pupils. This is aside the obvious fact that such a step is bound to positively rub off on other higher levels of learning.

REFERENCES

- Aluede, O.O., McEachern, A.G & Kenny, M.C. (2005). Counselling in Nigeria and the United States: Contrasts and Similarities. *International Journal for the Advancement of Counselling*, 27 (3): 371-380.
- Aluede, R.O.A. (2006). Universal Basic Education in Nigeria: Matters Arising. *Journal of Human Ecology*, 20 (2).
- Asaya, S.A, Ehigie, J.O. & Igbinoghene, N. (2006). *An Introduction to Pre-Primary and Primary Education Studies*. Benin City: Ambik Press.
- Awake! (2002). *Teachers: What Would We Do Without Them?* New York: Watchtower Bible and Tract Society.
- Awake! (2004). *A Child's Early Years: What Should Parents Do?* New York: Watchtower Bible and Tract Society.
- Bailey, D.B. & Wolery, M. (1992). *Teaching Infants and Preschoolers with Disabilities* (2nd edition). New York: Merrill.
- Bowe, F.G. (2000). *Birth to Five Early Childhood Special Education* (3rd edition). New York: Delmar Publishers.
- Caples, S.E. (1996). Some Guidelines for Preschool Design. *Young Children*, 51: 14-21.
- Duruaku, A.B.C. (2003). *Introductory Drama*. Owerri: Cherry Bren & Coy.
- Ebi, B.O. (2005). *Introduction to Theatre and Drama*. Benin City: Ava Graphics.
- Eduwen, F.O. (1994). *Essentials of Guidance and Counselling*. Benin City: Ambik Press.
- Encarta (2009). *Microsoft Student 2007 [DVD]*. Redmond, WA: Microsoft Corporation.
- Federal Government of Nigeria (2004). *National Policy on Education* (4th edition). Lagos: Nigerian Educational Research and Development Council.
- Gandini, L. (2002). The Story and Foundations of the Reggio Emilia Approach. In V.R.

- Fu, A.J. Stremmel & L.T. Hills (Eds.), *Teaching and Learning: Collaborative Exploration of the Reggio Emilia Approach*. New Jersey: Merrill, pp. 13-21.
- Garvey, C. (1990). *Play*. Massachusetts: Harvard University Press.
- Greenman, J. (1988). *Caring Spaces, Learning Places: Children's Environment that Work*. Redmond, WA: Exchange Press Inc.
- The Holy Bible* (n.d). (*Authorized King James Version*). Waynesboro: Gabriel Publishing.
- Inan, H.Z. (2009). The Third Dimension in Preschools: Preschool Environments and Classroom Design. *European Journal of Educational Studies 1 (1)*: 55-66.
- Iyeh, M.A. (2006). Developing the Child through Children's Theatre: Issues and Strategies. *A Paper Presented at the 20th National Convention and Annual General Meeting of the Society of Nigerian Theatre Artists*, University of Nigeria, Nsukka from July 11th - 15th. 2006.
- National Forum for Policy Development (2007). National Education Reform: An Alternative. *A Communiqué of the National Forum for Policy Development Workshop on National Education Reforms*, Issued at the Auditorium, National Universities Commission, Abuja on January 11, 2007.
- Ojuederie, B.M. (2007). *Tips on Knowledge Acquisition and Confidence Building*. Ibadan: Spectrum Books Limited.
- Onyeisi, R.V.O. (2006). Creative Dramatics as an Instrument of Developing Children's Personality. *A Paper Presented at the 20th National Convention and Annual General Meeting of the Society of Nigerian Theatre Artists*, University of Nigeria, Nsukka from July 11th - 15th. 2006.
- Vallins, G. (1971). Drama and Theatre in Education. In J.R. Brown (Ed.), *Drama and the Theatre with Radio, Film and Television: An Outline for the Student*. London: Routledge & Kegan Paul.

RE-EXAMINATION OF CHILD LABOUR FROM FEW UNNOTICED PERSPECTIVES

Dr. Steven Wind
Independent Researcher,
Arizona,
USA

Dr. Devajana C Nanjunda
National School for Advanced Study,
Kushalnager, Kodagu District,
INDIA
ajdmeditor@yahoo.co.in

ABSTRACT

Child labour implies that who are in the age group below 14 yrs and who work for themselves or for their family for an income and who contribute a significant share to the labour force of India. Child labour is more a rural phenomenon than an urban phenomenon in India. It is found that acute poverty and other reasons poor families send their children to urban areas for bread and butter. In urban areas, to survive in a cutthroat competition, manufacturers have lowered the real wages for adult workers in order to employ child workers on low wages. The problem is very much vast in its dimension. Children are forced to work in the most hazardous, unhygienic conditions, where they are vulnerable to many severe health problems. Child labour is an international evil. It requires cumulative efforts to wipe it out. Toiling long hours for a pittance, these little breadwinners accept exploitation as a way of life. This article gives a solid platform for debate with few unnoticed issues regarding child labour problem

Keywords: Child labour, labour force, efforts

INTRODUCTION

The issue of child labour has drawn international attention and condemnation since the 1970s. Criticism has focused on inhumane working conditions, impact on mental, physical and moral health, and lost educational opportunities. Over the last decade ILO has, while not abandoning its long-term goal of the complete elimination of child labour, increasingly emphasized the more immediate need of ending children's involvement in the most hazardous forms of work (Boyden 1997:201). Researchers have cautioned that effective solutions to child labour must situate the problem within the larger context of the economic decision making processes and survival strategies of poor households and have lamented the dearth of micro-level data in such areas.

However Only few studies have examined child labour in India from the perspective of household health maintenance with particular attention to household economic decision-making involving children's work, allocation of food and medical care within households having child laborers, and the perceptions of parents and children concerning the impact of work on children's health. The health and working conditions of children involved in varied types of work will be compared; working children and their siblings will be similarly contrasted along a number of health-related variables. Few study have further attempt to situate attitude towards child labor and health within a context of local cultural norms surrounding children and human rights.

The history of public concern about child labour significantly predates the industrial revolution, with some restrictions prohibiting the employment of children in selective dangerous areas of work having been enacted in Venice as early as 14th century. Historians give some evidence for the existence of child labour during medieval period of Indian History in India. However, the process of changing limited concerns regarding child labour in to broad social consensus was a slow one, involving much public debate during which the perception of the child gradually moved from one of a vial wage earner to that of a vulnerable individual to e loved and protected.(Weiner,1991). Protection of child laborers gained momentum with the establishing of ILO in 1919 and has continued strengthen with the adoption of a many international conventions, most important the UNO convention on the Rights of the Child in 1989 (Guptha, 1993). When calls for more intensive efforts to abolish child labour increased, the ILO and Other NGO's have increasingly acknowledged that regardless of Many conventions or laws of individual countries at least for the short-term the socio-economic realties of many developing countries, will continue to act as a push factor for the child involvement in the labour force and that economic enforcement of any child labour regulations (Boyden, 1988).

Hence this has led to programmes framed to improve working conditions and minimize the health risks faced by the working children while offering them additional opportunities for non-formal education and recreation (Narayana, 1988). While recent international efforts have focused both on ending exploitation of most vulnerable of children and all children's involvement in the most hazardous forms of work, conventions ending child labour have been criticized as leaving major part of definition of what constitutes hazardous work for children to cultural consensus in individual countries without recognizing that the definition may very by social group (White,1991).

Even as practical consideration have been the central force behind the modified emphasis of international child about remediation efforts, those efforts have also been pushed in new directions by growing social science critique of the philosophies underlying abolition oriented polices and programmes and the innovative approaches of some child welfare NGO's Social science critics contend that an universal conception of child development inform much of the international legislation, ignoring varied cultural meanings of age and developmental stage appropriate work as well as important socializing role of work(Khan,1991).They also asserted that concept of children's work must be geographically, temporally, and ethically deconstructed and historically situated giving attention to place ,era, generation and social class. Mohanty further asserted that given the socio economic realties of most developing countries, even if children were prohibited from working they would be unable to experience the kind of child hood envisioned appropriate in developed countries (Mohanty, 1999).

Number National child welfare NGO's have proposed a child-centered approach to research and interventions that explicitly acknowledge children's agency as a major element of the child labor conundrum. Utilizing innovative participatory and action research methodologies they have attempted to under stand child labour from the perspective of child conditions, and move forward a broad social agenda on issue affecting them (Guptha and Boyden, 1997) Concerned for Working Children (CWC) Bangalore based child worker advocacy NGO has trained working children in *participatory action research* methodology, with the trainees proceeding to gather data in their comminutes concerning child labour that they used to develop a children's policy agenda. Many Indian NGO's have expressed concerns about

additional strengthening of national and international restrictions on child labour. Also many NGO's have challenged the stereotype of child workers as helpless victims and the right of adults to speak for them while affirming their desire and need to be financially contributing members of their families (CWC, 2001).

Despite the recent proliferation of more realistic approach to child labour and the increased inclusion of children voice in the debate the dominant paradigms explaining child labour fail to adequately consider either the complexity of the phenomenon's causes or the health implications of its proposed abolition. Neoclassical economics driven poverty reduction approaches using the house hold as few unit of analysis fail to go beyond a conception of the house hold as a economically rational entity they situate child labour decisions within a more complex web of inter house hold decision making and power relations, socio cultural norms, and political economic factors. So they view the health of child workers as a segregated unit of analysis separates from their households in which they reside.

Although a political economic analysis of child labour provide a more realistic picture of the landscape within which child labour occurs, it fails to adequately examine the complex survival calculus of house hold economic and labour decisions, does not include consideration of house hold allocation of resources, and in general does not give proper attention to the relationship between child labour and family health outcomes. "A medical anthropological conceptual frame work that has been proposed to overcome the limitations of individual level analysis of health outcomes is known as house hold production of health (HHPH). HHPH proposes that household harness its resources in combination with a range of available medical service to produce good health for house hold members. The HHPH frame work realistically situates the choice made within the constraints of a large political economic environment"(Mosely, 1994- Internet Article) In addition to the need to consider gender as an important variable influencing access to health-producing resources within households, research has demonstrated that the relationship between productive ability and resource entitlement also has special implications for the study of child labour.

The information presented above illustrates why child labour may be plausibly viewed as a resource used in household health production as well as potentially one of a number of independent variables influencing inter household resource allocation. However, it is equally vital to look beyond the household level of social organization to identify community norms and practices concerning both work and children. To succeed in the short-term in removing children from the most hazardous forms of work will require culturally and geographically specific data concerning how communities classify particular types of work as being appropriate for different age groups, how they judge the degree of risk associated with each type of work, and how community social and economic resources can be mobilized for remediation campaigns and an examination of community norms influencing child labour practices must additionally consider community perceptions of human rights, specially the rights of children (Khan,1999)

Also social scientist asserted that the implementation of human rights should have more easily operationalizable norms and there should be flexibility of mechanism in implementation. More over the implementing mechanism should be culturally and geographically specific. Anthropologist Wilson say "local interpretation of human rights doctrine draw on personnel biographies, community histories, and on expression of power relations between interest groups their relation ship to formal, legal versions has to be discovered not assumed"(Wilson, 1997).

As a global solution to eliminate child labor, development experts are now proposing a standard based on the sanctity of the nuclear family on the one hand and the school on the other as the only legitimate spaces for growing up. If this becomes a universal standard, there is a danger of negating the worth of often precious mechanisms for survival, and penalizing or even criminalizing the ways the poor bring up their children. This criminalization is made more malevolent as modern economies increasingly display their unwillingness to protect poor children from the adverse effects of neoliberal trade policies'.(Thomas Offit, website article)

POLICY SUGGESTION

Any new proposed research study should examine the health status of children, working in hazardous sectors within the broad context of house hold livelihood strategies. The major objectives of any such research study may be to explore whether working children's contributions to house hold income differentially affect their access to health related resources and to find out and compare how a spectrum of work related dependent and independent variables are determined as impacting health of children working in hazardous industries. Also it must focus to reveal the perception and traditional practice of concerned households within a broader framework of community norms regarding childhood as inseparable part of a life phase, the human rights and rights of children. More over research should also adds to the general knowledge base of how community evaluates the risks associated with the children occupation, enlightenment crucial to promote global effort to immediately remove children from the most hazardous forms of work. Also any research needs to document ways in which universalistic conceptions of children rights can be operationalized within culturally divers setting.

Conclusion

While the study of child labour covers wide range of theoretical and geographic territory, India's standing as the country with the world's largest child workers population has made it the focus of a substantial proportion of the social science literature examining the issue's economic, socio-cultural, and health aspects. Only little work, however, has entailed in-depth consideration of the comparative emic perspective of child workers, the parents of such workers, and members of the communities in which they reside. Any proposed research should contribute to filling that gap in our anthropological understanding of child labour in urban India.

REFERENCES

- Ashok K, Srivastava (1998). Child Development: The Indian perspective, New Delhi, publication division, National Council at global computers.
- Boyden 1997. The elimination of child labour: Whose responsebility, , Sage publications New Delhi
- Burra N (1995). "Born to work: Child labour in India", Oxford University Press.
- D'Souza A (1995). Children in India-critical issues in human development, New Delhi, Social Institute.

Dabla BA (2006-2007). Life conditions of child labourers in the handicraft sector in Kashmir, report prepared for ICSSR, New Delhi.

Guptha, 2001 conditions of child labourers in the handicraft sector, EPW Vol 2 No 12 pp 56

Mohanty, (1999). Child as Human Resource-Policies and Approaches, New Delhi, Sarup and Sons.

Nieuwenhuys O (1994). Children's Lifeworlds: Gender, Welfare and Labour in the Developing World, London, Routledge.

Pati RN (1989). Rehabilitation of Child Labourers in India, New Delhi, Ashish Publishing House.

Sanon S, Chandragupt (1998). Working Children: A Sociological Analysis, New Delhi, APH Publishing Corporation.

Shukla CK, Ali S (2006). Child Labour: Socio-Economic Dimensions, New Delhi, Sarup and Sons.

Khan, 1999. Child Labour in India: Socio-Economic Perspectives, Delhi, Shipra Publications.

Singh AN (1996). The Child Rag-Pickers: Socio-Economic Perspectives and Intervention Strategies, Delhi, Shipra Publications.

Tripathy SN (1996). Child Labour in India: Issues and Policy Options, New Delhi, Discovery Publishing House.

White, G (1991). Child labour : A Global issue, BHJ Publications ,USA

Wilson, (1997). Socio-Economic Perspectives and Intervention Strategies, SDF Publication New Delhi

DEVELOP HUMAN CAPITAL THROUGH MUSIC EDUCATION IN MALAYSIA

Mubin Md Nor

Ipoh Teacher Training Institute, Ipoh

MALAYSIA

mubin_nor@yahoo.com

ABSTRACT

Music and art are two distinctive subjects which contribute towards the development of human interest in creating and upgrading human capital development. For us Malaysian, this subject is often considered as an optional. Vision 2020 sees towards the development of human capabilities among Malaysian and music education is seen one of the way to prove to the public that music has the mean to strengthen and develop human creativity and cognitive. The increase of crimes committed in our society and individualistic attitude of our people today, show that something must be done to change the mentality of the people so as to be more loving and caring towards man, nature and of course the universe. From the research done it has been proved that music education is able to develop the potentiality of the student and is equally important as other core subjects. To all music educators it is time to change public's perception that music is important towards the development of human capital, integrity and good value. This paper will discuss the retrospectives of music educators, administrators, and community in this present world setting.

Keywords: distinctive, human capital, vision 2020, integrity, good value

INTRODUCTION

Quiet often parents are not very happy when their children get involved with musical activities in school as they are afraid this will affect their children overall performance in the other important subjects such like Malaya language, English, Math and Science. In Malaysia the teacher of music in Primary or secondary schools do quiet often face with the problem and such teacher should be able to explain to the parents the important of music in children's development so as to make it more appreciative and acceptable to them. Many researches done by educators from the west show music is related to develop student's potential and also increase their performance in core subjects than students who don't take music as a subject. Konrad (2000) found higher achievement grades in history, and also significant increased in positive social behavior, including helping and sharing, increases in empathy for others, and beneficial attitudes including reduce prejudice and racism.

Malaysian Music Curriculum for primary school has been implemented since 1983 and for secondary school in 1988. Many issues cropped up when this subject was first introduced to the primary school. Discussions on these issues are still on and hopeful teaching a music is still in primary school curriculum among many other subject that have been introduced. In Secondary school music subject should be a continuation primary school including Malaysians traditional music which has been considered as our own heritage. A sample from one school which implemented music education showed that students who take music as a elective subject had shown good performance in the national exam conducted by Malaysian Ministry of Education in year 2004. In this paper I will discuss about the importance of music to develop student's potential and bring our society to be more critical and understands its importance in development of human capital.

Balkwill, L.L and Thompson, W.F. (1999) found music is highly powerful in communicating emotion and setting moods. They found the listeners were highly sensitive to emotional message, despite the fact that they are completely unfamiliar with the type of music. The findings suggest that music's power to communicate specific emotion is not merely cultural but reflect more basic human processes. *Bygrave, P.L. (1995-1996)* found music will improve children in learning new words. The findings suggest that music may be an effective learning medium for aspects of language development especially for student with reading problems.

Isreal Eady, Janell D. Wilson (2004) found music students able to develop self esteem, creativity and also show good result in other subject.

The scenario of Malaysian Music Education Primary and Secondary.

Malaysia's music curriculum in primary school is known as New Curriculum for Primary School and has been implemented since 1983 and in secondary school as Curriculum for Secondary School has been implemented since 1988. There is a reason to making music as a subject and for Malaysian this is the foundation to develop the philosophy of National Education in developing human intellectual, emotion, and physical.

The content of the music curriculums in primary school include the aspect of esthetic perception, musical experience, creative expression, and appreciation artistic. Secondary music curriculums content added with traditional music, playing instruments and wide experience for student to develop their skill in music. These are divided into two, lower levels for form one to three and upper level are form four and five.

In Primary school music is in the school time table and there are not many problems to face because music subject is available for student to learn from standard one until standard six. Where as, learning music in secondary school is elective and students have to make a choice. When the students finished their national examination in Penilaian Menengah Rendah, they will face with common problem of registry music as a subject for their examination because the package in Malaysian open examination does not include music. There are other problems faced by music subject such as:

Administration – lack of supervision of the implementation and management of music

in the schools, music classes held outside of school hours, time allocated for music classes being used for other subjects, lack of support for music, needed acknowledgement recognition for music teachers who often have to work above and beyond the call of duty, allocated funds for music spent elsewhere, in effective selection of students into the music program in secondary schools, problematic practices in placing Music teachers in schools, administrators who neither understand not know the nature Of music, and teachers who have been trained to teach music are assigned to teach other subjects and not music.

Society's perception of music – music is not considered to be important because it is not an examination subject, less convinced with music's goodness, music learning does not require music education, parents do not encourage their children to attend music classes or rehearsals, does not understand music, considers music to be only for entertainment purposes, and lack of supervision of music teachers' teaching.

Music teachers – questionable criteria for selecting music teacher candidates, unskilled and inexperienced music teachers, who are neither committed nor skilled in teaching music, need to include more subjects to improve their musical skills, and need to showcase their abilities

School music curriculum – should not exist to just produce musicians or focus on the playing of an instrument, should include Malaysian music, poor foundation in the primary schools for the secondary school music curriculum, and problems with the SPM music format and lack of resources.

But this is the common issues that has been discuss all over the country. What about the benefits in music education.

The benefits of music education

There are lots of benefits thru learning music which enable a person to achieve success in his or her life time.

Four categories benefits such as: a) Success in society, b) Success in school, c) Success in developing intelligence, and d) Success in life

Success in Society

Perhaps the basic reason that every child must have an education in music is that music is a fabric of our society. U.S. Department of Education (1997) list the arts including music subject contribute significantly to children's intellect development.

Grant Venerable (1989) the very best engineers and technical designer in the Silicon Valley industry are nearly wide exception, practicing musicians. Secondary student who participated in band or orchestra reported the lower set lifetime and all substances (alcohol, tobacco, and drug). Texas Commission on Drug and Alcohol act January 1998. Michael Greene(2000) music is a magical gift we must nourish and cultivate in our children, especially now as science proves that and education in the arts make better math and science students, enhance spatial in newborns and lets not forget that the art are a compelling solution to teen violence, drug and other.

When students became one of the community they will apply what they have been learned in school period. In this critical time they have to survived in their own life otherwise they will troubled the community. Music education as we know developed student to emulate good value, and positive character to succeed in community and hence benefit the nation.

Success in School

Success in society of course is predicated on success in school. Skills learned through the discipline of music, communication skills, and cognitive skills useful in every part of music curriculum. Through participation helps student learn to work effectively in school environment without resorting to violent behavior. Graziano, Amy, Matthew Peterson, Shaw (1999), a study of 237 second grade children used piano keyboard training and newly designed mathematics demonstrate improvement in math skills. The group scored 27 % higher proportional math test than children that used only math software. Catterall, JamesS, Richard Chapleau, and John Iwan(1999) in an analysis on more than 25000 secondary school (NELS:88, National Education Longitudinal Survey) found that students who reach high levels of involvement in instrumental music over the middle and high school years show high level mathematics proficiency. Student with experience in music performance and music appreciation scored higher points in verbal and math than did the students with no arts participation. Phi Delta Kappan(1994), Physician and biologist Lewis Thomas studied and 66% of music student who applied to medical school gain admission.

This means music student are always brilliant and I hope school managements of will give greater attention to music student in future and to make sure that the selected student must be bright intelligent and with right aptitude to be place in music class.

Success in Developing Intelligence

Success in school and in society depends on array of abilities. This burgeoning range of data long established base of anecdotal knowledge to the effect that music education makes kid smart new and especially compelling, however is a combination of tightly controlled behavioral studies groundbreaking neurological research that show how music actively contribute to brain.

Shaw, Rauscher, Levine, Wright, Dennis (1997) in their research exploring the link between music and intelligence reported that music trainers superior to computer instruction and enhancing children in learning math and science. Gadnier, Fox Jeffrey and Knowles (1996) students in two school showed improvement in reading and math skill after given an enriched with music program opposite the student the control group. Weinberger, Norm (2000) pianist and non –musicians of the same age are required to perform complex sequence of finger movements. Their brains were scanned by “ f MRI” (functional magnetic resource imaging) which detects the activity levels of brain non–musician were able to make the movement as correctly as the pianists but less active at making skill movement. These findings show that musical training can enhance brain. Costa-Giomi E (1999) found that pattern recognition and mental representation scores significantly for students given piano instruction over three year period.

From all these research we can't deny the fact that music could develop the student's cognitive and for those who are still doubtful with this subject, this is the time to stand up and give full support .

Success in Life

Each of us wants our children to achieve success in employment and success in social structure. Participation in music during the formative school years bring benefits to student may be in their spiritual, physical or psychological development. Frederick Tims (1999) music makes the elderly healthier. From the finding results music develop hormones in the immune system and decrease stress. Another individual that love music in his schooling is former President of United States, Bill Clinton who said music is about communication, creativity, and cooperation and by studying music in school the opportunity to build on these skills, enrich their lives, and experience the world from perspective. The United States top business executives agree that music and art education can help American education and prepare workers for the 21's century. Studying music and art elevates children's education, expands student and teaches to appreciate the wonder of life.

For us as music educators we have to defend our subject than denying its importance. Ramona (2005) in her paper mentioned that there is still space for music subject to survive in Malaysia school Curriculums. Several suggestions have been made to regarding this subject and as music educators we should support it.

SUGGESTIONS

Suggestion to Policy Makers

There are several suggestions and add value to policy maker, with this suggestion they (music educators) hope a bright cloud will appear.

1. The role of the Malaysian Association for Music Education (MAME) organizing more frequent conferences, creating active chapters of MAME in each state, appointment of an influential patron, inclusion of professional musicians as members, religious scholars and academician members, creating a bill of rights for music education in Malaysia, cooperation with the mass media, student teacher exchange, ensuring information gets passed on to all music educators, and

creating a networking community. As we all know Malaysia have been organized World Music Education Conference in July 2006 and motivate our music educators.

2. Administration should have a blueprint for music education, consistent and periodical monitoring and supervision of music in schools, coordination between the various divisions and institutions involved in music education such as the Curriculum Development Center, Education Administration, teacher training colleges, institutions of higher learning which offer music education programs, the need to have a designated music officer of sufficient authority and rank at the Ministry of Education, to uplift traditional music by sending would-be music lecturers to study in Eastern Asian countries, introductory and music appreciation courses for administrators to enable them to understand and better administer music, reducing bureaucracy, implementation of a policy for music teachers to teach only music, the placement of teachers to be conducted by the state music supervisors and not the School Division, a mini orchestra in each school, making formal music education available to artistes, Ministry of Education's uplifting of music's status, explaining the career opportunities in music, providing parents with knowledge of music in order to gain their support, and no more floating classes.
3. Curriculum implementing music as an examinable and core subject in schools, music across the curriculum, inclusion of Islamic arts and music civilization elements, music included in the vocational stream, expansion of the scope in music learning and teaching, systematic implementation of the music curriculum, balanced curriculum in terms of Western and Eastern elements, industry and corporate input, less examination oriented, curriculum scope needs to be reduced and more focused, curriculum review to meet current needs and developments, multimedia usage in all schools, implementation of music in all secondary schools, providing opportunities for students to achieve their musical potential, and music in schools to be taught in English if the teacher think it's necessary.
4. Music teachers enforcing more stringent entry requirements into music education programs at institutions of higher learning, appointing an expert music teacher in each state, producing music teachers with areas of specializations, introduction of a professional body for music teaching/profession, professionalism courses for music teachers, increasing intake into music teacher training programs, emphasis on methodology in music teacher training programs, comprehensive usage of technology, all music teachers to have higher degrees, and creating incentives/special allowances and a special award for music educators.
5. Resources and facilities make available more music texts, teaching materials, and local arrangements, documentation of music materials and composition, creating a fund for music, scholarships to music students, monitored distribution of monies, lower fees for private music instruction, abolishing taxes on music instruments purchased for educational purposes, cheaper music books as well as offering subsidies to publishers of music books, and obtaining copyright ownership of overseas publications.
6. Mass Media a music education slot on television radio, and mass media's role in promoting folk/Malaysian traditional music. These suggestions need tremendous effort to implement and there is a reason for all music educators be involved and do continuously fight for its glory if these suggestion are to reach the policy maker's door.

Suggestion for Music Educators

As educator we should have a strong spirit and act independent to make our subject relevant in Malaysia prime curriculum. What ever problem arise we should face and never give up. With determination and support we may be able to form our music educator community; educators involved in this subject should put their hand together to become one voice. Thus in globalization, has consistently been referred to the cross border internationalization towards producing, marketing and

exchanging of goods and service in the context of world wide economic system. Economic are dominated and the role of the information and communication technologies, developing human capital not such easy than before. Like a tidal wave this impact for human activity not only knowledge, disciplines, human behavior, culture and civilization but all spheres of human endeavor. Music education also has to parallel with this situation otherwise will be left behind while competitive subject will be introduced in Malaysian school curriculum. Hence attitude and mind of music educators should be changed, towards positive thinking; self esteem and get ready to take a challenge in millennium years. Furthermore, when music teachers are posted to the rural area with poor infrastructures and facilities, they still have to teach music to the rural student's. The teachers might use their creativity to develop music in the school, using local materials, such as their cultural music or whatever music that can be used as teaching and learning process. There are many of challenges which the teachers or educators have to face. Use the 'tool' from knowledge, experience, creativity, motivation and all the capability of the teacher to overcome the situation at the place working.

Community Perception and their suggestion

Image and reality have powerful implications for music education. Image and reality have a reciprocal relationship, each influencing the other in a somewhat circular way. The image is interpreted by the public about music education. Ramona (2005) in her presenting research paper among the music educators' perception and the most responses were recorded on the three areas of the status of music education the need for awareness of the importance of music education, and music teacher issues. In the first area, the comments most often made was that music is perceived by Malaysian society in general to be an unimportant, "second class", and a non-academic subject. In the second area, delegates stated that there was a lack of awareness on the value of music and in the third, that there is a shortage of able, experienced, and suitable music teachers in Malaysian schools.

It is important that the public receives the image that is intended. Suggestion for this issue is that music educators must developing skill in public relation and effective image to attract public attention. The image must be designed to accentuate the positive value and conceal significant negative. Music educators must reflect reality and the reality to be worthy of the public support. This means that we have to control both of the reality and of the image making process.

Although there are no reliable data what current images of music education are, we live in a time in which image reigns supreme. The public may begin to believe the image makers, in the best instance, music education will survived and the image projected will accurately reflect those capabilities.

CONCLUSION

Music Education is facing many critical issues and is still strong to compete with other subjects in Malaysia Curriculum. The music curriculum is the frame and guide line to teach music, but the most important reason is how music educators play their role to make music subject a reliable subject to be taught in every school in Malaysia. The challenge for educators are to make up their mind towards the reality when they are teaching in urban or rural school. Music educators must be responsible to teach music as a subject in school. If a qualified music educators refuses to teach when places in respective school, this subject will face difficulty to survive in Malaysia Curriculum. To the music educators who are struggling and fighting for the implementation of music in Malaysia curriculum, we should salute them for their hard works and undaunted spirit to develop subject through teaching and instructing where ever they may be in our country.

REFERENCE

Anyhony Seeger (2004). Music Education as a Means of Preserving and Indigenous Culture. International Music Education Policy Symposium Minneapolis Minnesota. April 17-18.

- Bygrave, P.L. (1995-1996). Development of receptive vocabulary skills through exposure to music. *Bulletin of the Council for Research in Music Education* 127, Winter, pg 28-32
- Cateteral, James S. Chapleau and John Iwan (1999). *Involvement in the Arts and Human Development: General Involvement and Intensive Involvement Music And Theater Arts*. Los Angeles: The Imagination Project at UCLA Graduate School and Information Studies.
- Charles H. Ball (1992). Image and Reality in Music Education. *Design for Art In Education*. Vol 93, Issue: 4
- Costa-Giomi, E(1999). The Effect of three years of piano instruction on children cognitive development. *Journal Research in Music Education*. 47:3, 1982-213.
- Texas Commission on Drug and Alcohol Act Reported in Huston Chronicle. January 1998
- The College Entrance Examination Board, (2001). College-Bound Seniors National Report SAT Programs Test Taker. Princeton, NJ.
- Frederick T. (1999). Human growth hormone is implicate pains. *AMC Music News*, June 2.
- Gardner, (1985). *The Mind's new science. A History of cognitive revolution*. New York: Basic Book.
- Gardiner, Fox,Jeffrey and Knowles(1996). *Nature*. May 23 1996.
- Grant Venerable (1989). *The Paradox of the Silicon Savior. The Arts in the Basic Curriculum*. New York.
- Graziano, Amy, Matthew Petterson, Shaw (1999). Enhanced learning of proportional math through music traning and spatial tempora. *Neurological Research* 21.
- Isreal Eady, Janell D. Wilson (2004). The Influnce of Music on Core Learning. *Music Education Journal*, Vol 125,
- Johami Abdullah (1993). *Pendidikan Muzik Semasa*. Kuala Lumpur: Dewan Bahasa Pustaka.
- Johami Abdullah(1989). *Formal Education in Malaysia: An Overview*. Kuala Lumpur: Maktab Perguruan Ilmu Khas..
- John H. Mueller (1954). *The Basic Concepts in Music Education*. Chicago: University of Chicago Press.
- Konrad R.R. (2000). *Empathy, Arts and Social Studies*, Dissertation Abs. Human 7 Soc. Sci, 60, pg 2325.
- Michael E. DeBakery (2002). *Music Education Fact and figures*. MENC.diperolehi Ogos 29,2005 daripada <http://www.menc.org/information/advocate/fact.html>
- Ministry Of Education(1980). *Laporan Jawatankuasa Kabinet Mengkaji Perlaksanaan Dasar Pelajaran*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
- Rausher F.H. (2003). Can Music Insruction Affect Children's Cognitive Development ? *Educational Research Information*, 34,166. EDO-PS-03-12
- Rausher, Shaw, Levine, Ky and Wright (1994). *Spatial Task Performance: A Casual Relationship*. California: University Of California.

Paul R. Lehman (2004). Music Education and the Quality of Life. *Journal of Research in Music Education*, 46(2), 173-181. EJ 612202

Ramona, M. T. (2005) A Qualitative Review of Music Educator's perspective on the present and desired Future State of Malaysia Music Education. Paper presented at Malaysia National Education Conference 2005.

Richard, (1999). U.S. Secretary of Education.

Shaw, Rausher, Levine, Wright, Deniss(1997). Training cause long-term enhancement of pre-school children's spatial temporal reasoning. *Research*, Vol 19. February 1997.

Sukatan Pendidikan Muzik, (1988). *Kementerian Pelajaran Malaysia*. Pusat: Perkembangan Kurikulum.

Weinberger, Norm (2000). The Impact of Art Learning. *Music Research* 7 (2) Neuroscience Letter: 189-93

U. S. Department of Education (1997). *Getting Ready for College Early: A Handbook for Parents of Student in Junior High School Years*.

SPECIAL EDUCATION IN PAKISTAN: IN THE PERSPECTIVES OF EDUCATIONAL POLICIES AND PLANS

Saeed Ahmad

Department of Education
B. Z. University, Multan,
PAKISTAN
maliksaedah@yahoo.com

Prof. Dr. Muhammad Yousaf

Department of Education,
B. Z. University, Multan,
PAKISTAN
education@bzu.edu.pk

ABSTRACT

Education is the most neglected social/service sector in most of the third world countries including Pakistan. Among education sector, the share of special needs education is too pathetic to describe. The educational and rehabilitation services provided to disabled children were not worth mentioning in Pakistan at the time of its creation. After independence, Pakistan had to face some serious challenges, due to which no proper emphasis was given to special education and even education. Among other reasons, lack of resources, financial as well as human, was the major one in this context. The need and importance of special education was felt in different educational policies of Pakistan in different times. At the first time, in its report, the Commission on National Education (1959) highlighted the importance of special education. After that the Education Policy (1972) and the National Policy and Implementation Programme (1979) gave some importance to this sector. The same was also reflected in different medium-term (five-year) plans. This was felt more seriously when the Directorate General of Special Education, Islamabad formulated a draft National Policy for Special Education in 1986 and revised it in 1988 to bring it in line with the emerging needs of special/disabled population. After that a special education policy was launched in 1999. Recently, Government of Pakistan has launched a new National Policy for Persons with Disabilities 2002, which is dynamically being implemented. The present study highlights the focus given to special education in the educational as well as special education policies of Pakistan and its reflection in different five-year plans.

Key Words: - Special Education, Educational Policies, Educational Plans.

INTRODUCTION

The importance of education for every person as well as every nation cannot be over-emphasized. Its importance is increased to a greater extent in case of persons with disabilities, as education can help them to adjust in the society. In special education, there are specially designed instructions to meet the unique needs and abilities of disabled children. Disabled children have conditions that adversely affect their progress in conventional educational programmes. Gifted children are those who demonstrate high capacity in intellectual, creative, or artistic areas, may perform poorly in regular educational programmes. Special education services can help both disabled and gifted children make progress in education programmes. However, only disabled children are taken in special education programmes in Pakistan.

The Government of Pakistan recognizes its responsibility to educate the handicapped pupils first time in the report of Commission on National Education, 1959. But the proposal to provide education for these children was not made until the Education Policy 1972-1980, and in the Fifth Five Year Plan (Pakistan Planning Commission, 1978), a modest sum was allocated to special education. In 1980s, much greater government involvement was witnessed and increased budgetary provision for special education, though

still insufficient, was made. During the Sixth Five Year Plan (1983-1988), the social welfare programme concentrated on strengthening existing institutions of social welfare and special education. In order to overcome organizational setbacks, the Federal Directorate General of Special Education with provincial counterparts was set up in 1985. Today a considerable number of special education institutions are functioning under the control of the provincial governments for the children having different disabilities. Recently, the special education institutions run by the federal government are devolved to the respective provincial governments in the consequences of the implementation of 18th amendment in the Constitution of the Islamic Republic of Pakistan.

Although the achievement in the form of services for the disabled children has been insignificant as compared to the need and problem of disability in the country, yet there is some hope for the future, and education is the best tool for enabling special children to take charge of their destinies. The present paper focuses on a review of the special education in Pakistan in the perspective of educational policies and plans.

The present study aimed at reviewing the efforts of the Government of Pakistan in the introduction and expansion of the services for the persons with disabilities. For this, the provisions of special education and related services were analyzed in the educational policies and five-year development plans.

OBJECTIVES OF THE STUDY

The major objective of the study as indicated above was bifurcated into following objectives:

1. To present a clear picture of special education services in Pakistan since its creation in 1947.
2. To provide a basis for decision making for the formulation of future plans and policies in the field of special education.
3. To give awareness to society, teachers and especially special education teachers about the special education services in Pakistan.
4. To highlight the shortage of existing educational facilities for disabled children in the country and to focus the need for more appropriate facilities.

METHODOLOGY

The present study was basically qualitative / descriptive in nature and based mainly on the review of related literature. The researchers followed the different methodologies for the present study such as consultation of libraries, review of related research journals, review of Government documents, internet surfing, etc.

SPECIAL EDUCATION IN FIVE YEAR PLANS

Historically, educational policy and practice in Pakistan has been influenced by the legacy of the British (1757 - 1947) (Fontana and Lari, 2006). A specific programme for the disabled persons named "Services for the Physically Handicapped" was included in the very First Plan of National Development (1955-60). However the programme could not be fully implemented due to lack of administrative support, funds, trained personnel's, etc. The programme had since been repeated in the subsequent four plans 1960 to 1983. In the Fifth Five Year Plan, a notable sum of 26 million was allocated for the purpose as compared to 2 million provided in the First Plan. The establishment of four model special education institutions for disabled children in Islamabad, under the Ministry of Health and Social Welfare, was an achievement of the Fifth Plan (1978-83).

In the 1980s, much greater government involvement was witnessed and increased budgetary provision for special education (though still inadequate) was made (Lari, 2006). During the Sixth Plan (1983-1988), the social welfare programme focused on improving existing institutions of special education and social welfare, both government and non-government. In order to overcome organizational setbacks, a Federal Directorate General of Special Education with provincial counterparts was set up in 1985 and the first National Policy for Rehabilitation of the Disabled was formulated in 1986 (Lari, 2006).

While quoting WHO figures for disability (10 to 15% of the population), and recognizing the need for special schooling and rehabilitative services, the Seventh Five-Year Plan (Pakistan Planning Commission 1988) noted that the existing facilities were few and inadequate. The facilities came under the Ministry of Social Welfare and Special Education (recently devolved), which is responsible for providing both special schooling and integrated and comprehensive rehabilitative services to children with disabilities.

SPECIAL EDUCATION IN EDUCATIONAL POLICIES OF PAKISTAN

Immediate after creation of Pakistan, a need was felt to organize the education system according to the requirements of newly born country. The responsibility of the Government to educate its handicapped pupils was recognized in the Commission on National Education (Pakistan Ministry of Education, 1959). But the proposal to provide education for these children was not made until the Education Policy 1972-1980 (Dani, 1986).

Report of the Commission on National Education (1959)

This Commission on National Education was appointed by a resolution adopted by the Government of Pakistan on December 30, 1958. It comprised of 10 prominent educationists / experts from various departments related to education. The President of Pakistan inaugurated the commission. The commission started its function with the inaugural address on January 15, 1959 and presented its report to President on August 26, 1959.

The Commission found that government should be responsible for "training of teachers who will serve the institutions for the handicapped" run by private philanthropists. The Commission focused the following major areas:

- i. For the education and rehabilitation of special children, it was felt that the professionals such as the doctor, psychologist, physiotherapist, etc must share with the teacher the responsibility for helping those children to achieve at least some degree of productive activity and a satisfactory adjustment in the society.
- ii. It was recommended that for almost all of the disability types, the general education should be combined with vocational education so that the individual may be equipped to earn his own living and trained to live cheerfully within the limits of his disability.
- iii. The responsibility of society for the education and other care of these children was highlighted in the report of the Commission. Owing to our limited resources, it was suggested to mobilize the community to accept its responsibility for the education of the handicapped.
- iv. Because the experience of other countries revealed that the actual care of handicapped children was suitably and effectively performed by the more personal medical and educational services of private philanthropic organizations, it was recommended to benefit from such organizations.

- v. To overcome the limitations of resources and to benefit the ability of private organizations, it was suggested that there should be a partnership between the Government and representatives of social organizations, to set up agencies specifically for the care of the several types of handicapped persons.
- vi. The Government suggested providing at its own expense and responsibility the highly specialized training of teachers to serve in the institutions for the handicapped. Initially, there should be at least one centre for the training of teachers for the blind and another for the training of teachers for the deaf and mute in our country. To take over such a programme, our personnel were suggested to be sent abroad for training and specialization.

The Education Policy (1972-1980)

In the Education Policy (1972-80), arrangements for special education for handicapped children were planned to make by opening new institutions and strengthening the existing ones, so that the handicapped children should be provided the opportunity to become productive and self-reliant citizens of the country.

Educational institutions, generally known as public schools and including such institutions as Aitcheson College, Lahore, wholly or partially financed by Government, were inaccessible to the poor students. For the education of gifted and intelligent children, it was decided that all public schools and institutions falling within the category would be taken over by the Government and converted into schools for the gifted to provide an enriched programme to gifted students, entirely free, drawn from all over the country without reference to their financial status or social background.

The National Education Policy and Implementation Programme (1979)

This policy was announced in 1979. In its foreword, the main purpose of the new policy was declared to recommend daring new effort for reconstruction of education in the country. Following were the major focus areas of the Policy.

Policy Statement

In the policy statement, education, treatment, institutional care and rehabilitation of the handicapped was stated important moral and religious obligations as a nation. According to the policy, the handicapped citizen should be so rehabilitated as to enable them to enter the main stream of national life.

Rationale

The policy document admitted the fact that there were great efforts of the philanthropic organizations for the progress made in the field of special education in the country. As the private organizations were limited in resources and ability, hence coordination among similar organizations was not easy. The institutions for special children established by the Government were inadequate in terms of teachers, equipment, books and other physical facilities. The Policy recognized that the Government would be failing in its responsibilities if it did not assume direct charge of education and rehabilitation of the handicapped.

Programmes

The following programmes were proposed in the policy regarding the education of the handicapped children:

- i. Survey of existing facilities for education of the handicapped in all the four provinces.
- ii. Identification of institutions, which had the potential of becoming national institutions.
- iii. Development of National Demonstration Pilot Projects for Education of the Disabled and Handicapped.
- iv. Development of projects for identifying needs for strengthening existing institutions for the disabled.

It was proposed that the educational programmes for the handicapped children would include provision of general education together with the vocational education of the right type so that the handicapped persons did not grow up as a burden on the resources of the nation but could be directed into productive activities.

As there was only one school in Pakistan to train teachers for the deaf and dumb schools, it was planned to provide such institutions for the handicapped at government's expenses. One teacher-training institute for the deaf and dumb would be opened in Sind and another for Blind in the Punjab.

The efforts of the philanthropist organizations were proposed to support, supplement and coordinate by the government in opening more special schools in the communities and strengthening the existing ones. Active involvement of Health, Social Welfare and Industry would be sought to prepare and launch integrated programmes for the handicapped. The curricula and syllabi of special education were also to be made in according to the needs and requirements of the disabled persons as well as society.

SPECIAL EDUCATION POLICIES

As an initial step the Directorate General of Special Education formulated a National Policy for Special Education in 1986 and revised it in 1988 to make it more appropriate for the emerging needs of special population. After that, a special education policy was launched in 1999. Recently, Government of Pakistan has launched a new National Policy for Persons with Disabilities 2002, which is dynamically being implemented.

National Policy for Rehabilitation of the Disabled, 1986

The United Nations declared 1983-1992 as the Decade of the Disabled, which brought into focus the need to formulate a national strategy to deal with the problems of the disabled of all categories. Thus, the Ministry of Health, Special Education and Social Welfare envisaged the National Policy for Rehabilitation of the Disabled in December 1986, and this was in fact the first policy on special education in Pakistan.

The National Policy, 1986 was primarily concerned with issues such as organizing services for the disabled and the implementation of programmes, and paid insufficient attention to the critical matter of the curriculum.

A review of the 1986 Policy was undertaken in 1988 that refereed to a category-based system of special education in Pakistan. The five categories of special needs education were identified in the policy. According to a survey conducted in Islamabad/Rawalpindi, the distribution / percentage of the five different disabilities were: i) Mental disability 21% , ii) Visual impairment 15% , iii) Hearing impairment 9% , iv) Physical disability 33% , v) Multiple disability 19% , and vi) Not classified 3%

The National Policy for Special Education, 1999

After the National Policy for Rehabilitation of the Disabled (1986), the Government of Pakistan formulated another policy on Special Education in 1999. The National Policy for Special Education (1999) recognized that the process of rehabilitation for many people with disabilities was an on-going one. It focused the need for change in public attitudes to the disabled and the crucial role of media in highlighting the successes of persons with disabilities. The policy also proposed some monetary concessions to be made for the disabled as well as providing them with legislative support.

National Policy for Persons with Disabilities, 2002

National Policy for Persons with Disabilities (2002) was the first full-fledged National Special Education Policy to fulfill need for the education, rehabilitation and care of the disabled both by government and by the private sector. In the policy, the provision of special facilities for the education, training and rehabilitation of disabled persons was regarded as being of central importance concerning the rights of a significant percentage of our population.

The goal of the policy was the empowerment of persons with disabilities, irrespective of caste, creed, religion, gender or other consideration for the realization of their full potential in all spheres of life, specially social, economic, personal and political.

The policy was formulated with a background of information about the number of disabled persons in Pakistan based upon the WHO estimates of 10% of the population and upon more detailed information provided by Pakistan-based studies including the National Census, 1998. The National Census Report of 1998 however indicated a low estimate of 2.49% of the total population, based on the reported cases of persons with disabilities. The distribution of different disabilities within the defined population of disabled persons, as indicated by the 1998 census, provided a valuable guide for planning programme Physically Handicapped (19%), Mentally Handicapped & Insane (14%), Multiple Disability (8.21%), Visually Impaired (8.6%), Hearing Impaired (7.40%), Others, not classified but included as disability (43.33%)

Areas of Focus and Special Attention

Following are the focus areas of the National Policy for Persons with Disabilities, 2002.

Early Intervention, Assessment and Medical Treatment

The goal of the policy was the empowerment and rehabilitation of persons with disabilities for the realization of their full potential in all spheres of life. To achieve the goal, prevention, detection, early intervention, guidance and counseling, etc. was proposed in the policy.

Education and Training

Pakistan has made significant progress in all related areas since the establishment of Directorate General of Special Education (DGSE) and National Trust for the Disabled (NTD) at the federal level in eighties. The provincial governments and NGOs joined the movement and initiated special projects. At the International level, the movement towards making special education an integral part of education has been gaining acceptance. Therefore, integration and mainstreaming of children with disability in normal system of education should be promoted at all levels. Following measures were proposed for to achieve the goal:

- provision of special aids and equipment,

- alignment of policies between the federal, provincial and district governments at the level of relevant ministries and departments,
- changes in curriculum in collaboration with relevant departments/agencies, and
- provision of specialized aids and equipment.

The existing system of post-graduate training in special education at the university level was planned to further strengthen. The training institutes like National Institute of Special Education (NISE) was proposed to further strengthen their programme of Teacher Training and Research to improve special education services. Similarly, the number of training institutions available for occupational therapy and physiotherapy were planned to increase along with training centers for speech therapists and other relevant professionals.

Vocational Training, Employment and Rehabilitation

Vocational training, employment, and rehabilitation of disabled persons were the main focus areas of the National Policy for Persons with Disabilities (2002). To achieve the target, the policy concentrated on the use of information and assisting technology, self-employment. It was planned to give incentives to employers for the provision of employment to disabled/special persons.

Research and Development

Both academic and applied research was planned to encourage for the benefit for persons with disabilities both at the federal and provincial levels. Efforts would be made to enlist the interest and support of the universities and other organizations particularly in the areas of medicine, social work, psychology, vocational training, engineering and technology.

Advocacy and Mass Awareness

To create a positive public attitude towards the persons with disabilities, the positive images of the persons with disabilities was planned to highlight by the projection of their success stories through mass media. All possible channels, at community as well as media level, are also planned to utilize for the creation of public awareness about the nature and types of disabilities and the need for community support for their identification as well as rehabilitation.

Sports and Recreation

Provision of appropriately designed sports and recreational facilities for children with disabilities and adults were planned to undertake in collaboration with all public and private authorities. Each district/local authority was expected to ensure that budgetary provisions to enable groups of persons with disabilities to establish clubs for sports and recreation and to provide appropriate free premises.

Design of Buildings, Parks and Public Places

The safe and easy access of persons with disabilities in public places / buildings was planned to ensure by introducing the codes of practice for the design of new public buildings and for the adaptation of existing premises. For this, it was planned that designs of public buildings will be prepared with the consultation of the Ministry of Social Welfare & Special Education, which provided specifications for such aspects of those buildings used by persons with disabilities such as ramps, lifts, toilets etc. Accessibility to other buildings of public use also requires special designing to facilitate easy approach for persons with disabilities.

Institutional Arrangement/Mechanism

The policy proposed the following institutional arrangements for its successful implementation.

- i. As the role of Federal Government in meeting the needs of disabled persons is very important at national level, the present support level of the federal government for efforts in the field of education and rehabilitation of person with disabilities was planned to enhance. For this purpose, joint efforts of the concerned Ministries in addition to the Ministry of Social Welfare and Special Education were proposed to fulfill the objectives, laid down in this Policy.
- ii. The role of provincial governments is crucial in providing all the required facilities to a maximum number of persons with disabilities. Based on the needs assessment, the provincial governments are expected to draw up action plans for public and private sectors. Federal Government would also provide assistance in areas of curriculum development and research.
- iii. District governments are expected to enhance the scope of programmes for persons with disabilities. It was planned to include the introduction of the system of integration of children with disabilities in normal schools in the area of jurisdiction of the district councils and union councils in the local bodies system.
- iv. It was planned to seek community involvement, for which the establishment of voluntary organizations are planned to encourage. The resources of NGOs in the field of community social work were planned to be channeled in the direction of projects for the welfare and uplift of persons with disabilities.
- v. To be effective, rehabilitation requires the involvement of a wide variety of professionals, organizations and community at large. Involvement of "Special Friends" and voluntary support groups were planned to ensure.

CONCLUSION

The education and rehabilitation services for the persons with disabilities are not up to mark in the developing countries including Pakistan. At the time of Pakistan's creation in 1947, government efforts channeled towards nation building and educational provisions for children with disabilities were few in number. Yet non-governmental organizations (NGOs) provided services to a large number of disabled persons, mainly in the cities. In different educational policies of Pakistan, special education was given importance to some extent, but the same was not proportionate to the special population. It was also reflected in the subsequent national plans, but was not fully implemented due to different reasons. These include the lack of administrative support, funds, trained personnel's, etc. The government increased the focus on special education in 1980s influenced by some international events. These events include the International Year of the Child (1979), the International Year of Disabled Persons (1981), and the Decade of the Disabled (1983-1992). As a result, considerable number of special education institutions (still insufficient) was established and the full-fledged special education policies were formulated. It is need of the time to expand the special education services so that the maximum number of special population may be benefited.

REFERENCES

- Dani, A.H. (1986). *Educational Progress in Pakistan: Challenge and Response*, In *Bulletin of the UNESCO Regional Office for Education in Asia and the Pacific* No. 27. Paris: UNESCO.
- Fontana, D. and Lari, Z. (2006). *The Curriculum in Special Needs Education in Pakistani Schools*, Retrieved June 8, 2006 from http://www.internationalsped.com/documents/the_curriculum_in_special_needs_education.doc

Lari, Z.S. (2006). *Aspects of Special Education in Pakistan and Other Developing Countries*, York: Saturday Night Press Publications.

Pakistan Ministry of Education (1960). *Report of the Commission on National Education*. Karachi: Government of Pakistan.

Pakistan Ministry of Health, Special Education and Social Welfare (1986). *National Policy for Rehabilitation of the Disabled*, Islamabad: Government of Pakistan.

Pakistan Ministry of Women Development, Social Welfare and Special Education (1999). *The National Policy for Special Education*, Islamabad: Government of Pakistan.

Pakistan Ministry of Women Development, Social Welfare and Special Education (2002). *National Policy for Persons with Disabilities*. Islamabad: Government of Pakistan.

Pakistan Directorate General of Special Education (1986 a). *National Policy for the Education and Rehabilitation of the Disabled*. Islamabad: Government of Pakistan.

Pakistan Ministry of Education (1959). *Report of the Commission on National Education*. Karachi: Government of Pakistan Press.

Pakistan Planning Commission (1978). *The Fifth Five Year Plan 1978-1983*. Islamabad: Government of Pakistan.

Pakistan Planning Commission (1983). *The Sixth Five Year Plan 1983-1988*. Islamabad: Government of Pakistan.

Pakistan Planning Commission (1988). *The Seventh Five Year Plan 1988-1993*. Islamabad: Government of Pakistan.

PORTRAYAL OF SCIENCE KNOWLEDGE IN THE 'CHILDREN'S PAGE' OF TWO URDU NATIONAL DAILIES OF PAKISTAN

Dr. Masood Nadeem

Department of Applied Psychology,
The Islamia University of Bahawalpur,
PAKISTAN.
masood.nadeem@iub.edu.pk

Prof. Dr. Muhammad Pervez

National Institute of Psychology,
Quaid-i-Azam University, Islamabad.
PAKISTAN

Abida Parveen

Department of Applied Psychology,
The Islamia University of Bahawalpur,
PAKISTAN

ABSTRACT

This study is the part of a larger study. In which the children's understanding of science concepts have been seen in their cultural context. The sample belonged to elementary schools in that study. The data was collected from multiple sources, one of the sources were the newspapers. Two Urdu national dailies were selected for this purpose. These two national dailies were; 'Jang' and 'Nawa-i-Waqat'. These two papers are widely circulated in the country. The content analysis of these two newspapers was done. The results show that space given to the science knowledge is very limited on the children's pages. The content of the presented knowledge is very small and is not sufficient to the present day needs. No attraction was found for the learning of the children. The results added up that artifacts are not contributing in the understanding of the science knowledge and concepts of the children.

Keywords: learning, newspapers, science knowledge

INTRODUCTION

21st century has unfolded and has witnessed the Third Industrial Revolution that is information technology, which is affecting every field of human activity. The world is clearly divided between those nations on the levels of their scientific and technological progress.

Science and technology has become an integral part of the modern culture and civilization and is the major driving force for economic growth and development. The power of science and technology has transformed the world and impacted every sphere of man's individual and collective activity, whether it is, economic, political, cultural, military, and educational etc.

In Pakistan a lot of emphasis is being laid upon science education, and efforts are being made to improve the quality of science education. We are still unable in creating an environment which triggers off a scientific and technological revolution whereby a broad based self sustained scientific and technological structure is established. Although in the past few years revolutionary steps have been taken to improve the quality and standard of the education in Pakistan. However, still our educational system particularly at lower level lacks many things. Unfortunately our educational system on the whole and specifically science education has failed to play its required role for the development of scientific concepts in students and scientific thinking in the society.

The focus of this study is to see the influence of cultural and other artifacts aspects as the major sources in the understanding of the concepts, particularly science concepts of the children. This research will base upon the findings of analysis of the newspapers.

Constructivism asserts that people do not merely discover knowledge, but that they construct or make it (Vygotsky, 1978). People invent concepts, models, and schemes to make sense of experience (Stahly, Krockover, & Shepardson, 1999). Schwandt's study (as cited in Laura, Gerald, & Danial, 1999) added that these construction are continually modified and refined as new phenomena are experienced.

Newspapers, as sources of science knowledge were considered for analyses, for these purpose two Urdu national dailies 'Jang' and 'Nawa-I-Waqat', of six months were analyzed from October 2005 to March 2006.

Case study method was used to get the results. When we speak of methods in case study, it means speaking principally of observation, interview, and document review (Stake, 1995). A qualitative method was selected for this study to investigate the newspapers analysis.

RESEARCH QUESTIONS

Review of the literature revealed that regarding the analysis of textbooks, written material, pictures, and trade books etc, involved in shaping and understanding of the scientific phenomena. Nevertheless, no previous study focused on these issues (Tennyson & Park, 1980). Perhaps this study is first study conducted in a Muslim culture. We have analyzed the newspapers, to get a clearer picture of the phenomena under study. To meet these needs, the following research questions guided, analysis, and interpretation were addressed through a qualitative research design.

1. Is there any cultural relevance in the presented science knowledge of the newspapers?
2. Can different dimensions of science concepts be related to a broader framework of educational aspects found in the newspapers?
3. Does science concepts in the forms of stories and narrative, contribute in the process of thinking?
4. What are the distinguishing features of scientific concepts portrayed in the newspapers?

OBJECTIVES

It was the goal of the study two was to examine the text structure and content about the science concepts presented in the newspapers to determine if the text presented in any form is helpful in the children's understanding of the science concepts. The study examined the different modes of representation of the textual material in the newspapers.

More specifically the analysis of the text in the textbooks was done to find out to which extent:

1. The implicit and explicit science concepts are instantiated that help in the better understanding of the science concepts of the children.
2. The space and volume is given to the science concepts in the newspapers.
3. The forms and modalities through which these concepts have been presented.
4. The illustrations and pictures have been used to present the concepts.

METHODS

The review of literature reveals that content analysis can be the best way to examine the text material related with science concepts, presented in the newspapers, regarding the science concepts. One of the major functions of the text material whether it is in the form of books, magazines, newspapers etc, is to present the concepts for the transmission of the knowledge to the children as well as adults. The results of previous studies show that psychological tools such as newspapers, magazine, and books help in the shaping of concepts. Children learn about the concepts particularly science concepts through different sources. These concepts are presented in different style and shapes, may be in the forms of narration, story, examples, illustrations, figures, pictures, diagrams, and analogies etc. This has also been supported by Hill (1957), who gave some reports from the research work of Beeler, which showed trends in the use of analogy in presenting science information to children through books and magazines.

PROCEDURE

The daily 'Jang' and 'Nawa-i-Waqt' are two popular newspapers in Pakistan, which are published in Urdu language. These two national dailies are widely read across all the sections of the society in the entire country. According to a survey around 70 percent of the population is reader of these two national dailies in the country. According to another survey the daily 'Jang' has got the highest circulation in the world among the Urdu dailies.

These two dailies issue the children edition once in a week on regular basis. This children's page has got the popularity among the Pakistani children. This has been observed that school going children take very keen interest in the reading of that page.

So, this was decided to analyze the newspapers containing as sources of science knowledge. Therefore, these two Urdu national dailies 'Jang' and 'Nawa-i-Waqt', of six months, from October 2005 to March 2006, have been analyzed.

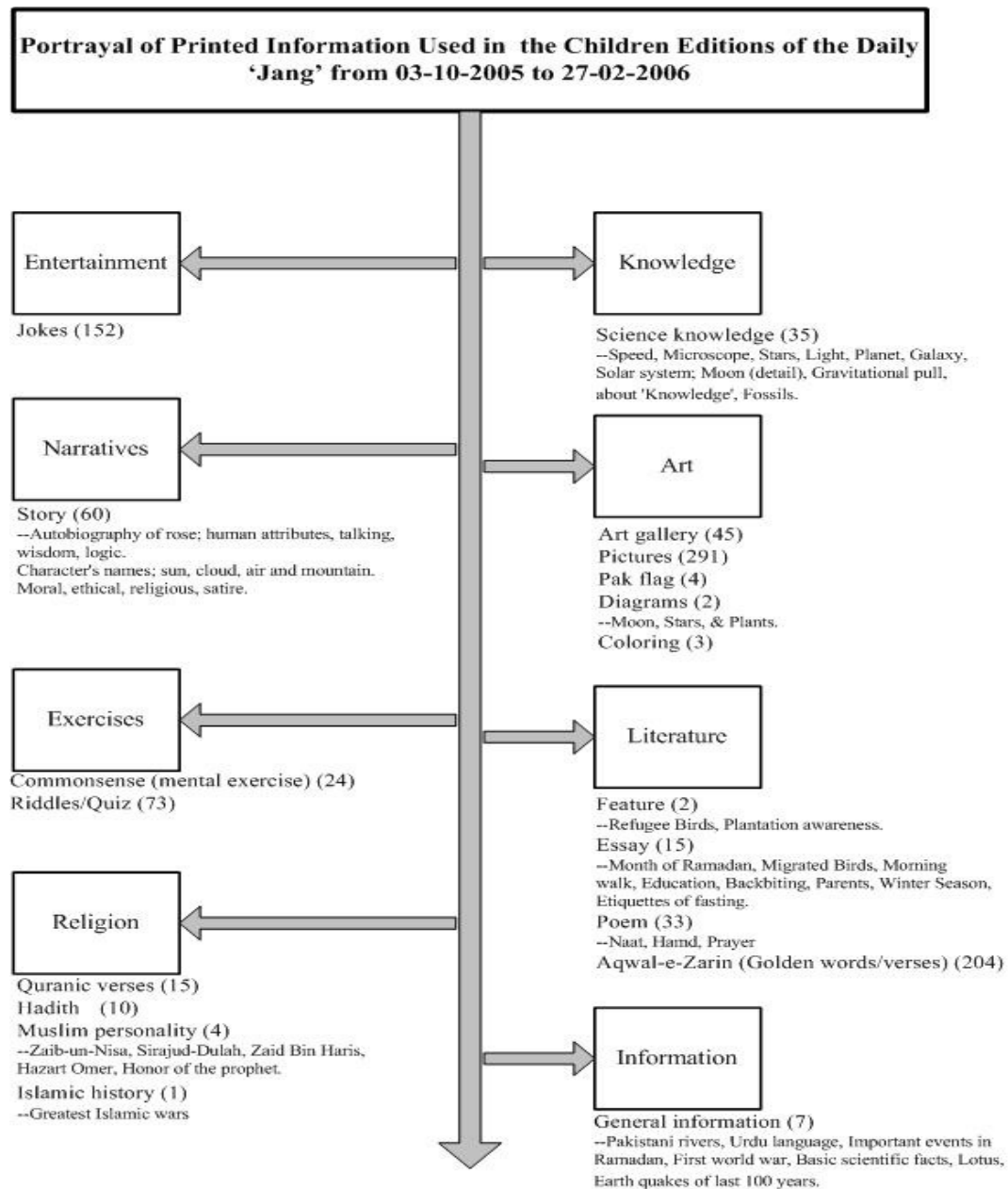
For the analysis of the newspapers, the relevant section of the library of National Institute of Psychology, Quaid-i-Azam University was contacted. The newspapers were collected from the beginning of the first week of the month of October 2005 up till end of March 2006.

After scanning all the pages, the printed information was categorized basically into two frames. One can be called *main frame* (MF). This MF consisted of eight areas of information in the complete page. The other can be called the sub-area of the MF, that having the actual content, substance or material in the BF. This sub-area can be called as *small frame* (SM).

RESULTS

Analysis of the Newspapers

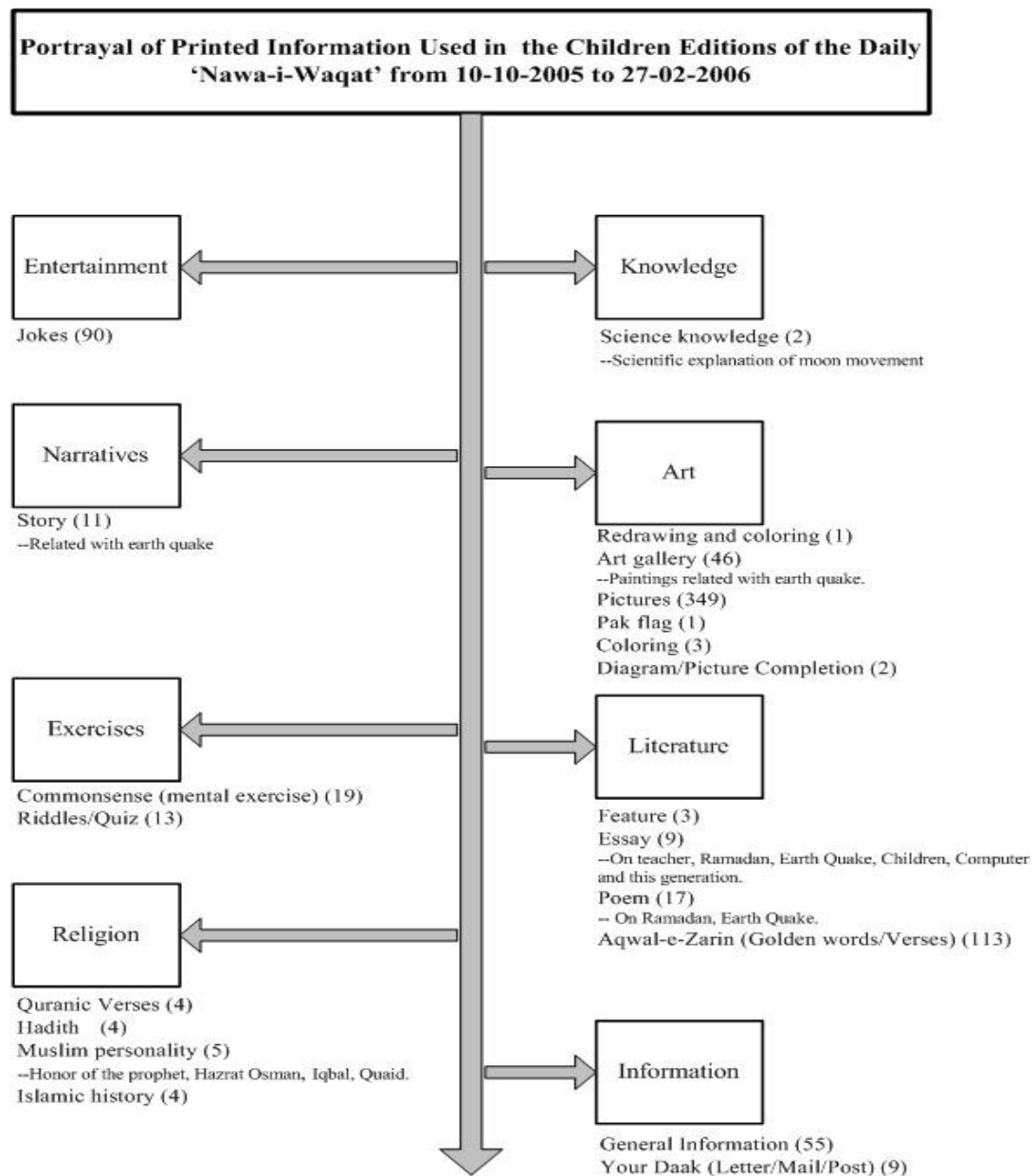
In this section, the analyzed data is presented in the forms of figures.



Number in () represents instances of occurrence within 'Small Frames' of the study.

Figure 1. Types of information or material established as a means for displaying knowledge in the daily 'Jang'.

Figure 1, shows that majority of the space covered in the daily Jang is by the pictures of the children. The other prominent material is golden words. The knowledge or information about the science concepts is very limited. Mostly, the knowledge is of very basic or factual level.



Number in () represents instances of occurrence within 'Small Frames' of the study.

Figure 2. Types of information or material established as a means for displaying knowledge in the daily 'Nawa-i-Waqat'.

Figure 2, shows majority of the space covered is by the pictures of the children. Following the space is covered by the golden words. Space covered by the science concepts is very limited.

DISCUSSION AND CONCLUSIONS

The overall results of the both national dailies; 'Jang' and 'Nawa-i-Waqat' indicated minimal portrayal of science knowledge. The kind and contents of the science knowledge was of factual level. This was indicative of having least contribution in the development and acquisition of science knowledge. Moon concepts are rarely found in the entire editions of both the newspapers. Therefore, it is hard to assume the tangible role of newspapers contextual material in understanding of the moon concepts in the children.

After viewing these results, it seemed justified to rule out further probing of the newspapers textual as well as printed material and its presumed role in the development of the science concepts.

However, it seemed important to focus the direction of the research towards the analysis of the textbooks to find out any textual or printed material related with science concepts, which could have contributed in the understanding the science concepts of the children.

REFERENCES

- Hill, E. K. (1957). Research concerning the nature of children's ideas in relation to scientific phenomena. *Science Education*, 41(4), 261-268.
- Laura, L. S., Gerald, H. K., & Danial, P. S. (1999). Third grade students' ideas about the lunar phases. *Journal of Research in Science Teaching*, 36(2), 159-177.
- Stahly, H. L., Krockover, H. G., & Shepardson, P. D. (1999). Third grade students' ideas about the lunar phases. *Journal of Research in Science Teaching*, 36(2), 159-177.
- Stake, R. (1995). *The art of case study research*. Thousand Oaks. CA: Sage.
- Tennyson, R. D., & Park, O. (1980). The teaching of concepts: A review of instructional design research literature. *Review of Educational Research*, 50, 55-70.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge. MA: Harvard University Press.

GENDER STRATIFICATION: A STUDY OF DISCRIMINATION AND OPPRESSION IN SELECTED COMMUNITIES IN NIGERIA

Dr. Nsirim-Worlu Heoma Gladys

Department of Sociology,
University of Port Harcourt,
NIGERIA
worlu@yahoo.com

ABSTRACT

Stratification is a concept that often features in many social sciences literature. In spite of general improvement in living standard and the integration of the world into a "global village", shades of discrimination and oppression which are aspects of stratification are still very evident in Africa. Stratification of humans into groups with varied unequal assess to social reward in forms of power, prestige, valued resources and personal freedom (among men and women) in social positions bring about discrimination and oppression. The radical feminist theory is employed to discuss why and how stratification manifests and the possible ways to reduce the degree of gender inequality and its attendant consequences. This paper establishes that stratification, discrimination and oppression are intense and severe in developing economies where patriarchy is practiced. Patriarchy is that phenomenon which makes men to occupy positions of decision making and they in turn ascribe status and prestige to their members. A very important factor to the continued existence of stratification is self-Image which is an emotional phenomenon. The men deliberately ensure that women are excluded from decision making positions which would improve or enhance the latter's social image. The women because of socialization of submissiveness recycle whatever social disadvantage some have suffered in the past. For an egalitarian society to be attained, both men and women should deliberately alter their self images.

Keywords: gender, stratification, discrimination, oppression, socialization

INTRODUCTION

The world over, a whole lot of literature on gender issues have been generated. While some scholars are for and others against for instance Introducing Women's Studies by Robinson and Richardson (1997) and the Psychology of Women by Matlin (2004). However, given the varied stages of societal development, laws and policies aimed at making or reducing inequality of humans, especially along gender, it beats this writer hollow that, stratification by sex which brings about discrimination and oppression are still very observable especially in African societies where patriarchy uses culture as its vehicle to denigrate or devalue females.

This paper posits that an individual is a boy or girl by birth and nature instituted these biological differences in order to bring about balance and perpetuation of every species, be it animal, plant or man. To support this, is the biblical presentation in Genesis 2:18 which states that after creation God saw that Adam was incomplete and thereafter, created Eve from the former's rib while he was in deep sleep.

In spite of the wisdom of God in the creation, it is almost an abnormal or plague to be a female in Africa. Women are considered as negative and evil especially during menstruation- which according to (Beers et al 2003:1346) is a series of cyclical events which occurs regularly on the average of

every twenty eight days .Menstruation therefore is a process which nature employs in preparing women for procreation for the perpetuation of human race .They are also deprived to partake in their families' wealth- be it family of orientation or procreation(inheritance right)and moreover, they are excluded from participating in decision making in families; the foregoing are corroborated by (Kottak 2000: 209).

From the forgoing, this work proposes that the more a society views the males as the sole authority-head, the more discriminated and oppressed the women are. Furthermore, the more women form allies with men the more the society is stratified along gender line. The forthcoming section is for the clarification of some concepts. The following concepts are hereby clarified for better understanding:-

Gender – Is a social construction whereby people are grouped and defined based on biological distinction of males and females and this distinction is based purely as a result of birth.

Stratification – Is a process by which resources and opportunities are distributed among various social actors based on certain criteria which may be by sex, age, race, ethnicity and / region.

Discrimination – This is an action which serves to deny members of a particular group equal rights and opportunities based on arbitrary bias determined by a minority who make decisions to suit their privileged position in society.

Oppression – It is an act whereby a segment of the society is not given equal rights and freedom as others; and this deprived group is restrained, subordinated and abused by the latter group.

Patriarchy – A process where men are the only ones that make decisions for the administration of the society and the women are completely excluded by a primary power structure sustained by strong and deliberate intention.

At this juncture, lets us consider the theoretical explanation for continued stratification of society by sex till date in all known societies but with emphasis in Africa. The theoretical perspectives are;

The functionalists or consensus theorists argue that society is like a biological organism that has different parts that are distinct in function and the functions are interrelated and interdependent but they work together for the good of the entire organism. However, this theory in the view of (Hale 1990:354) agrees that inequality is a pervasive feature of social life; even though it stresses individual merit. That is, that inequality reflects reward for individual contributions to the functioning of society.

For the Marxists, the importance of control over critical means of production for accumulating wealth in industrial society is stressed. Interpretative theorists look within the grand schemes of functioning social systems, capitalism and patriarchy to explore what people do in their everyday relations to produce the patterns of inequality that we subsequently perceive as merit, class or gender hierarchies. While the feminist, focuses on disparities in wealth, power, prestige and leisure between men and women; arguing that men on average are advantaged in all of these respects and that these disparities reflect patriarchy, or the power of men over women, which is distinct from, although associated with capitalism.

Justification for employing the radical feminist theory in this piece is not limited to the following assumptions by (Ritzer 1996: 454 – 456); first that woman's subordination results not from her biology, but from social arrangements and for (Blumerg 2000:154) therefore, "the relational basis for women's subordination lies in the family. Furthermore, that Society legitimizes this family system by claiming that such a structure is the fundamental institution in all societies.

These assumptions also explain that the exploitation of labour has developed into increasingly complex structures of dominating, most particularly class relations; the political order was created to

safeguard all these systems of domination; and the family itself has evolved along with the historic transformations of economic and property systems into an embedded and dependent institution, reflecting all the more massive injustices of the political economy and consistently enforcing the subordination of women.

In the forthcoming unit, we shall discuss some of the possible factors that encourage and sustain stratification along gender.

Forces Of Stratification By Gender

Certainly many factors had been discussed by other scholars as being contributory to the sustenance of stratification by gender, which directly bring about discrimination, domination and oppression in society; but for this paper, the forces of stratification to be emphasized are in the forms of:

Patriarchy– Where ever it is practiced and it is predominant in Africa; it prescribes and emphasizes marriage and whenever marriage is contracted, women as a matter of best practice and accepted standard automatically move into their husband's family or clan to reside. This is what (Anele 2003:105) considers as virilocal residential pattern. Following this residential pattern, the women are alienated from their family of orientation and people. In most communities, the women are regarded and treated as either strangers or intruders. This hidden practice exposes most women to series of conflicts which directly and sometimes indirectly predispose most of them to mental problems (disorders); (Eaton 2001:179). Among the problems that arise from this type of relation or interaction is what (Flanagan 1989:245) describes as "inequality in social resources which seems to be present in every current society".

The last and most obnoxious aspect of patriarchy is the exclusion of women from inheriting properties from either their families of orientation or procreation; thereby making women powerless socially and economically. In support of the above is what (Hale 1990: 337) describes aptly as the family being the site of exploitation and oppression.

Another factor to be expanded upon is religion. Most of the world's religions preach about the submission of wives to their husbands, without necessarily emphasizing that aspect which admonishes the husbands to love their wives as Christ loved the church that He gave his life. The foregone presentation to a large extent in collaboration with other institutions emphasize the socialization process that encourages stereotyping of person along gender which will unequivocally bring about the submissiveness, intimidation and lack or none economic power of women as observed in Africa.

In the course of this work, about 150 women are purposefully sampled basically due to what the writer perceives to be the society's conception of marriage and residential pattern in three selected communities of Nigeria.

Community Perspective on Marriage

The women of Ikwerre extraction lamented that, to be a woman is more of a curse than a blessing. Some of the reasons preferred are that as soon as a girl child is delivered, the environment starts by educating her on the dos and don'ts that is expected standards of the society which some scholars tagged 'double standard'. In the process, the girl is prepared for marriage as she is expected to be a source of wealth to her family of orientation. The well behaved and hard working she becomes, the more wealth the wealth expected to accrue to her family of orientation; therefore, she must not question her father and brothers' decisions, her opinions and ideas would not be sort either and much more her husband's and in-laws. Her father allocates no landed property to her, because it is believed that she belongs to another family. Through history, there are records of some fathers bequeathing little portions of their personal lands to their daughters as dowry. Such fathers are seen and viewed by many as paranoid. Paranoid, according to (Swill 1977:30 and Ida, et al 2002:485) is the delusionary

system of thinking based on misinterpretation of remarks or events. Also, a woman is excluded from decision making of any sort; and if by any event a woman asserts her right, she is seen as being abnormal and such derogatory word as “Owaruanya” is used to describe her and the entire society or community sees her as an outcast or mal-oriented person.

On the same pedestal, is the Igbo community, which cherishes and emphasizes marriage and also, encourages virilocal residence; but the fathers and brothers from that environment listen, value and cherish the contributions of their daughters when important family issues arise for discussion. The females from this part of Nigeria, are taught the importance of competition even in marriage, therefore, the females know that their personal achievements would be honoured in different forms and sometimes with chieftaincy titles as their male counterparts. To that effect, they acquire landed properties for themselves and their family of procreation which in turn increase the economic base of such families.

On the other hand, the kalabari kingdom was also investigated and it was established that, that kingdom is much more egalitarian in outlook than the other two kingdoms described earlier. There, the relationship between the males and females are observed to be based on ability and not merely on gender (Haralambos and Holborn 2000). Egalitarian society according to (Hale 1990:565); is that society where every citizen is given equivalent chance to compete for social positions that carry relatively higher rewards. In this community, marriage is permissive, that is, it is not a do or die affair for its members. Also established, is the fact that, that community practices bilocal and sometimes ambilineal residential patterns. Most interesting of all is the fact that a female child is highly valued and so, given adequate freedom and facilities to enable her achieve her optimum in any life endeavors. Therefore, no matter who or where she is married to, her contribution(s) by way of ideas, wealth, care etc are sort for by her family of orientation. In the light of the above findings, the issues of domination and oppression are near to none existent.

Given the above scenario, the forthcoming section shall be used to discuss the consequences of stratification based on gender on society.

Consequences of Stratification

The consequences of stratification are many and vary from society to society. Highlighted below are some consequences that this investigation elicited which is subject for our discussion.

First, a very major effect of stratification is social inequality as corroborated by such scholars as Giddens (1996: 209), (Eaton 2001: 181); (Ifeanacho and Okaba in Anikpo and Atieme 2006: 102). Social inequality has many fangs with which it destroys society; some of which are domination and oppression. It is obvious that anything whether human or not that is ascribed with low status by the society is an object of elimination when the need arises. This fact is exemplified as recorded in China, India and Pakistan where females are killed, sent into prostitution and sometimes starved when the need arises. Such less valued individuals can be commoditized as object of economic or wealth accrual to their families; therefore, she can be given out in marriage very early in life. Following marriage, the only available option is for her to be a child making machine. The woman hence continues to make children in order to at least harp on her biology to attract some affection and relevance; even if she dies in the process of parturition is of no significance.

Nevertheless, both the economic and social status of this woman (individual) is irreparably lower. The woman is continuously denied property and inheritance right, in both her family of orientation and procreation. It is pertinent at this juncture to state that since 1925 that the right of women to acquire and accumulate property was passed into law in Nigeria; yet most women do not know about it and so do not access it, the educated and uneducated alike.

Ironically, it is very pitiable to state that majority of women are not aware and that the men that know about the existence of this, Endeavour to keep it eternally secret. Another discriminatory practice whereby a woman has any opportunity to travel outside her country and she is mandated to provide an authority/ permission evidence from her husband. However, this is fast going out of fad; as an influential woman who almost lost an opportunity to travel abroad for a business opportunity fought this practice to a halt.

Another consequence of stratification by gender is low self image. The women in this region of the world are denied certain opportunities; such as taking arrested people on bail, even though in Nigeria the law is to the contrary, the woman is also denied opportunity to obtain bank loans under the guise of providing collateral despite the fact that those establishments that make such demands are aware that women are not entitled to own landed property in their communities. This actual denial of certain rights of women by the society brings about low self image of women and this low self image makes most women timid. It this observed timidity which makes some to engage in anti-social behaviors some of which are; prostitution, gossips and the other majority become steady and regular faces in churches which also is a means of cushioning the effect of self image problem (deficit).

Furthermore, is the issue of low output. This is common especially as the labour of women are not quantified and priced. Therefore, the amount of time women spend on family care is not considered economically which is why no member of the society takes the women of wealth into consideration when families are ranked socially by wealth. Under the given circumstance, most women hand over whatever wealth they have accumulated to their husbands including land bequeathed to them as dowry during weddings. On the other hand, some women hand over money and property to their brothers who use such wealth to update their individual families and thereby receive societal approval; while the women are viewed as never do wells. This experience is totally contrary to what Farnham (1997:47); as gender equality in European society where men and women discuss and manage whatever resources that are at their disposal.

To climax these consequences is the health aspect of the women. Due to how the society views and treats women some of them present with what Wheaton in (Eaton 2000 :191) calls fatalism. Fatalism is a situation where external factors in the environment make the women vulnerable to psychological disorders. A woman is forbidden to complain aloud if she experiences difficulties with either her spouse or male siblings; she cannot decide or determine the number of children she should have, nor speak out if raped. Low and behold, the bottled up emotions over a long period manifest as mental disorders of varying magnitude of which she may not be given the opportunity of early or no medical attention. To add credence to this phenomenon is (Brown and Harris 1978:150) who state that there is evidence of a relationship of life event stressors to depression. Also to support this trend is (Brown, et al 1975:78) who account that there is evidence of a social class to depression. The foregoing statements confirm the fact that, some women present with depression as health malady, which occurs as a result of the position they occupy in the social world (family, office etc).

The most unappealable of stratification is discrimination and oppression. In societies where stratification is emphasized based on gender, it is observed that the women are discriminated and oppressed everywhere- whether in their homes, social organizations and not excluding religious settings. That is why, in every know society, women are expected to behave, talk and think in certain way. Therefore, females must dress in feminine forms which may include covering of the entire body- as their bodies are for their husbands exclusively; or the exposure of majority of their bodies which its main aim is to attract men to them. They also must cover their heads in religious places and town halls which are evidence of submissiveness. Again, they cannot independently express their feelings where people are gathered; nonetheless, if it becomes imperative for them to do so at all, such presentations must be through a male representative, no matter how young or inconsequential the male may be. The females as matter of tradition are the ones to care for children and to perform every known household chores. Anything to the contrary puts the woman in a bad light and she can be addressed in either of these repugnant names – macho-woman, wild woman and in native parlance as ‘Owaruanya’. This

method of describing a woman, automatically and completely posits her as an abnormal woman; who no right thinking person will want to associate with; women too are not excluded from regarding fellow women degradingly so.

Identified also as one of the consequences of stratification based on gender is sibling rivalry. Sibling rivalry is rife where ever the male children of the family pose as though they are repositories of all known knowledge and so, whatever contributions the daughters of the families make, such contributions are considered valueless and invalid and so must be discarded. This position has rocked the foundation of sibling unity in most homes and unhealthy competition is a common feature.

CONCLUSION AND SUMMARY

Though stratification is prevalent in all societies and it takes different forms and the consequences are numerous; however, stratification by gender is intense and severe in patrilineal and virilocal societies, where authorities rest with the men who occupy positions of decision making and are therefore considered as custodians of the peoples customs and traditions; and they in turn assign status and prestige to its members.

It has to be emphasized at this juncture, that, wherever, patriarchy is rife, domination and oppression of women are obvious and gratified by society. In the light of the foregoing, therefore, both the men and women strive as much as possible to maintain their status quo; this idea is supported by (Johnson 1997:28). The begging question at this point is, how? The men ensure that women are excluded from the position of authority, while the women due to socialization of submissiveness ensure that whatever disadvantages some of them have suffered in society are recycled so that a lot more others would experience same in the future; examples are; widowhood rites, inheritance rights and the likes. This view is in tandem with what (Satzler 2003:345); views as “gender stratification being enforced often by an ideology constructed by the dominant or majority group which has the power to define itself legally but also to shape a society’s values.”

Furthermore, it is understood that African societies and especially Nigeria are still traditional and therefore, conservative and retrogressive; and the people hide under the cloak (guise) of culture to subjugate, deny and deprive their sisters, wives and even daughters (certain population of the society) rights to decision making, wealth acquisition and accumulation, functional education and even ideology(philosophy).

Also found out is the fact that when women’s economic power relative to men is growing, what Blumerg (ibid) posits as “transition period”, men are likely to perceive such changes as a threat and to repress physically, politically and even emotionally women’s efforts to gain equal power. These stipulated facts are true and common and that is why it is very prevalent to hear and see women who are assaulted by men who are in close and emotional relationship with them. Finally, gender inequalities will cease only, when women as a matter of expediency change gender ideology, norm, stereotype and value; which accounts majorly for the continued discrimination and oppression of women in most societies and much more in Africa.

RECOMMENDATION

This paper recommends that women of the world should unite to eliminate this obnoxious creation (patriarchy) which had continually oppressed and subjugated African women socially known as stratification by gender.

To be able to achieve such feat therefore, successful mobilization of women by all, will certainly raise their economic power which will translate to political power and influence. At the attainment of this process, then the political policies working against women will recede, male supremacist ideologies will recede and violence against women punished and record of offenders kept. However, we wish to

remind ourselves of Blumerg's contribution earlier in this work which is that "when women's economic power relative to men is growing, men are likely to perceive such changes as a threat and to repress physically, politically women's effort to gain equal power". This therefore calls for caution especially by women and advocates of women empowerment.

Finally, the mobilization of women's resources will go a long in tackling such factors as kinship system and residential pattern after marriage; alter the position of women in relation to communal means of production and the exclusion of women from family inheritance scheme which collectively from time had been bane to women's attainment to enviable societal heights and the palpable sequel of gender discrimination and oppression of females.

When these identified configuration in gender relations are changed, then, those women who have attained the zenith of either their economic or political careers would henceforth cease to be described by the larger society as "Owaruanya" (wild women), since everyone will be given opportunities based on his or her capability or characteristics; and the society will be better for it.

REFERENCES

- Anele, K.A (2003). Ethnography of Sub-Saharan Africa. Nigeria.Luckozim Nigeria Ltd.
- Anikpo, M.O.C and J.D. Atemie. (2006) Nigeria. Pam Unique Publishers.
- Beers M.H et al (2003). The Merck Manual of Medical Information United States of America. Merck Research Laboratories.
- Blumerg R.L.(2000). General theory of Gender Stratification.
- Brown, G.W. and T. Harris (1978).The Social Origins of Depression: A study of Psychiatric Disorder in Women. Tavistock.
- Chafetz, J.S. (1990). Gender Equity: An Integrated Theory of Stability and Change. Newbury Park, CA; Sage.
- Eaton W.W. (2001). The Sociology of Mental Disorders. United States of America. Praeger Publishers.
- Flanagan, J. G (1989). Hierarchy in Simple Egalitarian Societies. Annual Review of Anthropology. Vol. 18 (245-266).
- Farnham, C.A. (1997). Women of the American South; A Multicultural reader. New York. University Press.
- Giddens, A. (1996). Sociology. Cambridge. Polity Press.
- Hale S.M. (1990), Controversies In Sociology. Canada. Copp. Clark Pitman Ltd.
- Haralambos, M and M. Hollborn (2000). Sociology Themes and Perspectives. London. Harper Collins Publishers Ltd.
- Ida, G.D. et al (2000). Mellonis Illustrated Medical Illustrated Dictionary. London. Parthenon Publishing.
- Johnson, A.G. (1997). The Gender Knot. Philedelphia Temple University Press.

Kottak, C.P (2000): Cultural Anthropology United States of America. New York. The McGraw Hill Companies, Inc.

Ritzer, G. (1996), Controversies in Sociological Theory. New York. The McGraw Hill Companies, Inc.

Swift, C.R (1997). Mental Health, Nairobi. African Medical and Research Foundation.

Turner, J. (2003). The Structure of Sociological Theory. CA.: Belmont, Thompson/W

INFLUENCE OF MANAGERIAL SKILLS OF MIDDLE-LEVEL MANAGERS ON ORGANIZATIONAL EFFECTIVENESS, IN NIGERIAN COLLEGES OF EDUCATION

Olorisade, G.O., Ph.D.

Department of Business and
Vocational Education,
Kwara State University,
MALETE

olayiwola.olorisade@kwasu.edu.ng

ABSTRACT

This paper investigated the influence of the managerial skills of middle-level managers on organizational effectiveness in Colleges of Education in South Western Nigeria. This was prompted by the observation of the researcher on the lack of administrative training of most deans and heads of department in Nigerian Colleges of Education. The population of study consisted of deans, heads of department, and academic staff members of nine Colleges of Education, while the sample consisted of 461 academic staff members randomly sampled from the Colleges. The instrument used was the questionnaire tagged Managerial Skills, Staff Morale and Work Effectiveness Questionnaire (MSSMAWEQ). Descriptive statistics, simple regression analysis and Pearson Product Moment Correlation statistics were used to test the hypotheses. The study revealed that middle-level managers demonstrated requisite managerial skills in the Colleges of Education. It was also found that the managerial skills of middle-level managers had a very low influence on academic staff research/publications effectiveness and on community service effectiveness. Further still it was established that there was no significant relationship between managerial skills of middle-level managers and students academic performance. The paper therefore advised these group of managers to use their technical skills to improve the quality of classroom lecture delivery, by institutional staff, through students' exposure to research findings in their chosen fields of study; employ motivational skills to encourage academic staff to carry out researches into issues that will positively impact upon their host communities and add value to the Nigerian society.

Keywords: Managerial skills, Effectiveness, Research publications, Community service, managers

INTRODUCTION

Every organization exists to accomplish a purpose in the larger society and this is usually stated in the form of objectives or goals. Owing to the growing complexity of organizations as a result of their size, coverage, technology and corporate social responsibilities; organizations now strive to enhance their effectiveness though focused attention on managerial effectiveness aimed at helping managers to get the best out of themselves and their teams. Again, organizations are structured in ways that make people fill certain intentionally designed roles, to ensure that activities fit together to enhance smooth, effective and efficient performances of group tasks. Hence formal relationships are established following the organizations line of authority depicted by the structure of organizations. Although educational institutions are regarded as formal organizations, its management, especially tertiary institutions, differs slightly from other organizations. This is partly because specialists (i.e. professor, chief and principal lecturers) are found in various departments who may be professionally higher in rank than their Faculty, School or departmental heads; but to whom work may have to be assigned and tasks delegated. This complexity requires tact by Faculty, School and Departmental Heads who are expected to show respect for superiors and demonstrate appropriate managerial skills for them to

create an environment in which academic staff and other subordinates can best perform. The Faculty, School and Departmental Heads are required to demonstrate effective communication skills by sharing information with academic staff, use appropriate decision-making techniques and problem solving skills to resolve disagreement, resistance and opposition of staff in such institutions. They are also required to effectively use motivational skills to encourage academic staff to perform other complementary tasks of: collation of results, registration of students and to regularly attend Faculty, School and Departmental meetings in the bid to accomplish stated educational goals. The objective of this study therefore is to determine the demonstration of managerial skills by Deans and Heads of Department, and its consequent effect on the effectiveness of Colleges of Education in South Western Nigeria.

LITERATURE REVIEW

Leaders at the helm of affairs in any organization are charged with the responsibility of mobilizing appropriate human and material resources available, for the purpose of achieving the organizational goals. Consequently, the effectiveness of organizations is partly determined by the quality of leadership.

Researchers like Peretomode (2003) and Edem (1998) have identified factors that underlay success of school administrators. Some have highlighted the importance of personality traits or the psychological make-up of individuals; while other studies have attributed administrator's success to the factors within the environment to which they have been exposed. Yalokwu (2000) has emphasized the effects of the possession of some special skills and family background as the major factors in the molding of the successful school administrator. Olayonu (1998), investigated the relationship among principals' personality types, their communication skills, and academic achievement of secondary school students in Nigeria. The study sampled seven hundred and fifty-four secondary school principals. Multiple regression analysis, Pearson Product Moment Correlation and the t-test statistical tools were employed to analyze the data. The result revealed that secondary school principals' personality type and their communication skills were significantly related to and could predict student's achievement. In his own contribution, Ibrahim (2004) observed that participatory decision-making is often viewed as intrinsically good, and that it possess overwhelming positive effects on institutional functioning, although it requires tact, trust, skills, empathy, patience and coordination to make it work in any organization.

Again Sometip (1984) carried out a study on the perceived importance of managerial skills of educational administrators in public schools and post-secondary educational institutions. Factor analysis and multiple regression analysis were used to process the data. He identified four managerial skills of educational administrators- job management skills, employee orientation skills, organizational skills and program advancement skills. He concluded that educational staff administrators perceived that both management skills and employee orientation skills were more important to their position. Harman (1995) studied factors influencing principal's administrative effectiveness in Niger State Post Primary Schools. Data collected were analyzed using regression analysis and t-test statistical technique. The study revealed that communication and motivational skills have significant influence on principals' administrative effectiveness in schools.

STATEMENT OF THE PROBLEM

Middle-level managers are the bridge between top management (the Provost, Registrar, and so on) and staff members, and between the staff and students. This level of managers, regarded as intermediate, constitute the highest decision-making organ on academic matters in Colleges of Education in Nigeria (i.e. the Academic Board), and their failure to effectively carry along and interact with subordinates, as well as relating appropriately with superiors can have negative effects on organizational performance. This study therefore seeks to investigate the influence of managerial skills of middle-level managers on organizational effectiveness in Colleges of Education in South Western Nigeria.

PURPOSE OF THE STUDY

The specific purpose of the study is to:

- i) Determine the extent to which middle-level managers demonstrate managerial skills in handling institutional matters
- ii) Determine the extent to which managerial skills of middle-level managers influence academic staff research/publications and community service effectiveness, as well as students' academic performances in Colleges of Education in South Western Nigeria.

SIGNIFICANCE OF THE STUDY

The findings of the study will broaden knowledge and improve the managerial skills of deans and heads of academic departments, as they handle situations in their institutions. Again the study has implications for educational administrators in the area of promoting staff productivity in research/publications and community service effectiveness. The study also has implications for professional organizations involved in management, who need to develop skills measurement system for educational managers to acquire effective management skills necessary for the performance of their tasks.

RESEARCH HYPOTHESES

This research work attempts to provide answers to the following null hypotheses:

- H₀₁: Middle-level managers in Colleges of education in South Western Nigeria do not exhibit requisite managerial skills.
- H₀₂: Managerial skills of middle-level managers does not significantly influence academic staff research /publications effectiveness.
- H₀₃: Managerial skills of middle-level managers does not significantly influence academic staff community service effectiveness.
- H₀₄: There is no significant relationship between the managerial skills of middle-level managers and students academic performances in Colleges of Education in South Western Nigeria.

METHODOLOGY

The design employed was the descriptive survey research based on correlation design and carried out ex-post facto. The study population for this research consisted of deans, heads of department and academic staff members of all colleges of education in Nigeria. Purposive sampling technique was used to select nine (9) out of the ten (10) College of Education in South-Western Nigeria. Stratification was done on the basis of schools, with sample proportionate to size, and then random sampling technique was used to select 461 academic staff members from the nine colleges of education. The basic instrument used in the collection of data was the 83 item Managerial Skills, Staff Morale and Work Effectiveness Questionnaire; while a proforma on students performance was adapted from the research work of Afolabi (2004). The layout of the questionnaire showed its division into sections A, B, C, D and E, with section A requiring personal information. Section B contained questions relating to the deans and heads of department' managerial skills. Section C contained questions on the satisfaction and positive feelings of staff on their job; while section D contained statement to be ranked in the order of importance for developing managerial skills. Section E measured academic staff research/publications and community service effectiveness. Descriptive statistics was used to show the level of deans and heads of department' demonstration of managerial skills, while simple regression analysis was used to test hypotheses two and three. Hypothesis four was analyzed using the Pearson Product Moment Correlation (PPMC) statistical tool. All the hypotheses were tested at .05 level of significance.

DATA ANALYSIS

The result of the study are herein presented:

Hypothesis 1: Middle-level managers in Colleges of Education in South-Western Nigeria, do not exhibit requisite managerial skills.

Table 1: Middle-level managers' demonstration of communication, motivational, decision-making and problem solving skills.

Skills Performance	No response 0	Never 1	Rarely 2	Sometimes 3	Always 4	Average 5
Communication	0.46	1.20	7.76	39.37	51.19	84.85
Motivational	0.52	1.07	8.89	36.56	53.11	85.25
Decision-making	1.29	2.24	10.51	43.09	42.90	81.04
Problem-solving	1.14	2.34	9.99	39.63	46.87	82.18

The result in table 1 indicates that middle-level managers in Colleges of education. In South-Western Nigeria demonstrate requisite communication, motivational, decision-making and problem-solving skills in the performance of their duties.

Table 2: Middle-level manager's demonstration of technical, conceptual and interpersonal skills.

Institutions Total	Technical skills	Conceptual skills	Interpersonal skills
Adeniran Ogunsanya College of Education, Otto-Ijanikin 87.1	29.5 ¹	28.5 ³	29.1 ²
Adeyemi College of Education, Ondo 80.1	26.4 ³	27.2 ¹	26.5 ²
Federal College of Education, Abeokuta 80.2	27.6 ¹	26.3 ²	26.3 ²
Federal College of Education (Technical), Akoka 86.6	28.5 ³	29.1 ¹	29.0 ²
Federal College of Education, Oyo 73.2	26.5 ¹	23.2 ³	23.5 ²
Lagos State College of Primary Education, Epe 79.8	27.3 ¹	26.4 ²	26.1 ³
Osun State College of Education, Ila-Orangun 87.2	28.7 ³	29.5 ¹	29.0 ²
Osun State College of Education, Ilesha 86.2	29.4 ¹	28.8 ²	28.0 ³
Oyo State College of education, Oyo 85.8	28.3 ³	28.8 ¹	28.7 ²

Evidences from the research in table 2 shows that middle-level managers demonstrate appropriate technical, conceptual and interpersonal skills.

Hypothesis 2: Managerial skills of middle-level managers do not significantly
Influence academic staff research/publications effectiveness.

Table 3: Result of regression analysis of managerial skills on academic staff research/publications effectiveness

Source	Df	Ss	Ms	R	F	Sig. F
Regression	1	943.44	946.44	.107	.316	3.84
Residual	459	81717.73	178.03			

$R^2 = .01145$

The result in table 3 indicates that managerial skills of middle-level managers had a very low influence on academic staff research/publications effectiveness in colleges of education in South-Western Nigeria.

Hypothesis 3: Managerial skills of middle-level managers do not significantly influence academic staff community service effectiveness.

Table 4: Result of regression analysis of managerial skills on academic staff community service effectiveness

Source	Df	Ss	Ms	R	F	Sig. F
Regression	1	657.44	657.44	.089	3.98	3.84
Residual	459	82006.73	178.66			

$R^2 = .00795$

The result in table 4 implies that managerial skills of middle-level managers had a very low influence on academic staff community service effectiveness.

Hypothesis 4: There is no significant relationship between the managerial skills of middle-level managers and students academic performances in colleges of education in South Western Nigeria.

Table 5: Correlation analysis of managerial skills and students academic performances.

Variables	No of cases	X	SD	Df	Cal. R	Critical value	Decision
Managerial Skills	461	99.909	13.405	459	.143	.254	H ₀ accepted
Students Academic Performance	71.133	12.677					

The result in table 5 showed that there is no significant relationship between the managerial skills of middle-level managers and students' academic performance.

DISCUSSION AND IMPLICATIONS

The result in table 1 showed that middle-level managers in Colleges of Education in South Western Nigeria, demonstrated requisite managerial skills. The table showed that motivational skills was the most demonstrated (85.25%), depicting a picture of deans and heads of department who encourage staff towards goal attainment through the varying motivational tools. This is closely followed by the demonstration of communication skills (84.85%), which is also followed by the problem-solving skills (82.18%). The decision-making skill was the least demonstrated (81.04%) and this may be because such managers prefer to take decisions with minimal contributions from staff.

Again, while considering the technical, conceptual and interpersonal skills, the technical skills was the most demonstrated as it ranked first in five colleges. This depict a picture of deans and heads of department who often demonstrate expertise in teaching, who have a clear understanding of actions, consequences and results of specific classroom behaviors which are capable of facilitating the accomplishment of the goals of their institutions. In addition these managers use appropriate procedures and techniques in the performance of specific tasks like appointing people into committees, approving students results, allocating courses to staff and coordinating schools' and departmental meetings. The demonstration of technical skills is closely followed by that of conceptual skills which ranked first of the skills in four colleges; while interpersonal skills was the least demonstrated, revealing that the human relations of deans and heads of department is poor.

Furthermore, the results showed that the managerial skills of middle-level managers had a very low influence on academic staff research/publications effectiveness. It was evident from the responses of respondents that academic staff research/ publications effectiveness was better enhanced by the desire to scale promotion hurdles, assistance obtained in typing and producing conference papers, as well as financial assistance obtained towards attending conferences, seminars and workshops. This agrees with Creamer's (1998) findings that institutional policies and practices contribute, but do not determine whether a faculty member initiates and sustains a substantial record of scholarly publishing.

The results also showed that managerial skills of middle-level managers had a very low influence on academic staff community service effectiveness, because contributions to community service is only required for promotion to principal and chief lecturer cadres. In addition, academic staff commitments to assigned tasks, and their desire to make a mark in their host communities, influence their contributions to community service. This agrees with the findings of Afolabi (2004) and Opadokun (2004) that the low impact of managerial skills on academic staff contributions to community service

revealed that little emphasis is placed on lecture's participation in community service, especially at the lower cadre.

Evidences from this research also showed that there was no significant relationship between the managerial skills of middle-level managers and students' academic performance. This may be because managerial skills of middle-level managers do not have direct effect or implications on students' academic performance, but on academic staff morale, which is then brought to bear on students, in the way academic staff teaches and the enthusiasm demonstrated while teaching. This agrees with the findings of Opadokun (2004) who opined that staff recruitment procedures (an element in managerial skills) do not have significant relationship with students' academic achievement.

CONCLUSION AND RECOMMENDATIONS

The results obtained from this study revealed that:

- i) Middle-level managers in colleges of education in South-Western Nigeria demonstrate requisite managerial skills; but the decision-making skills and the interpersonal skills were the least demonstrated of the old and new typologies of managerial skills respectively.
- ii) Managerial skills of middle-level managers had a very low influence on academic staff research/publications and on community service effectiveness.
- iii) There was no significant relationship between the managerial skills of middle-level managers and students' academic performances in colleges of education in South-Western Nigeria.

On the basis of the findings of this study, the following recommendations are suggested:

- a. Professional organizations like the Nigerian Institute of Management (NIM), National Institute for Educational Planning and Administration (NIEPA), the National Institute for Policy and Strategic Studies (NIPSS) need to develop on line skills measurement systems for educational managers to acquire effective management skills, on appointment as deans and heads of department.
- b. Middle-level managers in colleges of education need to employ their technical and interpersonal skills to encourage academic staff improve on the quality of classroom teaching/learning by exposing students to research findings in their chosen fields.
- c. They need to employ their interpersonal and motivational skills to encourage the more senior lecturers to mentor younger ones and helping them to acquire competencies in writing and assessing publications, in the bid to improve on their research and publication effectiveness.
- d. They should commission research works that will positively impact upon their host communities and add value to her people.
- e. Institutional managers need to celebrate outstanding research/publication works of staff, to encourage and motivate other staff to develop interest in research and publication of journal articles.

REFERENCES

- Afolabi, S.O. (2004). Influence of resource utilization on organizational effectiveness in Kwara State Government owned tertiary institutions. Ph.D. dissertation. Ilorin: University of Ilorin.
- Creamer, E.G. (1998). Assessing faculty publication productivity issues of equity. *Eric Digest* 8 (07).
- Edem, D.A. (1998). Introduction to educational administration in Nigeria. Ibadan: Spectrum books Ltd.
- Harman, J.T. (1995). Factors affecting principals' administrative effectiveness in Niger State post-primary schools. Ph.D. dissertation. Ilorin: University of Ilorin.
- Ibrahim, A.O. (2004). Influence of participatory decision making on teacher effectiveness in Ilorin South-West Local Government Education Authority primary schools. M.Ed dissertation. Ilorin: University of Ilorin.
- Olayonu, E.O. (1998). Relationship among principals personality types, their skills and academic achievement of secondary schools students in Nigeria. Ph.D. dissertation. Ilorin: University of Ilorin.
- Opadokun, A.D. (2004). Influence of personnel management practices on academic staff productivity in Nigerian Colleges of Education. Ph.D. dissertation. Ilorin: University of Ilorin.
- Peremode, V.F. (2003). Educational Administration: Applied concepts and theoretical perspectives. Lagos: Joja Educational Publishers.
- Sometip, T. (1984). The perceived importance of managerial skills of educational Administrators. *Dissertation Abstract International* 45 (9), 2723A-2724A.
- Yalokwu, P.O. (2000). Management concepts and techniques. Lagos: Peak Publishers.

A STUDY OF TEACHING APTITUDE AND RESPONSIBILITY FEELING OF SECONDARY SCHOOL TEACHERS IN RELATION TO THEIR SEX AND LOCALE

Ravi Kant

PG Department of Education,
Teerthanker Mahaveer Institute of
Management and Technology,
Moradabad, UP
INDIA.
edu.ravikant@gmail.com

ABSTRACT

Teacher is the main pillar of educational system. It is to him compulsory to have teaching aptitude and responsibility in his job. An attempt has made to determine the difference between teaching aptitude and responsibility feeling among secondary school teachers. A sample consisting of 100 secondary school teachers were chosen in this study. Sample was equally divided on sex and locale base. After statistical treatment it revealed that sex and locale has no significant effect on teaching aptitude and responsibility. However minute differences were found in some cases.

Keywords: Teaching aptitude, Responsibility feeling, Secondary school teachers

INTRODUCTION

Teacher is very important person in the field of education. It is on him that the organization of education is based. His scholarship, conduct, behavior have a permanent effect on the students because the student imitates the teacher. For young children he is the hero of ideal. It is necessary for the teacher to be intelligent in his subject, polite nature etc. Teacher is the main pillar in the process of education. In case he is half hearted in doing the job, he cannot deliver the good expected of him. All the duties and responsibilities of the teachers are limited theoretically in books. It would be the endeavor of the world to find whether the teacher feel that they are true towards their duty. The role of teacher in moldings in the personality of the students depends on the aim of education. Education is to aim at wholesome progressive, harmonious and spontaneous growth and development of personality. T P Nunn agreed "The primary aim of all education efforts should be help boys and girls to achieve the highest degree of individual development of which they are capable of."

It is universally accepted and established fact that academic growth and intellectual advancement of a nation is shaped by the quality of its citizen and this quality is inseparably linked with the quality of education imparted to them and it is depend upon several factor home, inherited traits, parental attitude, financial support, material equipments, curriculum and method of instruction in schools. The identification of qualified and able teaching personal constitutes one of the most important of all educational concerns. The role played by the teachers in the growth of civilization is of great significance and worth assuring recognition. A teacher is the king pin of, what is generally called educational policies and programs depend Where the teacher is so important factor in the educational system. It is very essential that he/she should possess specific skills and justify the responsibility of his job.

Mailmen (1977) in his study revealed that the variables of school levels, sex, experience, special training and interaction with vocation have a little significance on teacher's perception on

responsibility. Ronald (1979) concluded that in elementary school with organizational climate other than the extreme closed climate, there is a significantly greater perceived on the teacher's professional responsibilities. Srivastava (1979) found no significant difference between male and female teachers on the quality of disciplinarianism and interest in teaching job. Regarding age and teaching experience it was observed that younger teachers have shown higher sense of responsibility than older ones. Rao and Suvarnal (1990) in his study found that there was no significant difference between teacher effectiveness on sex base.

Ediger (1991) said in his article Teachers as professionals that teacher need to be viewed as trained educated brings within a profession. To be a teacher means to be a decision maker within an open ended area, problems arise and solution needs to be found the suggested ten approaches that will help teacher to be good professional i.e. engaging in research, doing profession, reading, attending professional meetings, conducting faculty meetings, taking university courses, being involved in departmental meeting, planning as in-service education program, participating in workshops, developing a school and doing self evaluation.

Perveen (2006) in her study revealed that Discipline and Sex of the pupil teachers does not contribute towards teaching aptitude of male and female arts pupil teachers were compared, it was observed that female arts pupil teachers secured significantly higher mean scores than their counterpart male arts pupil teacher. It was found that teaching aptitude of the pupil teacher was significantly correlated with their general teaching competence, professional interest and academic achievements. General teaching competence and professional interest of the pupil teachers significantly affect their teaching aptitude. In addition to this, effect of academic achievement on teaching aptitude of the pupil teaches was positive but not significant at acceptable level of confidence. Uaha (2010) in her study revealed that there was a significant difference between teaching aptitude of effective and ineffective male and female teachers

OBJECTIVES

The main objectives of the present study are as follow-

- A. To find out whether the teaching aptitude and responsibility feeling differ significantly on the basis of sex (Male and female).
- B. To find out whether teaching aptitude and responsibility feeling differ significantly on the basis of their location (Rural and urban).

HYPOTHESES

To extract some meaningful results following hypotheses were formulated-

1. There is no significant difference between the teaching aptitude of male and female secondary school teachers.
2. There is no significant difference between the responsibility feeling of male and female secondary school teachers.
3. There is no significant difference exists between male rural and urban teachers in teaching aptitude.
4. There is no significant difference exists between male rural and urban teachers in responsibility feeling.
5. There is no significant difference between female rural and urban teachers in teaching aptitude.
6. There is no significant difference between female rural and urban teachers in responsibility feeling.

CLARIFICATION OF TERMS

Teaching aptitude- According to Bingham, - “As a condition symptomatic in his readiness to acquire proficiency his potential ability and another is his readiness to development an interest in exercising his ability.” So that it can be said that teaching aptitude is a specific ability, potentiality, interest, satisfaction and fitness in teaching profession.

Relationship- Degree of correspondence statistically expressed as a coefficient of correlation.

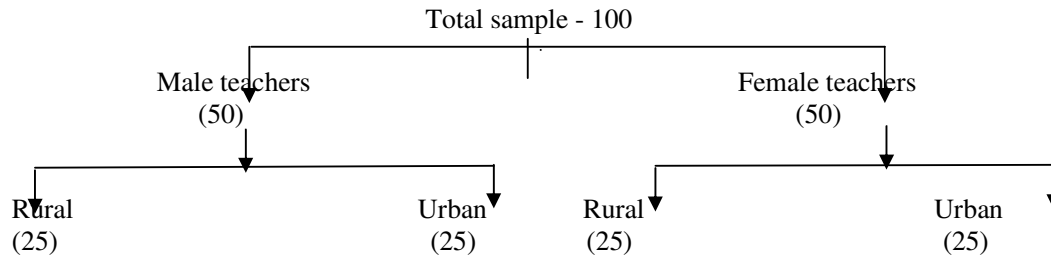
Responsibility Feeling- Sincerity and devotion according to one’s capacity and ability towards his profession.

SAMPLE

In this normative survey type research following sample from Rampur was used-

Number of Institution – 06

Total number of teachers- 100



INSTRUMENTATION

For research purpose following instruments were used-

a. Teaching Aptitude Test Battery (TATB)

By Dr R P Singh and Dr S N Sharma

Patna University, Patna.

This aptitude test has been designed for use among teachers. This test will work with Hindi knowing population. It is intended to serve a tool for find out the teaching aptitude. Items are divided in to 5 areas. They are mental ability, attitude towards children, adaptability, professional information and interest in profession.

b. The Responsibility Feeling Test

By Dr V S Gupta

Hindu college, Moradabad.

This consists of 28 items with no sub division.

ANALYSIS AND INTERPRETATION

1. Statistics of teaching aptitude of male and female teacher

Table 1 Mean, S.D., and CR values of male and female teachers of teaching aptitude.

S.N.	GROUP	N	MEAN	S.D.	SE _D	CR	SIGNIFICANCE
1	Male	50	80.33	7.21	4.54	1.97	Not significant
2	Female	50	77.29	8.30	-	-	

The mean values of teaching aptitude are 80.33 and 77.29 for the male and female teachers respectively. In this case male teachers have the higher mean value than that of female teachers but the obtained CR value is not significant at any level. On the basis of higher mean value it can be said that male teachers have more aptitude towards teaching profession in comparison to female teachers. One of the reasons may be that female teachers have to spend more time in household works.

2. Statistics of responsibility of male and female teachers

Table 2 Mean, S.D., and CR values of male and female teachers of responsibility feeling.

S.N.	GROUP	N	MEAN	S.D.	SE _D	CR	SIGNIFICANCE
1	Male	50	34.00	4.78	0.98	0.46	Not significant
2	Female	50	34.30	5.50	-	-	

Table shows that the mean values of responsibility feeling are 34.00 and 34.30 respectively for male and female teachers. It appears that the mean value of female teachers is higher in comparison to that of male teachers. But the difference is not significant. So it can say that male teachers and female teachers feel more or less the same responsibilities. Hence in this case of responsibility feeling sex has nothing to do.

3. Statistics of teaching aptitude of rural and urban male teachers

Table 3 Mean, S.D., and CR values of rural and urban male teachers of teaching aptitude.

S.N.	GROUP	N	MEAN	S.D.	SE _D	CR	SIGNIFICANCE
1	Rural	25	77.69	6.36	1.65	0.57	Not significant
2	Urban	25	78.05	5.39	-	-	

The mean values of teaching aptitude for male rural and urban teachers are 77.69 and 78.05 respectively. Obtained CR value is not significant at any level of significance. Both have more or less same mean value so location has no important role in teaching aptitude.

4. Statistics of responsibility feeling of rural and urban male teachers

Table 4 Mean, S.D., and CR values of rural and urban male teachers of responsibility feeling.

S.N.	GROUP	N	MEAN	S.D.	SE _D	CR	SIGNIFICANCE
1	Rural	25	34	5.09	1.43	1.43	Not significant
2	Urban	25	34	4.47	-	-	

Table show that means values of both teachers is same and the obtained CR value is not significant. It proves that location has no place in rural and urban teachers for responsibility feeling.

5. Statistics of teaching aptitude of rural and urban female teachers

Table 5 Mean, S.D., and CR values of rural and urban female teachers of teaching aptitude.

S.N.	GROUP	N	MEAN	S.D.	SE _D	CR	SIGNIFICANCE
1	Rural	25	76.80	8.11	2.38	0.51	Not significant
2	Urban	25	75.80	8.66	-	-	

The mean values of rural and urban female teachers are 76.80 and 75.80 respectively. The obtained CR value is not significant at any level. So it can be inferred that rural and urban female teachers feel more or less the same teaching aptitude. So location has no important role in teaching aptitude in case of female teachers.

6. Statistics of responsibility feeling of rural and urban female teachers

Table 6 Mean, S.D., and CR values of rural and urban female teachers responsibility.

S.N.	GROUP	N	MEAN	S.D.	SE _D	CR	SIGNIFICANCE
1	RURAL	25	35.70	4.76	1.55	1.63	Not significant
2	URBAN	25	33.80	5.12	-	-	

The mean value of rural and urban female teachers is 35.70 and 33.80 respectively for responsibility feeling. The obtained CR value is not significant. The mean values have no remarkable difference. Hence it can be said that in this case of responsibility feeling location has no role.

FINDINGS

Findings of the this research are as follows:-

1. The first hypothesis was "There is no significant difference between the teaching aptitude of male and female secondary school teachers" with the objective to find out whether teaching aptitude differ significantly on the basis of sex. On the analyzing the result the hypothesis has been accepted and the objective has been achieved. It is clear that there is no significant difference in teaching aptitude among male and female teachers of secondary schools. But the higher value of

mean in case of male teachers indicates that they have more teaching aptitude in comparison to female teachers.

2. Second hypothesis was “There is no significant difference between the responsibility feeling of male and female secondary school teachers”. It appears from results that the mean scores on the level of responsibility of both male and female teachers have no significant difference. The higher value of mean of female teachers indicates that they have more responsibility in comparison of male teachers. Thus null hypothesis is accepted.
3. “There is no significant difference exists between male rural and urban teachers in teaching aptitude” was third formulated hypothesis. Obtained CR value is not significant at any level. So null hypothesis has been accepted. But the higher value of urban male teacher indicates that they have little more teaching aptitude in comparison of rural male teachers.
4. The forth hypothesis was “There is no significant difference exists between male rural and urban teachers in responsibility feeling”. It reveals through table that there is no significant difference. So null hypothesis stands accepted. Mean value of responsibility feeling is exactly same, so it can be said that rural and urban male teachers both have feel same responsibility.
5. Fifth hypothesis was formulated as “There is no significant difference between female rural and urban teachers in teaching aptitude”. Statistics revealed that CR value is not significant on any level. So null hypothesis has been accepted. It can be said that in case of female teachers location does not matter.
6. “There is no significant difference between female rural and urban teachers in responsibility feeling”. This hypothesis has been also accepted because CR value is not significant at any level of significance. The mean value is approximately same for both categories.

REFERENCES

1. Malimen, Vonna Mal (1977), Secondary special education teachers perception of the responsibility for the instruction to handicapped secondary students in Riinnesola, Doctoral Disseartation FROM www.goole.com.
2. Deek, Ronald Robert (1979), A study of the relationship between organizational climate and the perceived congruence between teachers and principals of teachers in the elementary school. *Nassa country doctorate dissertation abstract*, Int (A), 1979, 40:3, pp-1170A.
3. Srivastava, Usha (1979), A study of sense of responsibility among secondary school teachers, Ph.D. BHU, 1979.
4. Rao, G Sundara and Savarna D (1990), Teaching effectiveness- an observational study, *The educational Review*, Feb 1990, pp 29-33.
5. Ediger, Marlow (1991), Teachers as professionals, *The progress of education*, Feb.1991, pp-154-156.
6. Sharma, Parveen (2006), A Study of Teaching Aptitude in Relation to General Teaching Competency, Professional Teaching and Academic Achievements of B. Ed. Pupil Teachers, Ph.D. Jamia Milia University, New Delhi.
7. Rani, Usha (2010), A study of teaching aptitude, adjustment and job motivation of effective and ineffective teachers of government secondary schools in view of teaching, Ph.D. IASE, Rajasthan.

STAKEHOLDERS' PERCEPTION ABOUT RISK MANAGEMENT IN THE PROCESS OF CHANGE FOR ORGANIZATIONAL SUCCESS

Jalil-Ur-Rehman Baloch
Institute of Education & Research,
Gomal University, DI Khan,
PAKISTAN.

Dr. Asif Jamil
Institute of Education & Research,
Gomal University DI Khan,
PAKISTAN.
asifjamil72@hotmail.com

Muhammad Younis
Govt. Degree College #2
DI Khan
PAKISTAN.

ABSTRACT

This study was conducted to assess percept of stakeholders about risk management in the process of change for organizational success. The stakeholders encompassed Administrators, Teachers and Parents. Stratified sampling technique was applied for selection of sample population. The respondents were supposed to respond to predetermined queries about application and decisions making processes to address the risk(s) before its materialization in the educational institutions. It was learnt that percept of the stakeholders is quite clear about risk management and a strong relationship prevails among risk management, proper planning, taking mitigation and contingency actions, reviewing the plans, goals and decisions from time to time to achieve the objectives skillfully and keeping a record of the past activities and events. However, responses of teachers and parents revealed that the administrators were ruthless to claim that they remain alert to advantages and disadvantages of proper use of financial resources, believe in the crises management, follow well defined procedures and properly direct the team on daily tasks to control the risk.

Key words: Change, Risk Management, Perception, Organizational Success

INTRODUCTION

According to an international definition, risk stands for the degree to which inconsistency is spread around the expected best value projected to continue for in question economic variable that may be a quantifying the upper and lower limits, which are considered to be realistic, logical and sensible for the estimation of that very factor.

Harding, R (1998) says that risk is a mixture of occurrence of distinct danger and the degree or scale or number of penalties for potential harmful occurrence of the event(s), and how these events will affect the system. (Slovic 1999) declares that the risk may be based on assumptions which are very much subjective in nature and it may be well judged through experimentation or experiences. (Blomkvist 1987), defines risk as "the possible loss of something of value". Risk is presumed to be a serious hazard in the accomplishment of goals and success whether these are individual or organizational. Fortunately or unfortunately almost every aspect of life involves some risks but beauty of life is veiled in the risks and their management. Looking for change is also an uphill task and among those risky phenomena which are never easy to infuse as it is always difficult to digest some new idea, some adventure or innovation in the beginning while it also involves risk. Imparting education is a traditional reflexive process and the knowledge gained in the change process may not necessarily reflex positively as risks like extreme specialization and knowledge explosion within this global village are writing on the wall (Egneus et al 2000) and therefore, risk management is of paramount importance. The process of risk assessment is always helpful in the comprehension and tackling of a wide variety of threats and proves to be instrumental especially for the academic community and sports orientation. Risk management involves information processing and dissemination, taking regulatory and technological decisions, setting priorities and developing looms for the benefit of innovative and regulatory policies, however risk assessment is a little too tricky and

therefore its reliability remains disputed but teaching is a profession of talented people and it competes against many important professions (McC Campbell & Stewart, 1992) and therefore demands more visionary attitudes from its prospective in their perception especially to risk management. Creative change initiators have inspirational approach and its thoughtful incorporation in the operational agenda can stimulate theory building and improve career growth through performance (Chen, 2003).

Everyone has to deal with some risk at many junctures of life but it depends mainly on how well that was understood. In this context, properly integrated and effective risk analysis can play a very vital role in identifying, recognizing and understanding the risk and its management through consolidated efforts. A number of steps like proper planning, liaison among the different segments, establishment of regular operational progress goals, then reviewing all of the above from time to time can prove helpful in the development of some positive means to manage or at least mitigate the risk. Strategically, putting the educational enterprise on the path of success and uplift contingency actions can prove helpful in controlling the threshold of risk but to suggest contingencies past records are of key nature. Positive and effective change is only possible through well focused pursuit of values for all key stakeholders like teachers, parents of the subjects and administrators themselves which can make the institution or organization more dynamic and well equipped for future responsibilities. On this occasion the researchers would like to quote John Browne (2001),

"We can't ignore mounting scientific evidence on important issues such as change. The science may be provisional. All science is provisional. But if you see a risk you have to take precautionary action just as you would in any other aspect of business"

Risk is always there where there is some uncertainty, but it does not mean that the world and especially the education world cannot make arrangement to manage the wide variety of probable effects or safeguard against possible expensive prospective outcomes (Robert Watson, 2000) and if teaching or managing education were such a straight forward tasks, the teachers may have approached the heaven in the professional culture and technology, but there are a lot of indeterminate risks involved which may affect the clarity of even goals as they may be of diverse and sometimes complex nature, dispersed and disputed among various stakeholders. (Terence & Wiske, 1983). It is said that fear of risk materialization in the complex problems leads to interdisciplinary efforts. The complexity requires immediate solutions for simplicity whether through direct implementation or taking policy decision to curb upon the risks involved. Practical involvement of the stakeholders to tackle the problem and to solve it is an integrated work that has become well-known component of interdisciplinary activities associated with the application of knowledge when looking for change (Egneus, et al. 2000).

These phenomena are apparent around us in the shape of confusion over intellectual plans. The advocates of intellectual designs will never accept that the educational institution may teach Satanism despite the fact that we do see evil plans at the hand of intellectuals (Rozycki, 2003) but it doesn't mean that we may not take initiative for some innovative work and manage the risk involved as spirited viability is always conditional with ground-breaking new ideas and paying attention to these ideas like in sports (Sharkie 2003).

It has been observed that a number of issues are arising on daily rather on hourly basis in the institutions and these are proving to be the serious threats to the organizations and their basic ideology especially in the field of education, like international evaluation has made it obvious that worth of knowledge is at risk because of very low performance and it needs to be addressed on priority basis (Mullis et al, 2003). We must remember that when working on molding or polishing the behaviour of an individual or an organization we need to manage the risk of globalization as just passing on some understood or plain words would not be sufficient and knowledge management issue is of decisive nature in the present pattern of education (Santos & Williamson 2001; Thurow 2000).

Research and teaching is another standard where the teacher needs to excel as the globalization of learning has deepened the race for quality everywhere especially in education if we are looking for change and uplift of our educational system (Latham, M. 2001). Another important aspect in the risk

management is to remain acquainted with the innate autonomy of human race that alters into dependency and makes the outcomes vague, which limits the upshot of all institutional perspective to a great extent. (Pérez-Díaz, V. & Rodríguez, 2001). This freedom of thought always creates the environment for conflict and competition rather than shared vision and closer association as the educational institutions looking for change are more vulnerable to a crowd of influential and authoritative external and internal forces (Haag, S. & Smith, M.L 2002). It is also worth mentioning that proper selection and effective training also optimize the success and minimize the risk for the administrators looking for organizational success, but mostly the good deeds like skill developments, enhancement or improvement of knowledge and attitude development are ignored (Vance & Paik 2006; Suutari 2002). As the global market is becoming highly competitive so, inflexible schedules for learning may also be risky in the innovative ideas transformation and this risk may be addressed through flexible scheduling. (Smith and Oliver, 2000; Bok, 2003; Attwood and Gill, 2008). Risk is sometime so much threatening that people who are reluctant to face the risk, do like to scarify some of their most important and valuable assets to avoid the uncertainty of the risk (Ghadim & Pannell 2003; Marra et al 2003; Ghadim & Pannell 1999; Cary et al 2002; Dalgleish & White 2001). Perception of risk and its management is mainly dependent upon the trust in personal capabilities and their utilization (Petts & Leach 2000; Finucane 2000; Siegrist & Cvetovich 2000).

METHOD AND MATERIAL

The study was conducted to gather information regarding percept of the heads of the institutions, teachers and parents regarding risk management processes to consider viable change in the present educational system in the southern districts of NWFP. To collect necessary data survey method was considered to be helpful as the human populace was being studied (Bulmer and Warwick), a total of 800 respondents equally representing all the three categories of the population were taken as sample population, selected through disproportionate stratified sampling methods (Birchall, 2010) and 587 (both genders male and female in all categories with a ratio of 399:188 respectively) responded to the questionnaire, which is 73.38 percent of the total sample. A five point Likert scale in a structured questionnaire was served to all of the respondents (strongly agree, agree, uncertain, disagree and strongly disagree) (Likert, 1931) suited the collection of ordinal data for the above said purpose. The data collected was treated statistically using SPSS (Statistical Package for Social Scientists) version 12, whereas independent sample t-test and different parametric and non parametric correlation coefficients were applied. Reliability of the scale based on standardized items on Cronbach's Alpha proved to be 0.969.

HYPOTHESES

H₀: There is no significant difference in the perception of risk management in Change activities for the uplift of education and educational institutions among the respondents on the basis of gender

H₀: There is no significant difference in the approach of the teachers and administrators upon risk management

H₀: There is no significant difference in the approach of the administrators and parents upon risk management

H₀: There is no significant difference in the approach of the teachers and parents upon risk management.

H₀: Risk management has no significant correlation with planning, liaison, contingency and mitigation actions, review and record while looking for some positive change in the present educational scenario.

RESULTS AND DISCUSSION

The research was pinpointed to consider the perception of the stakeholders about management of risk in the processes of change that may prove worthwhile in the present educational system and for organizational success. The results depicts that a major portion of the stakeholders (48.6%) including

administrators have shown disagreement for being notified or informed about the advantages and disadvantages of different events taking place in the institution while (14.5%) remained uncertain. The data reveals that (40.4%) of respondents (majority from the teachers and parents) don't consider the use of financial resources in accordance with the need, therefore the adjustments are also not justified and risks are not covered by judicious use of resources whereas (23.3%) showed uncertainty. The results disclose that (45.5%) of the stakeholders illustrate dissatisfaction on the crises management when they start to happen, and (14.8%) stay uncertain. The stakeholders' major segment (42.6%) mainly teachers and parents) believes that the administrators neither direct the daily tasks nor they follow well defined procedures while (17%) were doubtful.

INFERENCES

The histogram below figure 1 elucidates that majority of parents and teachers don't show goodwill to the administrator in management of risk for the uplift and bearing good name to their respective institutions. Most significantly round about 50% showed concern over the present situation of risk management in bringing change for the uplift and bearing good name to their institutions and a major fraction of the population was distrustful about the administrators' role, however there were many who favored them above indecision as the histogram indicates in the right hand side area. Favoring the analysis Curran (1988) tells that it is important to take into account the effect of change and the risk involved. He adds that risk analysis at proper time pays a lot in return as one can control a possible overrun, which may be financial, moral or ethical in its nature and in addition opportunities can be capitalized. From the above results it is evident that proper management of risk has a very significant role in bringing meaningful change for the uplift of the education and educational institutions and it is evident from the stakeholders' response irrespective of their categories and gender. They believe that proper risk management can curb upon many superfluous, void and simulated problems rising from communication gap.

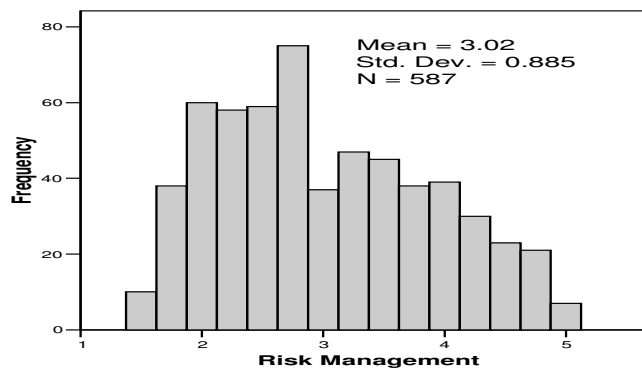


Figure 1. Good of administrator by parents and teachers for risk management

No significant difference of perception between female and male about risk management in change activities was observed as the t-test results revealed that $\bar{x} = 3.91 > 3.01$, $S.D = .951 > .880$. $C.V = 24.32 < 29.23$, $\alpha = 0.05$; respectively for female and male with $n=587$ affirm the hypothetical stance of the researchers that there is no significant difference in the perception of risk management in Change activities for the uplift of education and educational institutions among the respondents on the basis of gender as both packs lacks the fundamental knowledge of change. According to (Paté-Cornell 2002) indecision is the resultant of absence of the basic information about the point of concern in addition to accidental happenings within the sample for which the prospects of happening are known. In addition to the above it is also said that gender based analysis of events is often influenced by society, culture and history and it is never permanent rather rapidly changing with the society. It has

also been observed that most of the societies either western or eastern are patriarchal in nature and it may portray a pigeonholed picture of gender differences (De Beauvoir, 1953; Harding, 1986; Riley, 1988; Scott, 1988; Hill-Collins, 1990). A difference in approach upon risk management in change activities as perceived by the administrators and teachers was identified by applying t-test the mean values of which point toward the difference of 1.42(4.29-2.87) with standard deviation 0.477 and 0.767 for administrators and teachers respectively, which is very much significant. Calculated t-value 15.183 is greater than tabulated t-value 1.96, hence null hypothesis is rejected, which narrates that there is no significant difference in the approach of the teachers and administrators upon risk management; rather it is evident that teachers have shown a lot of disagreement in risk management with the administrators in the prevailing scenario. In this regard Ross and Anderson 1982: 149 and Siegrist and Cvetovich 2000: 714 are of the opinion that people do accept the risky situation and manage it where they find benefits from the activity being carried out, but they are careful in collecting the data for substantial benefits. (Ross and Anderson 1982:149; Siegrist and Cvetovich 2000: 714).

Sample population response declares that more than 40% have shown disagreement while almost 10% strong disagreement with the statement that the administrators remain alert to the changing scenario, which is alarming on part of administrators as agreement is 20% and strong agreement about 18% including administrators' own standpoint with 15% remained uncertain about the situation. This phenomenon has been explained by Adams 1995 in a very interesting manner, he says, "It appears that people have a level of risk with which they feel comfortable and will adjust the riskiness of their behaviour in the presence of safety measures". Adams names this tendency as individual's "thermostat" against the risk and its management. (Adams 1995). Application of t-test identified difference of approach in risk management for change initiation activities as perceived by the administrators and parents. Mean values shown in the table indicate the difference of 1.50(4.29-2.79) with standard deviation 0.477 and 0.770 for administrators and parents respectively, which is highly significant. Calculated t-value 16.100 is greater than tabulated t-value 1.96, hence null hypothesis is rejected, as there is significant difference in the approach of the parents and administrators upon risk management and parents have shown a lot of uncertainty and disagreement with the administrators upon risk management in the present situation. Spangler 1984: 7 and Garvin 2001: 450 explains that risk perception and its management is socially constructed and the difference of approach in risk perception and its management might be resultant of personal experiences, memory abstraction and likewise many other factors like ignoring the probability of the happenings etc. (Spangler 1984:7; Garvin 2001:450).

Results of the t-test show difference of approach in risk management for change initiation activities as perceived by teachers and parents. Mean values of the table specify the difference of 0.08(2.87-2.79) with standard deviation 0.767 and 0.770 for teachers and parents respectively, which is highly significant. Calculated t-value -1.284 is smaller than tabulated t-value 1.96, hence null hypothesis is accepted, and it shows logical coherence in the approach of the teachers and parents upon risk management and they have shown a complete unity and agreement with the each other upon risk management by the administrators in the present situation.

Table 2. correlation between Risk management and change initiation activities

		Risk management	change initiation
Risk management	Pearson	1	.872(**)
	Correlation		
	Sig. (2-tailed)	.	.000
	N	587	587
change initiation	Pearson	.872(**)	1
	Correlation		
	Sig. (2-tailed)	.000	.
	N	587	587

Table 2 reveals that the administrators initiating some positive change in the education or educational scenario need to manage risks so that it may not materialize. Change initiation has a very strong relationship with risk management by the administrators of the educational enterprise. The table 6 shows that stakeholders' perception regarding this correlation which is rejecting null hypothesis (H_0) that correlation between risk management and change initiation is insignificant at 0.01 level on parametric and non-parametric measures.

According to Twig, J (2007) defining risk reduction or its management is technically a difficult task but generally the administrators perceive the importance of change initiation and risk management and administer it through the development of wide ranging policies, strategies and practices which in turn minimize risk(s) through society. (Twigg. 2007)

The table 3 divulges that liaison among different units operating for change proves to be a strong force in risk management for the administrators looking for some good in the education. It has a very strong relationship with risk management as every administrator has to utilize the services of different people and units to take ease up the risk involved in change initiation. In the table 7 it has been demonstrated that stakeholders' perception regarding this correlation is quite clear hence null hypothesis (H_0) is rejected that correlation between risk management and liaison activities is insignificant at 0.01 level of significance (Table 7).

Table 3. Showing correlation between Risk management and liaison activities

		Risk management	liaison
Risk management	Pearson Correlation	1	.795(**)
	Sig. (2-tailed)	.	.000
	N	587	587
liaison	Pearson Correlation	.795(**)	1
	Sig. (2-tailed)	.000	.
	N	587	587

The table 4 tells that planning before and during change initiation provides a healthy pedestal for risk management to the innovative administrators in the field of education as every ground-breaking idea has certain risks involved. Proper planning may prove of key importance to manage risk prior to its visibility or occurrence as every administrator likes to at least simplify the risk involved in change initiation. In the table 7 it has been established that stakeholders' perception regarding this correlation is quite clear hence null hypothesis (H_0) is rejected that correlation between planning activities and risk management is insignificant at 0.01 level of significance (Table 8).

Table 4. Showing correlation between Risk management and planning activities

		Risk management	planning
Risk management	Pearson Correlation	1	.826(**)
	Sig. (2-tailed)	.	.000
	N	587	587
planning	Pearson Correlation	.826(**)	1
	Sig. (2-tailed)	.000	.
	N	587	587

Contingency and alleviation or easing actions are necessarily to be taken into account whenever there is an emergency or risk is involved, and the researcher thought that it be probably the responsibility of the administrators to engage such actions when a change is to be initiated for improvement or uplift in the education or the educational institutions. Stakeholders proved themselves to be focused for their

percept about risk management and easing up action along with incidental happenings. It was found that correlation between risk management and contingency mitigation actions is quite significant rejecting null hypothesis at 0.01 level of significance as shown in the table 5

Table 5. Showing correlation between Risk management and mitigation contingency activities

		Risk management	Mitigation Contingency
Risk management	Pearson Correlation	1	.808(**)
	Sig. (2-tailed)	.	.000
	N	587	587
Mitigation Contingency	Pearson Correlation	.808(**)	1
	Sig. (2-tailed)	.000	.
	N	587	587

Review is a regular activity in the change process and it becomes of more importance when coping with the risk or risky situation. Good administrators always remain watchful to the evident risks or in emergency and constantly review their strategies to achieve their desired goals. Review activities are equally important to achieve short term goals, long term objectives or an abstract aim. According to the stakeholders responses null hypothesis has been rejected and it proved to be significant at 0.01 level of significance on Pearson correlation, Kendall's tau_b and Spearman's rho (please refer to table 10)

Management is considered to be the sole responsible to keep the record intact especially with reference to risk management, abreast not only itself but also the other stakeholders and to use it for future assistance and references and to remain connected and responsive to the past. Consistent and reliable record of risk management helps the administration in this ever changing state of affairs in the educational institutions, and comprehensively tells about what happened in the past near or far. Keeping record is always positive in order to plan better for the present and future in the light of the past experiences and in raising positive and feasible and practical strategies. The responses show close association between risk management and record activities and have a strong correlation at 0.01 level of significance as can be seen in table 6

Table 6. Showing correlation between Risk management activities and record

		Risk management	record
Risk management	Pearson Correlation	1	.761(**)
	Sig. (2-tailed)	.	.000
	N	587	587
record	Pearson Correlation	.761(**)	1
	Sig. (2-tailed)	.000	.
	N	587	587

CONCLUSION

It is concluded from the above discussion that though the administrator claim to be well versant with risk and risk management activities like judicious use of financial resources, that they have a strong belief in crises management and remain involved in giving proper directions to the team through well defined processes on daily basis to control the risk before it materializes in the institution but the parents and teachers did not favour them to a large extent.

It means that the administrators, who are the sole responsible for the change activities must work upon risk management keys like keeping closer liaison with their team, proper planning, taking mitigation and contingency actions, reviewing the achievements, goals and ongoing activities on regular basis

and keeping a detailed record of happenings in the institution to merge the new ideas with positive note for all the stakeholders.

End Note

A famous proverb, “look before you leap and think before you speak” was probably written with the mind to “Manage the risk before it materializes” as those who thought well, processed and planned well, developed the ideas properly, looked for the pros and cons from all sides, discussed them with mindful people and acted accordingly had always registered their names in the history.

REFERENCES

- Adams, J. 1995. Risk London: UCL Press.
- Attwood, R. and Gill J. (2008). Student numbers are at risk as UK demographics shift. Times Higher Education Supplement. [Viewed June 17 2008].
- Blomkvist, A. (1987). Psychological aspects of values and risks. In L Sjöberg (Ed) Risk and Society, Allen & Unwin: London.
- Bok, D. (2003). Universities in the marketplace: The commercialization of higher education. Princeton, NJ: Princeton University Press.
- Cary, J. Webb, T. & Barr, N. 2002. Understanding landholder capacity to change to sustainable practices. Bureau of Rural Sciences: Commonwealth of Australia.
- Chen, C. P. (2003). Integrating perspectives in career development theory and development. Career Development Quarterly, 51, 203-216
- Curran, M. W. (1988). Range Estimating: Reasoning With Risk, Paper N-3, AACE Transactions, AACE International, Morgantown, WV, USA.
- Curran, M. W., ed. (1998). AACE International's Professional Practice Guide to Risk, 3 vols., AACE International, Morgantown, WV, USA.
- Dalglish, D.L. & White, B. 1999-2001. CVAP Project M5 – Seasonal climate information and farmers' risk assessment and decision-making. Land & Water Australia: Canberra.
- De Beauvoir, S., 1953. The Second Sex. Translated and edited by H.M. Parshley. London: Jonathan Cape.
- Doz, Y.L., Santos, J. & Williamson, P. (2001) From global to metanational: how companies win in the knowledge economy. Boston, Harvard Business School Press.
- Edward G. Rozycki, (2003) "Religion, Intelligent Design and the Public Schools: serving God to Mammon?" <http://www.newfoundations.com/EGR/Religion.html>
- Egneus, H., Bruckmeier, K and Polk, M. (2000) “The Nature of interdisciplinarity”. Rapport til Temanämsden, Institutionen för Tvärvetenskapliga studier. Göteborgs Universitet.
- Finucane, M. 2000. Improving quarantine risk communication: Understanding public risk perceptions. Report # 00-7, Decision Research: Eugene, Oregon.
- Garvin, T. 2001. Analytical paradigms: the epistemological distances between scientists, policy Makers, and the public. Risk Analysis 21(3): 443-455.
- Genderwatch: ...still watching. Stoke-On-Trent: Trentham, pp. 82-84.
- Ghadim, A.A. & Pannell, D.J. 2003. Risk attitudes and risk perceptions of crop producers in Western Australia. Pp 113 – 133 in B.A. Babcock, R.W. Fraser, & J.N. Lekakis (eds) Risk Management and the Environment: Agriculture in Perspective. Kluwer Press: Dordrecht.

- Ghadim, A.A. & Pannell, D.J. 1999. A conceptual framework of adoption of an agricultural innovation. *Agricultural Economics* 21: 145-154.
- Haag, S. & Smith, M.L (2002) "The Possibility of Reform: Micro-politics in Education. *Education Policy Analysis Archives* 10 (21)
- Harding, R. (ed) 1998. *Environmental Decision-Making: The Roles of Scientists, Engineers and the Public*. The Federation Press: Sydney.
- Harding, S., 1986. *The science question in feminism*. Ithaca, New York: Cornell University Press.
- Hill Collins, P., 1990. *Black feminist thought*. New York: Routledge.
- Kahneman, P. Slovic & A. Tversky (Eds), *Judgment under uncertainty: Heuristics and biases*, Cambridge University Press: Cambridge.
- Lave, A. Moghissi and V.R.R. Uppuluri (Eds), *Uncertainty in Risk Assessment, Risk Management, and Decision Making*, Plenum Press: New York.
- Marra, M. Panell, D.J., & Ghadim, A.A. 2003. The economics of risk, uncertainty and learning in the adoption of new agricultural technologies: where are we on the learning curve. *Agricultural Systems* 75: 215-234.
- McCampbell, W. H., & Stewart, B. R. (1992). Career ladder programs for vocational educators: Desirable characteristics. *The Journal of Vocational Education Research*, 17(1), 53-68.
- Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., & Kennedy, A.M. (2003). *PIRLS 2001 International Report:IEA's Study of Reading Literacy Achievement in Primary Schools*, Chestnut Hill, MA: Boston College.
- Paté-Cornell, E. 2002. Risk and uncertainty analysis in government safety decisions. *Risk Analysis* 22(3): 633-646.
- Pérez-Díaz, V. & Rodríguez, (2001) *Educación superior y futuro de España*. Fundación Santillana, Madrid. P. 30
- Petts, J., Leach, B. 2000. *Evaluating methods for public participation*. R&D Technical Report E135. Environment Agency: Bristol.
- Riley, D., 1988. *Am I That Name? Feminism and the category of 'woman' in history*. Basingstoke: Macmillan.
- Robert Watson Chief Scientist, World Bank and Chairman, IPCC Presentation of Robert Watson, Chair IPCC, at the Sixth Conference of Parties to the UNFCCC, November 13 2000.
- Ross, L. & Anderson, C.A. 1982. Shortcomings in the attribution process: on the origins and maintenance of erroneous social assessments. Pp 129-152 in D.
- Scott, J.W., 1988. *Gender and the politics of history*. New York: Columbia University Press.
- Scott, S., 2007. Uniform and dress codes. In K. Myers, H. Taylor, S. Adler & D. Leonard, eds.
- Sharkie, R. (2003) Knowledge creation and its place in the development of sustainable competitive advantage. *Journal of Knowledge Management*, 7(1), pp. 20-31.
- Siegrist, M. & Cvetovich, G. 2000. Perception of hazards: the role of social trust. *Risk Analysis* 20(5): 713-719.
- Sir John Browne (2001) A BBC Radio Programme, as Chief Executive BP Amoco 4th June 2001.
- Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis* 19 (4): 689-701.
- Smith, J., and Oliver, M. (2000). Academic development: A framework for embedding learning technology. *International Journal for Academic Development*, 5(2), 129-137.

Suutari, V. (2002) Global leader development: an emerging research agenda. *Career Development International*, 7(4), pp. 218-233.

Terence Deal and Martha Stone Wiske (1983) "Planning, Plotting and Playing in Education's Era of Decline," Chapter 23 in J. Victor Baldrige & Terrence Deal, *The Dynamics of Organizational Change in Education*. Berkeley, Cal.: McCutchan pp.452.

Twigg, J (2007). Characteristics of a Disaster-resilient Community A Guidance Note, http://www.benifieldhrc.org/disaster_studies/projects/communitydrrindicators/Characteristics_disaster_low_res.pdf

Vance, C.M. & Paik, Y. (2006) *Managing a global workforce: challenges and opportunities in international human resource management*. Armonk, NY, M.E. Sharpe Publishers.

PUNJABI COLOR CATEGORIES: AN ANALYSIS OF WORLDVIEW OF RURAL COMMUNITY IN GUJRAT, PAKISTAN

Sarfraz Khan

Department of Sociology
University of Gujrat
PAKISTAN
sarfraz.khan@uog.edu.pk

Prof. Dr. Hafeez-ur-Rehman Chaudhry

Department of Anthropology,
Quaid-i-Azam University, Islamabad,
PAKISTAN
hafeez@qau.edu.pk

ABSTRACT

Keeping in view the dominantly prevailing Universalists and Relativists' perspectives in anthropology, present research aims at understanding Punjabi color terms. 11 colors have already been identified by Berlin and Kay [1] in their monumental work which was shown to the respondents on a color chart and their responses were measured. The following selection criterion was likewise adopted: i) Punjabi speaking natives; ii) having age between 30 to 50 years; and iii) illiterate; for the inclusion of the respondents. Keeping in view this criterion Punjabi speaking rural people were selected through purposive sampling. On the basis of the responses of the respondents two major color groups emerged, the group-I represents 7 basic colors with Punjabi names while group-II shows 4 remaining colors which have no specific native color terms either respondents take it from the physical objects or from the other languages. Present community resides at sixth stage with seven color term.

Keyword: Punjabi language; Color terms; Sapir-Whorf Hypothesis; Universalists' Perspective; Relativists' Perspective;

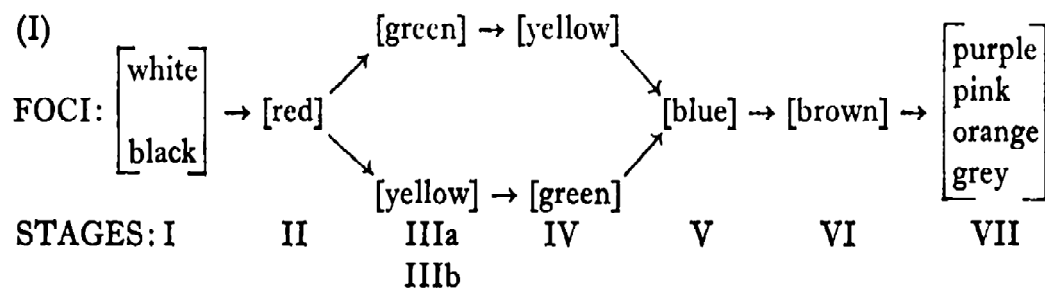
INTRODUCTION

Anthropologists throughout the twentieth century have been focusing on the issues of color categories. There are different perspectives on the study of color categories. Among others two are more influential. First, there is the Universalist Theory. Its practitioners are of the opinion that color cognition is an innate, physiological process, rather than a cultural one. It was initiated by Berlin and Kay (1969) in a study "Basic Color Terms: Their Universality and Evolution." The study was mainly focused on the existing theory of linguistic relativity; set forth by renowned linguists Edward Sapir and Benjamin Lee Whorf in their Sapir-Whorf Hypothesis. They found that the number of basic color terms that a language can have are universally restricted by the ways in which that language can employ these terms. Further to elaborate the universalists' perspective on the color terms Foley (1997) asserts that undoubtedly the most influential and possibly the most robust claim of universal innate constraints on the semantic structure of certain cognitive domains have been made in the area of color terminologies, starting with the landmark study of Berlin and Kay (1969) and extended with subsequent work by them and associates vis-à-vis Berlin and Berlin (1975); Kay (1975); Kay, Berlin, and Merrifield (1991); Kay and McDaniel (1978); and MacLaury (1987, 1991, 1992).

The systems of color terminologies among the language of the world present a promising case of the establishment of universals in human categorization, due to panhuman neurophysiology of human vision. The thrust of the work stemming from Berlin and Kay (1969) has been to prove exactly this

claim, locating established universals in the system of basic color terminologies in the mechanisms of human color vision and arguing further that cultural interests and practices play no role (Foley, 1997). The study of Berlin and Kay included data, collected from speakers of twenty different languages selected from a variety of language families. They identified eleven possible basic color categories: white, black, red, green, yellow, blue, brown, purple, pink, orange, and grey. They lay down a criterion for color categorization vis-a-vis: i). It is monomorphemic; ii). It is monolexemic (for example, blue, but not bluish); iii). Its signification is not included in that of any other color term (for example, crimson is a type of red); iv). Its application must not be restricted to a narrow class of objects (for example, blonde is restricted to hair, wood); v). It must be psychologically salient for informants (for example, “the color of grandma's freezer” is not psychologically salient for all speakers). In case of doubt, they also set the following subsidiary criteria: i). The doubtful form should have the same distributional potential as the previously established basic color terms (for example, you can say reddish but not salmonish); ii). Color terms that are also the name of an object, characteristically having that color are suspect, for example, gold, silver and ash; iii). Recent foreign loan words may be suspect; iv). In cases where lexemic status is difficult to assess, morphological complexity is given some weight as a secondary criterion (for example, red-orange might be questionable) (Broch, 1974).

Kay (1975) asserted that the major data on which the revisions of the basic color term theory are based are contained in four detailed studies of the color term systems of individual speech communities which have been undertaken since 1969 Berlin and Berlin (1974); Dougherty [12]; Hage and Hawkes (1975); and Heider (1972a, 1972b)."



Further he added that “the original Berlin and Kay hypothesis was that the basic color terms of all languages encode some subset of a set of eleven fixed perceptual foci and that there is a partially fixed temporal order in which these foci are encoded, shown in figure (I).” While the second major perspective on color categories which emerged as a critique of the Berlin and Kay is Relativism. Among others, Barbara Saunders and John Lucy are prominent who critically surveyed the Berlin and Kay theory. Saunders believes that Berlin and Kay's theory of basic color terminology contains several unspoken assumptions and have significant flaws in research methodology. Lucy also criticized Berlin and Kay theory on the same lines. In this context Foley (1997) opines that the relativist response to this imposing body of work and how do they account for the universal constraints on basic color terminologies. It is perhaps best articulated in Sahlin (1976), but also see Lucy (1996a, 1996b), Saunders (1995), and Tornay (1978). The basic point, of course, is that cultural practices are a crucial mediating force in color naming and the system of basic color terms. They argued that culture must be a crucial autonomous intermediary between any innate and hence universal neurological perception of color stimuli and cognitive understanding of these. This is echoed linguistically by Wierzbicka (1990) who notes that meaning of the color term in a language

cannot possibly be neural response to a color chip, but rather the cognitive understanding the native speaker of the language, has of that term: “language reflects what happens in the mind, not what happens in the brain.”

Describing the Universalists’ and Relativists’ perspective, Rahman (2010) opines that “the idea was that color terms is a universal phenomenon and is predictable, so that if there are three terms you can be sure that this implies they would be black, white, and red, and not blue, purple, and orange. This implies that the human mind is programmed to think in this manner and that the stronger version of the Sapir-Whorf is wrong. Our perception is not determined by our language alone. It is also determined by some common human ways or abilities of understanding reality (cognitive universals). However speakers do characterize what they see in color terms they possess. Human beings see the same colors but refer to them the words of classification they possess. This supports the weaker version of the of the Sapir-Whorf hypothesis that language does influence perception. To understand the Universalists and Relativists’ perspectives on the basic color terms, present study was conducted in the rural settings of Gujrat. The main purpose was to identify the color terms used by the Punjabi-speaking indigenous people of the village *Ikhlasgarh* and to find the connection of the present community color terms in the stages given by Berlin and Kay. Keeping in view the above mentioned rules of classification of specific color terms present study was conducted.

According to Malik (2010) “the Punjabi language is a member of the Indo-Aryan subdivision of the Indo-European language family. It is spoken by more than 100 million people in Punjab (in Pakistan and north western India). Over 44% of Pakistanis acquire it as their first language and about 70% of Pakistanis can understand it.

METHODOLOGY

Present study was conducted in a village *Ikhlasgarh*, some 13 kilometers in east of Gujrat city. The village was selected through convenient sampling. The major rationale behind the selection of this village was that majority of its inhabitants were Punjabi speaking. 20 respondents were selected through purposive sampling under the following selection criteria: i) they speak Punjabi language; ii) have no formal education and ii) have age between 30 to 50 years. A chart containing 11 major colors were shown to selected respondents and their responses were carefully recorded and presented in two main color groups.

RESULTS AND DISCUSSION

For present study a chart of 11 basic colors were used as identified by Berlin and Kay. These include black, white, red, green, yellow, blue, brown, purple, pink, orange, and grey. After showing these colors, their responses were measured. A list of Punjabi color terms being identified by these respondents are given below in the form of group-I

Table 1. Basic Punjabi Color Terms

S. No	Color Terms in English	Color Terms in Punjabi	Responses Frequency (out of 20)	Responses Percentage (out of 20)
1	Black	<i>Kala</i>	20	100 %
2	White	<i>Chitta</i>	20	100%
3	Red	<i>Sooaa</i>	19	95%
4	Yellow	<i>Peela</i>	18	90%
5	Green	<i>Harra</i>	18	90%
6	Blue	<i>Neela</i>	17	85%
7	Brown	<i>Bhoora</i>	17	85%

The above mentioned color terms were identified in the light of criterion of Berlin and Kay. One can easily identify that the color mentioned in the group-I (black, white, red, yellow, green, blue, and brown) are to some extent relevant to the color theory of Berlin and Kay by fulfilling the key criteria-I of the colors. The debate was not restricted to this description only. There was still some confusion regarding the categorization of the blue and brown colors. For instance, blue can be assumed as respondents resembled it with the color of sky and to some extent in view of some respondents it resembled water color which in indigenous terms is *aabi* (color of water) where as on other hand in the case of brown, it remained the same as of blue. It also resembled the color of soil, and wood. The Punjabi terms denoted to the basic 7 colors are purely indigenous. Further respondents identified 4 color terms in resemblance of the different geo-cultural objects from their environment.

The remaining four color terminologies are presented below in the form of group-II

Table 2. Alternative Punjabi Color Terms

S. No	Color Terms in English	Color Terms in Punjabi	Responses Frequency (out of 20)	Responses Percentage (out of 20)
1	Purple	<i>Jaammnee</i>	20	100 %
2	Pink	<i>Ghulabi</i>	20	100%
3	Orange	<i>Khatta; Malta</i>	19	95%
4	Grey	<i>Saletti</i>	18	90%

While the colors presented in group-II are having no specific color terms in the Punjabi language. These colors resembled the items like in the case of purple, it resembled a fruit *jaamman* (Jambolan), pink is associated to a flower *ghulab* (rose). Orange is identified in resemblance of a fruit-*malta* (citrus) while grey color is resembled as *saleeti* (grey). The colors presented in group-II are not fulfilling either the major or subsidiary criteria of the Berlin and Kay. So, on the basis of the criteria,

we might exclude this group-II from the major colors of the local community. Keeping in view Berlin and Kay's 11 color categories we shall identify the community's position. Berlin and Key (1969) said that the colors found in these languages followed a specific evolutionary pattern. This pattern is as followed:

1. All languages contain terms for black and white.
2. If a language contains three terms, then it also contains a term for red.
3. If a language contains four terms, then it also contains a term for either green or yellow (but not both).
4. If a language contains five terms, then it contains terms for both green and yellow.
5. If a language contains six terms, then it also contains a term for blue.
6. If a language contains seven terms, then it also contains a term for brown.
7. If a language contains eight or more terms, then it contains a term for purple, pink, orange, and/or grey.

If we are not interpreting the data wrong, this community in the reference of the color categorization do exists in the stage-VI because it includes all the colors before brown but not beyond it.

CONCLUSION

For the present study of the Punjabi color terms interesting findings came out. Keeping in view the stages of the Berlin and Kay, present community can be categorized in the stage-VI (with seven terms) same as Leach (1974) identifies Urdu and Hindi. There might be a possibility of adaptation of these color terms for these languages through extensive interaction of the speakers. In the end present study's findings on one side authenticate the theory of Berlin and Kay. But the descriptions made by the indigenous dwellers cannot be restricted only to the theory of Universalists. The Eurocentric framework and technological relation with the color categorization can not be considered as true. Keeping in view the indigenous terms, their categorization has nothing to do with the technological advancement. These are purely indigenous in origin and description. So, the color categorization stages cannot determine the ranking of the native community within the framework of Berlin and Kay rather such an attempt help loosen the essence of the native construction of language.

REFERENCES

- Berlin, B. and E. A. Berlin (1975). Aguaruna Color Categories. *American Anthologist*, 2(1): 61-87.
- Berlin, B. and E. A. Berlin, (1974). Aguaruna Color Categories. *American Ethnologist*, 2(1): 61-87.
- Berlin, B. and P. Kay (1969). *Basic Color Terms: Their Universality and Evolution*. Berkeley: University of California Press.
- Broch, H. B., (1974). A Note on the Hare Indian Color Terms Based on Brent Berlin and Paul Kay: Basic Color Terms, Their Universality and Evolution. *Anthropological Linguistics*, 16(5): 192-196.
- Dougherty, J., (1974). Color Categorization in West Futuna: Variation and Change. *Paper presented to American Anthropological Association Annual Meeting*. Mexico, D.F.

- Foley, W. A., (1997). *Anthropological Linguistics: An Introduction*. Oxford: Blackwell Publishers.
- Hage, P. and K. Hawkes (1975). Binumarien Color Categories. *Ethnology*, 14(3): 287-300.
- Heider, E. R., (1972a). Universals in Color Naming and Memory. *Journal of Experimental Psychology*, 93: 10-20.
- Heider, E. R., (1972b). Probabilities, Sampling and Ethnographic Method: The Case of Dani Colour Names. *Man*, 7: 448-66.
- Kay, P. and C. McDaniell (1978). The Linguistic Significance of the Meaning of the Basic Color Terms. *Language*, 54: 610-646.
- Kay, Paul. (1975). Synchronic Variability and Diachronic Change in Basic Color Terms. *Language in Society*, 4(3): 257-270.
- Key, B., B. Berlin, and W. Merrifield (1991). Biocultural Implications of Color Naming. *Journal of Linguistic Anthropology* 1: 12-25.
- Leach, G., (1974). *Semantics*. Harmondsworth: Penguin Books Ltd.
- Lucy, J. A., (1996a). The Linguistics of "Color". In Hardin C. and L. Maffi, eds. *Color Categories in Thought and Language*, Cambridge: Cambridge University Press.
- Lucy, J. A., (1996b). The Scope of Linguistic Relativity: An Analysis and Review of Empirical Research. In John J. Gumperz and Stephen Levinson (Eds.), *Rethinking Linguistic Relativity*. Cambridge: Cambridge University Press. 37-69.
- Maclaury, R., (1987). Color-category Evolution and Shuswap Yellow-with-Green. *American Anthropologist*, 98: 107-124.
- Maclaury, R., (1991). Exotic Color Categories: Linguistic Relativity to What Extent? *Journal of Linguistic Anthropology*, 1: 26-53.
- Maclaury, R., (1992). From Brightness to Hue: An Explanatory Model of Color Category Evolution. *Cultural Anthropology*, 33: 137-186.
- Malik, T. G., (2010). Lexical Borrowing: A Study of Punjabi and Urdu Kinship Terms. *Language in India*, 10(8): 22-32.
- Rahman, T., (2010). *Linguistics for Beginners: Basic Concepts*. Oxford University Press, Karachi.
- Sahlins, M., (1976). Colors and Cultures. *Semiotica*, 16: 1-22.
- Saundres, B. (1995). Disinterring Basic Color Terms: A Study in the Mystique of Cognitivism. *History of the Human Sciences*, 8 (7): 19-38.
- Tornay, S., ed. (1978). *Vios et Nommer les Couleurs*. Nanterre: Service de Publication du Laboratoire d'Ethnologie et de Sociologie Comparative de l'Université de Paris X.
- Wierzbicka, A., (1990). Antitotalitarian language in Poland: Some Mechanisms Linguistic Selfdefense. *Language in Society*, 19, 1-59.

PRESERVICE SECONDARY SCHOOL MATHEMATICS TEACHERS' SUBJECT MATTER KNOWLEDGE OF CALCULATING PERIMETER AND AREA

Dr. Wun Thiam Yew
School of Educational Studies,
Universiti Sains Malaysia
MALAYSIA
tywun@usm.my

Dr. Sharifah Norul Akmar Syed Zamri
Faculty of Education,
University of Malaya
MALAYSIA
snorul@um.edu.my

Dr. Lim Hooi Lian
School of Educational Studies,
Universiti Sains Malaysia
MALAYSIA
hllim@usm.my

ABSTRACT

This purpose of this article is to examine preservice secondary school mathematics teachers' subject matter knowledge of calculating perimeter and area of composite figure. Clinical interview technique was employed to collect the data. Interview sessions were recorded using digital video camera and tape recorder. Subjects of this study consisted of eight preservice secondary school mathematics teachers enrolled in a Mathematics Teaching Methods course at a public university in Peninsula Malaysia. They were selected based on their majors (mathematics, biology, chemistry, physics) and minors (mathematics, biology, chemistry, physics). This article presents the analysis of the responses of the subjects related to a particular task. The finding suggests that most of the preservice secondary school mathematics teachers in this study had adequate procedural knowledge of calculating perimeter and area of composite figure. All the preservice teachers in this study understand the general measurement convention that perimeter and area is measured by linear units and square units respectively. All of them wrote the measurement units (without being probed) for the answers of the perimeter and area of the composite figure that they have calculated. Nevertheless, none of the preservice teachers in this study check the correctness of their answers. Once getting an answer, they seemed to satisfy that the task was finished. When probed to check answer, then only they suggested the strategies that they would use to check the answers. The preservice teachers in this study employed two types of strategies to verify their answers for calculating perimeter and area of composite figure, namely recalculating strategy and alternative method. The similarities and differences of the findings of this study in comparison with the findings of previous studies were discussed.

Keywords: preservice secondary school mathematics teachers, subject matter knowledge, perimeter and area, case study, clinical interview.

INTRODUCTION

One cannot teach what one does not know. Teachers must have in-depth knowledge of mathematics they are going to teach. Therefore, it is important that a teacher need to have a comprehensive knowledge of mathematics to enable him or her to organize teaching so that students can learn mathematics meaningfully. Fennema and Franke (1992) advocated that "no one questions the idea that what a teacher know is one of the most important influences on what is done in classroom and ultimately on what students learn" (p. 147). Furthermore, "teachers who do not themselves know a subject well are not likely to help students learn this content." (Ball, Thames, & Phelps, 2008, p. 404). This applies also to mathematics teacher.

One of the learning outcomes enlisted in the Form One Mathematics Curriculum Specifications is 'find the areas of composite figures made up of rectangle, parallelogram, triangle, or trapezium' (Ministry of Education Malaysia, 2003). This learning outcome could be extended to perimeter as well. However, previous study (Baturu & Nason, 1996) revealed that preservice primary school teachers in their study had inadequate procedural knowledge of calculating area of the given shapes.

Moreover, Cavanagh (2008) and van de Walle (2007) found that students tend to confuse with the slanted side (slanted height) and the height (perpendicular height) of a parallelogram.

It is a general measurement convention that perimeter and area is measured by linear units (such as mm, cm, m, km) and square units (such as mm^2 , cm^2 , m^2 , km^2) respectively. However, Tierney, Boyd, and Davis (1990) noticed that many prospective primary school teachers from a teachers college in their study labelled the area measurements in linear units. Likewise, Baturu and Nason (1996) found that several preservice primary school teachers in their study wrote the calculated area measurement in linear unit such as 128 cm. Similarly, Cavanagh (2008) revealed that high school students in his study inappropriately labelled the length of sides in cm^2 or areas in cm. They did not understand the general measurement convention that length is measured in linear units while area is measured in square units.

Baturu and Nason (1996) revealed that most preservice primary school teachers in their study who attempted to verify their answers did so by recalculating strategy or using the inverse operation. They never think of using an alternative method to verify their answers. Mosenthal and Ball (1992) argued that assessing the reasonableness of one's solutions is a hallmark of understanding. Moreover, checking the correctness or reasonableness of one's answers or solutions is a good behavior in mathematics (Nik Azis, 2007). However, Baturu and Nason (1996) found that majority of the preservice primary school teachers in their study had to be prodded towards checking their answers. Once getting an answer, they seemed to satisfy that the task was finished.

PURPOSE OF THE STUDY

The purpose of this study was to examine preservice secondary school mathematics teachers (PSSMTs)' subject matter knowledge of calculating perimeter and area of composite figure. Specifically, this study aimed to investigate the preservice teachers' procedural knowledge, linguistic knowledge, strategic knowledge, and ethical knowledge of calculating perimeter and area of composite figure.

CONCEPTUAL FRAMEWORK OF THE STUDY

Nik Azis (1996) suggested that there are five basic types of knowledge, namely conceptual knowledge, procedural knowledge, linguistic knowledge, strategic knowledge, and ethical knowledge. This applies also to subject matter knowledge. In the present study, the researchers have adapted Nik Azis's (1996) categorization of knowledge to examine the PSSMTs' subject matter knowledge of calculating perimeter and area of composite figure.

METHODOLOGY

Research Design

In this study, the researchers employed case study research design to examine, in-depth, PSSMTs' subject matter knowledge of calculating perimeter and area of composite figure. "A case study design is used to gain an in-depth understanding of the situation and meaning for those involved" (Merriam, 1998, p. 19). Several researchers (e.g., Aida Suraya, 1996; Chew, 2007; Lim, 2007; Rokiah, 1998; Seow, 1989; Sharifah Norul Akmar, 1997; Sutriyono, 1997) employed case study research design to study Malaysian students, preservice teachers, and lecturers.

Selection of Subjects

The researchers employed purposeful sampling to select the subjects (sample) for this study. Eight subjects (sample) were selected for the purpose of this study. They were PSSMTs from a public university in Peninsula Malaysia enrolled in a 4-year Bachelor of Science with Education (B.Sc.Ed.) program, majored or minored in mathematics. These subjects enrolled for a one-semester mathematics teaching methods course during the data collection of this study. The mathematics teaching methods

course was offered to B.Sc.Ed. program students who intended to major or minor in mathematics. The researchers had selected four B.Sc.Ed. program students who majored in mathematics, and four B.Sc.Ed. program students who minored in mathematics for the purpose of this study. Each PSSMT was given a pseudonym, namely Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha, in order to protect the anonymity of all interviewees. The brief background information about the subjects is shown in Table 1.

Table 1. Subjects' Ethnicity, Gender, Age, Major, Minor, and CGPA

Subject	Ethnicity	Gender	Age	Major	Minor	CGPA
Usha	Indian	Female	(21, 9)	Mathematics	Biology	2.92
Mazlan	Malay	Male	(21, 8)	Mathematics	Chemistry	2.70
Patrick	Bidayuh	Male	(21, 7)	Mathematics	Chemistry	3.04
Beng	Chinese	Female	(22, 9)	Mathematics	Physics	3.82
Roslina	Malay	Female	(21, 8)	Biology	Mathematics	3.15
Liana	Malay	Female	(21, 5)	Chemistry	Mathematics	2.77
Tan	Chinese	Male	(22, 7)	Chemistry	Mathematics	3.69
Suhana	Malay	Female	(20, 10)	Physics	Mathematics	2.52

Instrumentation

Eight types of interview tasks were devised for this study. This paper reports only the responses of the subjects on Task 6.1 (see Appendix A). In Task 6.1, subjects were required to help his or her student to calculate the perimeter and area of the given diagram (Diagram 1) that involved composite figure, namely rectangle and parallelogram/triangle. The objective of this task was to determine the subjects' procedural knowledge for calculating perimeter and area for the composite figure. Task 6.1 was used to determine the subjects' linguistic knowledge of standard units of perimeter and area measurement by determining whether the subject use the correct standard units of measurement for perimeter (cm) and area (cm²) when they write the answers for these measurements. Task 6.1 was also used to determine the subjects' strategic knowledge for checking the correctness of their answers for perimeter as well as area. Task 6.1 was used to determine the subjects' ethical knowledge by ascertaining whether the subjects write units of measurement upon completing a task. This task was also used to ascertain whether the subjects check the correctness of their answers.

Data Collection

Data for this study was collected using clinical interview technique. In the present study, materials collected for analysis consisted of audiotapes and videotapes of clinical interviews, subject's notes and drawings, and researcher's notes during the interviews. The audiotapes and videotapes were verbatim transcribed into written form and the transcriptions were the raw data for this study. The transcriptions include verbal and nonverbal interaction between researcher and subject.

Data Analysis

The data analysis process encompassed four levels. At level one, the audio and video recording of the clinical interview were verbatim transcribed into written form. The transcription included the interaction between the researcher and the subject during the interviews as well as the subject's

nonverbal behaviors. At level two, raw data in the forms of transcription were coded, categorized, and analyzed according to specific themes to produce protocol related to the description of subjects' subject matter knowledge of calculating perimeter and area for the composite figure. At level three, case study for each subject was constructed based on information from the written protocol. At this level, analysis was carried out to describe each subject's behaviors in solving the task. At level four, cross-case analysis was conducted. The analysis aimed to identify pattern of responses of subject matter knowledge of calculating perimeter and area for the composite figure held by the subjects. Based on this pattern of responses, preservice teachers' subject matter knowledge of calculating perimeter and area for the composite figure were summarized.

FINDINGS OF THE STUDY

Procedural Knowledge

Finding of the study suggests that seven of the PSSMTs, namely Beng, Liana, Mazlan, Patrick, Roslina, Suhana, and Usha, have successfully calculated the perimeter of Diagram 1 as 104 cm. Table 2 reveals PSSMTs who have successfully and unsuccessfully calculated the perimeter of Diagram 1.

Table 2. PSSMTs who Have Successfully and Unsuccessfully Calculated the Perimeter of Diagram 1

Calculating the perimeter of Diagram 1	PSSMTs
Successful	Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Usha
Unsuccessful	Tan

Of the seven PSSMTs who have successfully calculated the perimeter of Diagram 1, five of them, namely Beng, Mazlan, Patrick, Roslina and Usha, used the list all-and-sum algorithm to calculate the perimeter of the diagram. They listed all the length of sides that surrounded the diagram and then summed them up to get the perimeter of the diagram as 104 cm. Table 3 exhibits the algorithms used by PSSMTs to calculate the perimeter of Diagram 1. The other two PSSMTs, namely Liana and Suhana, used the doubling-and-sum algorithm to calculate the perimeter of the diagram. They doubled the length of sides UP, PQ, and QR and then summed them up to get the perimeter of the diagram as 104 cm.

Table 3. The Algorithms Used by PSSMTs to Calculate the Perimeter of Diagram 1

Algorithms used to calculate the perimeter of Diagram 1	PSSMTs
List all-and-sum	Beng, Mazlan, Patrick, Roslina, Tan, Usha
Doubling-and-sum	Liana, Suhana

Only one PSSMT, namely Tan, have unsuccessfully calculated the perimeter of Diagram 1. Tan mentally cut the triangle TRS of Diagram 1 and pasted it next to the triangle TQR of Diagram 1 so that it formed a rectangle ("TQSR") with the dimension of 15 cm by 8 cm. He used the list all-and-sum algorithm to calculate the perimeter of the diagram, He listed all the length of sides that surrounded the "long" rectangle and then summed them up to get the perimeter of the diagram as 86 cm (the correct answer should be 104 cm). Tan did not know that the "cut and paste" transformation does not conserve the perimeter of a diagram. Thus, he incorrectly calculated the perimeter of the diagram as 86 cm based on the length of sides that surrounded the "long" rectangle formed ($20 + 8 + 15 + 20 + 8 + 15$) and not based on the length of sides that surrounded Diagram 1 ($20 + 17 + 15 + 20 + 17 + 15 = 104$).

Finding of the study suggests that six of the PSSMTs, namely Beng, Liana, Patrick, Roslina, Suhana, and Tan, have successfully calculated the area of Diagram 1 as 420 cm^2 . Table 4 shows PSSMTs who have successfully and unsuccessfully calculated the area of Diagram 1.

Table 4. PSSMTs who Have Successfully and Unsuccessfully Calculated the Area of Diagram 1

Calculating the area of Diagram 1	PSSMTs
Successful	Beng, Liana, Patrick, Roslina, Suhana, Tan
Unsuccessful	Mazlan, Usha

Of the six PSSMTs who have successfully calculated the area of Diagram 1, five of them, namely Beng, Liana, Patrick, Roslina, and Suhana, used the partition-and-sum algorithm to calculate the area of the diagram. They partitioned Diagram 1 into a rectangle PQTU (labelled as A) and two triangles QRT (labelled as B) and RST (labelled as C). Beng, Liana, Patrick, Roslina, and Suhana calculated the areas of A, B, and C using the area formulae of rectangle and triangles respectively and then summed them up to get the area of the diagram as 420 cm^2 . Table 5 depicts the algorithms used by PSSMTs to calculate the area of Diagram 1. The other PSSMT, namely Tan, used the “cut and paste” transformation to transform Diagram 1 into a “long” rectangle. He calculated the area of Diagram 1 as the area of the “long” rectangle formed using the area formula of a rectangle where its length and width is 28 cm and 15 cm respectively. Tan got the area of the diagram as 420 cm^2 .

Table 5. The Algorithms Used by PSSMTs to Calculate the Area of Diagram 1

Algorithms used to calculate the area of Diagram 1	PSSMTs
Partition-and-sum algorithm	Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Usha
“Cut and paste” transformation	Tan

The remaining two PSSMTs, namely Mazlan and Usha, have unsuccessfully calculated the area of Diagram 1. They used the partition-and-sum algorithm to calculate the area of the diagram. Mazlan partitioned Diagram 1 into a rectangle PQTU and two triangles, namely QRT and RST while Usha partitioned Diagram 1 into a rectangle PQTU and a parallelogram QRST. They correctly calculated the area of the rectangle as 300 cm^2 . Mazlan viewed the two triangles as parallelogram QRST. Nevertheless, Mazlan and Usha confused with the slanted side and the height of the parallelogram that they used the slanted side QR as the height ($TR = 8 \text{ cm}$) of the parallelogram. Thus, Mazlan and Usha incorrectly calculated the area of the parallelogram as ' $17 \times 15 = 255 \text{ cm}^2$ ' (The area of the parallelogram should be ' $15 \times 8 = 120 \text{ cm}^2$ '). Consequently, they got the area of the diagram as 555 cm^2 (The correct answer should be 420 cm^2 , not 555 cm^2).

Linguistic Knowledge

Finding of the study suggests that all the PSSMTs, namely Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha, used the correct standard unit of measurement for perimeter, namely cm, when they wrote the answer for this measurement of Diagram 1. It indicated that they understand the general measurement convention that perimeter is measured by linear unit. Finding of the study also suggests that all the PSSMTs, namely Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha, used the correct standard unit of measurement for area, namely cm^2 , when they wrote the answer for this measurement of Diagram 1. It indicated that they understand the general measurement convention that area is measured by square unit.

Strategic Knowledge

When probed to check the answer for the perimeter of Diagram 1, seven of the PSSMTs, namely Beng, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha, suggested that they would use the recalculating strategy to verify the answer. Beng, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha suggested that they would check the answer for perimeter by recalculating strategy that using the same method and calculate again. Table 6 exhibits the strategies suggested by PSSMTs to check the answer for the perimeter of Diagram 1.

Table 6. Strategies Suggested by PSSMTs to Check the Answer for the Perimeter of Diagram 1

Strategies suggested to check the answer for the perimeter of Diagram 1	PSSMTs
Recalculating strategy	Beng, Mazlan, Patrick, Roslina, Suhana, Tan, Usha

Alternative method	Liana
--------------------	-------

When probed to check the answer for the perimeter of Diagram 1, Liana suggested that she would use an alternative method to verify the answer. Liana used the doubling-and-sum algorithm to calculate the perimeter of the diagram. She doubled the length of sides UP, PQ, and QR and then summed them up to get the perimeter of the diagram as 104 cm. Liana suggested that she would check the answer for perimeter by using an alternative method, namely list all-and-sum strategy. Liana explained that she could just “15 plus 20 plus 17 plus 15 plus 17 plus 20” (Liana/L991-992) to check the answer for the perimeter.

When probed to check the answer for the area of Diagram 1, half of the PSSMTs, namely Mazlan, Roslina, Suhana, and Usha, suggested that they would use the recalculating strategy to verify the answer. Mazlan, Roslina, Suhana, and Usha suggested that they would check the answer for the area by the recalculating strategy that using the same method and calculate again. Table 7 shows the strategies suggested by PSSMTs to check the answer for the area of Diagram 1.

Table 7. Strategies Suggested by PSSMTs to Check the Answer for the Area of Diagram 1

Strategies suggested to check the answer for the area of Diagram 1	PSSMTs
Recalculating strategy	Mazlan, Roslina, Suhana, Usha
Alternative method	Beng, Liana, Patrick, Tan

When probed to check the answer for the area of Diagram 1, the other half of the PSSMTs, namely Beng, Liana, Patrick, and Tan, used an alternative procedure (alternative method) to generate an answer which could be used to verify their original answer. Beng, Liana, and Patrick used the partition-and-sum algorithm to calculate the area of the diagram. They partitioned Diagram 1 into a rectangle PQTU (labelled as A) and two triangles QRT (labelled as B) and RST (labelled as C). Beng, Liana, and Patrick calculated the area of A, B, and C using the area formulae of rectangle and triangles respectively and then summed them up to get the area of the diagram as 420 cm^2 .

Beng, and Liana, checked the answer for area by moving triangle RST under the translation T_{SR} to form a rectangle with the dimensions of 15 cm by 8 cm. Beng drew a large rectangle with the dimension of 28 cm by 15 cm and calculated its area by using area formula of rectangle as 420 cm^2 . Liana drew a large rectangle with the dimension of 28 cm by 15 cm. She partitioned the large transformed rectangle into two smaller rectangles with the dimensions of 20 cm by 15 cm and 8 cm by 15 cm and labelled them as A and B respectively. Liana calculated its area by using area formula of rectangle and summed up the area as 420 cm^2 . Patrick checked the answer for area by moving triangle RST under the translation T_{SR} to form a rectangle (labelled as new “B”) with the dimensions of 15 cm by 8 cm. He calculated area of “B” by using area formula of a rectangle, namely $15 \times 8 = 120 \text{ cm}^2$. Patrick explained that both methods gave the same answer, namely 420 cm^2 .

When probed to check the answer for the area, Tan used an alternative procedure (alternative method), namely partition-and-sum algorithm to generate an answer which could be used to verify his original answer. Tan used the “cut and paste” transformation to transform Diagram 1 into a “long” rectangle. He calculated the area of Diagram 1 as the area of the “long” rectangle formed using the

area formula of a rectangle where its length and width is 28 cm and 15 cm respectively. Tan got the area of the diagram as 420 cm^2 .

Tan checked the answer for area using the partition-and-sum algorithm to calculate the area of the diagram. He partitioned Diagram 1 into rectangle PQTU and parallelogram QRST. Tan calculated the area of the rectangle using the area formula of a rectangle as 300 cm^2 . He calculated the area of the parallelogram using the area formula of a parallelogram as 120 cm^2 . Tan then summed them up to get the area of the diagram as 420 cm^2 . Tan explained that both methods gave the same answer, namely 420 cm^2 .

Ethical Knowledge

All the PSSMTs, namely Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha, wrote the measurement unit (without being probed), namely cm, for the answer of the perimeter of Diagram 1 that they have calculated. Likewise, all the PSSMTs, namely Beng, Liana, Mazlan, Patrick, Roslina, Suhana, Tan, and Usha, also wrote the measurement unit (without probed), namely cm^2 , for the answer of the area of Diagram 1 that they have calculated.

All the PSSMTs have successfully calculated the perimeter of Diagram 1, except Tan. Nevertheless, none of the PSSMTs checked the correctness of the answer for the perimeter. Tan might have spotted his mistake should he checked the answer for the perimeter of Diagram 1. When probed to check answer, then only all the PSSMTs suggested the strategies that they would use to check the answer for perimeter.

All the PSSMTs have successfully calculated the area of Diagram 1, except Mazlan and Usha. Nevertheless, none of the PSSMTs checked the correctness of the answer for the area. Mazlan and Usha might have spotted their mistake should they checked the answer for the area of Diagram 1. When probed to check answer, then only all the PSSMTs suggested the strategies that they would use to check the answer for area.

CONCLUSION AND DISCUSSION

Most of the PSSMTs in this study had adequate procedural knowledge of calculating perimeter and area of composite figure. For instance, all but one PSSMT had successfully calculated the perimeter of Diagram 1 in Task 6.1 as 104 cm. Similarly, six out of eight PSSMTs had successfully calculated the area of Diagram 1 in Task 6.1 as 420 cm^2 . Mazlan and Usha confused with the slanted side and the height of the parallelogram in Diagram 1 that they used the slanted side QR as the height ($TR = 8 \text{ cm}$) of the parallelogram. Thus, Mazlan and Usha incorrectly calculated the area of the diagram as 555 cm^2 . This finding concurs with Cavanagh (2008) and van de Walle (2007) who found that students tend to confuse with the slanted side (slanted height) and the height (perpendicular height) of a parallelogram. However, the finding of this study is in contrast with the findings of Baturo and Nason (1996). Baturo and Nason (1996) revealed that preservice primary school teachers in their study had inadequate procedural knowledge of calculating area of the given shapes.

All the PSSMTs in this study understand the general measurement convention that perimeter and area is measured by linear units (such as mm, cm, m, km) and square units (such as mm^2 , cm^2 , m^2 , km^2) respectively. These findings are in contrast with the findings of previous studies (Baturo & Nason, 1996; Cavanagh, 2008; Tierney, Boyd, & Davis, 1990). Tierney, Boyd, and Davis (1990) noticed that many prospective primary school teachers from a teachers college in their study labelled the area measurements in linear units. Likewise, Baturo and Nason (1996) found that several preservice primary school teachers in their study wrote the calculated area measurement in linear unit such as 128 cm. Similarly, Cavanagh (2008) revealed that high school students in his study inappropriately labeled the length of sides in cm^2 or areas in cm on the written test. They did not understand the general measurement convention that length is measured in linear units while area is measured in square units.

None of the PSSMTs in this study check the correctness of the answers for the perimeter and area of Diagram 1. Once getting an answer, they seemed to satisfy that the task was finished. When probed to check answer, then only they suggested the strategies that they would use to check the answers. This finding is in agreement with the finding of previous study (Baturu & Nason, 1996) which found that majority of the preservice primary school teachers in their study had to be prodded towards checking their answers.

The PSSMTs in this study employed two types of strategies to verify their answers for calculating perimeter and area of composite figure in Tasks 6.1, namely recalculating strategy and alternative method. Recalculating strategy refers to strategy using the same method and calculates again while alternative method refers to method that was different from the original method. This finding is slightly contrast with the finding of previous study (Baturu & Nason, 1996) which found that most preservice primary school teachers in their study who attempted to verify their answers did so by recalculating strategy or using the inverse operation. They never think of using an alternative method to verify their answers.

REFERENCES

- Aida Suraya, M. Y. (1996). *Skim nombor perpuluhan bagi murid tahun lima sekolah rendah [Decimal numbers schemes of year five primary school pupils]*. Unpublished doctoral thesis, University of Malaya, Kuala Lumpur.
- Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, 59 (5), 389-407.
- Baturu, A. & Nason, R. (1996). Students teachers' subject matter knowledge within the domain of area measurement. *Educational Studies in Mathematics*, 31(3), 235-268.
- Cavanagh, M. (2008). Area measurement in year 7. *Reflections*, 33(1), 55-58. Retrieved September 27, 2008, from http://www.curriculum.support.education.nsw.gov.au/secondary/mathematics/assets/pdf/s4_teach_ideas/area/area_meas.pdf
- Chew, C. M. (2007). *Form one students' learning of solid geometry in a phase-based instructional environment using the Geometer's Sketchpad*. Unpublished doctoral thesis, University of Malaya, Kuala Lumpur.
- Fennema, E., & Franke, M. L. (1992). Teachers' knowledge and its impacts. In D. A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 147-164). New York: Macmillan.
- Lim, H. L. (2007). *Penggunaan model SOLO dalam penilaian kebolehan penyelesaian persamaan linear pelajar tingkatan empat [Assessing form four students' linear equation solving ability by using SOLO model]*. Unpublished doctoral thesis, University of Malaya, Kuala Lumpur.
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
- Ministry of Education Malaysia (2003). *Integrated Curriculum for Secondary School: Curriculum Specification Mathematics Form 1*. Kuala Lumpur: Curriculum Development Centre.
- Mosenthal, J. H., & Ball, D. L. (1992). Constructing new forms of teaching: Subject matter knowledge in inservice teacher education. *Journal of Teacher Education*, 43(5), 347-356.
- Nik Azis, N. P. (1996). *Penghayatan matematik KBSR dan KBSM: Perkembangan profesional [Appreciation of the integrated curriculum of primary and secondary school mathematics: Professional development]*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Nik Azis, N. P. (2007, August). *Values development in mathematics education: Challenges and needs*. Paper presented at the International Seminar on Development of Values in Mathematics and Science Education, University of Malaya, Kuala Lumpur.

Rokiah, E. (1998). *Kajian kes tentang pengajaran matematik pensyarah di Institut Teknologi Mara [Case studies about the mathematics teaching of lecturers in Mara Technology Institute]*. Unpublished doctoral thesis, University of Malaya, Kuala Lumpur.

Seow, S. H. (1989). *Conceptions of mathematics and mathematics teaching: Case studies of four teacher trainees*. Unpublished M.Ed. Dissertation, University of Malaya, Kuala Lumpur.

Sharifah Norul Akmar, S. Z. (1997). *Skim penolakan integer pelajar tingkatan dua [Integers subtraction schemes of form two students]*. Unpublished doctoral thesis, University of Malaya, Kuala Lumpur.

Sutriyono (1997). *Skim penolakan nombor bulat murid darjah dua dan tiga [Whole numbers subtraction schemes of standard two and three pupils]*. Unpublished doctoral thesis, University of Malaya, Kuala Lumpur.

Tierney, C., Boyd, C., & Davis, G. (1990). Prospective primary teachers' conceptions of area. In G. Booker, P. Cobb, & T. de Mendicuti (Eds.), *Proceedings of the Fourteenth Annual Conference of the International Group for the Psychology Mathematics Education with North American Chapter* (Vol. 2, pp. 307-315), Mexico. (ERIC Document Reproduction Service No. ED411138).

Van de Walle, J. (2007). *Elementary and middle school mathematics: Teaching developmentally* (6th ed.). Boston: Pearson Education.

APPENDIX A**Task 6.1: Rectangle and parallelogram/triangle**

(Puts a handout written the following problem in front of the subject). Suppose that one of your Form One students asks you for help with the following problem:

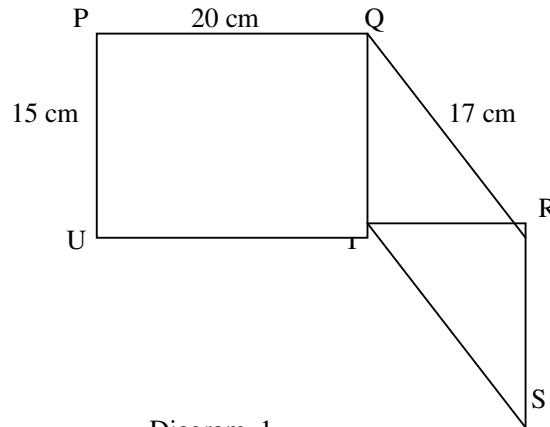


Diagram 1

In Diagram 1, PQTU is a rectangle and QRST is a parallelogram.
UTR is a straight line.

Calculate

- (a) the perimeter of the diagram,
- (b) the area of the diagram.

How would you solve this problem?

Probes:

What do you mean by ____ ?

Could you tell me more about it?

Could you explain your solution?

How did you get that answer?

How would you check your answer?

UPGRADING THE INTEREST OF STUDENT LEARNING ON INTRODUCING NUMBER CONCEPT (Classroom Action Research on Initial Learning of Mathematics)

Soelistianah

Kindergarten Educational Department,
Open University Kindergarten School
of Taman Harapan, Malang
INDONESIA
soelistianahharjanto@yahoo.com,

ABSTRACT

This study intended to know the progress of applying Drawing Number Card method in learning of number concept. Number concept was one of initial mathematical learning. The methodology consisted of classroom action research and it was carried out in the class of kindergarten school at Taman Harapan, Malang of Indonesia. Result was used to perform a teaching model which would apply to upgrade the learning interest of student on mathematical learning.

Keywords: Drawing Number Card, initial mathematical learning, learning interest

INTRODUCTION

Teachers needed to upgrade themselves with their skills, knowledge, and positive attitude with the requirement of integrated curriculum of Kindergarten School. Kindergarten school was the basic before students began their education in elementary school. Previous teachers with some experiences had developed a theoretical framework to conceptualize their knowledge in performing effective learning process and teaching (Yusuf and Zakaria, 2010). Therefore, some experts in education had claimed that the content knowledge of pedagogy was critical. It was very important for a teacher to master it in order to have ability in conveying lesson content to their student effectively and efficient.

More current research had focused on teacher candidates to understand the measurement and evaluation methods (Inan and Bayindir, 2009). The evaluation methods consisted of objective, subjective, and performance of measurement and evaluation. Measurements and evaluation was the main topics discussed seriously among educators. Many workshops and seminars offered classes to teach teacher how to evaluate their students. It was known that measurement and evaluation was one of the most important and fundamental components of education.

Collaboration was defined as a process which disciplines work closely together (Soliman and Ismail, 2010). Collaborative learning was originally developed from practice and literature at kindergarten and elementary school. This view of learning could not be carried out as conventional learning. It was needed difference approach to set qualified learning process. This could only be achieved in a cooperative and collaborative learning that was grounded since kindergarten (Soliman and Ismail, 2010).

CONTEXT AND REVIEW OF LITERATURE

This study was carried out at Kindergarten School of Taman Harapan. Location of Kindergarten Taman Harapan School was at Malang city, East Java Province of Indonesia. This study was included classroom action research and wanted to know the progress of applying Drawing Number Card as a tool to know number concept. Research was carried out in 2 cycles in one of kindergarten classes with number of students were 26.

Drawing Number Card Method

Drawing Number Card Method was an attractive model for introducing number concept to kindergarten students. Mathematics was assumed as the most difficult subject in school. Actually, mathematics was not only as counting tool but it was accurately as thinking pattern which was needed to analyze any kind of problem (Montarcih, 2009). Introducing number in Kindergarten was as initial stage of learning mathematics.

Drawing Number Card was designed as an attractive drawing card which was targeted to be able to get some attentions from students. It was due to numbers were something kind of abstract things for the beginner students. Method of Drawing Number Card demanded a task of teacher to design and explain actively the number concept. The student had to be activated in understanding the number concept. If the students were very interest with the drawing card, they were be able to understand the material of learning.

The process and the grade score of learning

There were some manners to be used to evaluate the success of teaching. Score of teaching would be used in this study. The score was consisted of 1 (bad), 2 (enough), and 3 (good). If the average of score was due to the success measurement of students learning, so the success of a teacher could be measured from teaching score.

The evaluation of education was more expanded compared with the evaluation of learning score and teaching process in class. Educational evaluation was included the evaluations of curriculum, teaching program, and some others innovation in the scope of teaching and education. Evaluation of learning score was focused on product (score) or effect that was produced by student due to instructional aim which had to be reached (Stufflebeam, 1974).

METHODS

The methodology was consisted of classroom action research which was carried out in 2 cyclers. The steps were described as in Table 1 and 2 below.

Table 1 Program of cycler I

Day Date	Indicator	Teaching activity	Method	Tool/ source of learning	Score of student progress	
					Tool	Score
Monday 17-05- 2010	To follow the rule of game sp.19	I. Initial activity 30' <ul style="list-style-type: none"> Praying, ceremony, say hello Sharing and telling story about the event at the street Training body balance with standing in one foot and it was done in turn of the right and left one 	Demonstration, direct practice		performance	
	To stand in one foot at about 30 minutes. f.19	II. Main subject 60" <ul style="list-style-type: none"> Talking about any vehicles with 2, 3, 4. 6 wheels Mentioning the number consecutively by filling the blank number Pinning up the available pattern 	asking-answer	picture	work	
	To answer the question about information B.8		giving work	Work paper	working	
	To mention the number 1 to 10 consecutively K.7		giving work	Needle, pinned pillow	Work result	
	To pin up the picture of vehicle with 4 wheels S.13	III. Resting 30' <ul style="list-style-type: none"> Free outdoor/ indoor playing, go to restroom and washing hand 			performance	
	To sing about 15 children songs S.24	IV. Closing 30' <ul style="list-style-type: none"> To sing some songs about vehicles like <ul style="list-style-type: none"> Pedicab City bus etc Discussion/ moral message Ceremony and say good bye 		Kind of swaying, sliding, wash lap, foot-stuffs demonstration direct practice		

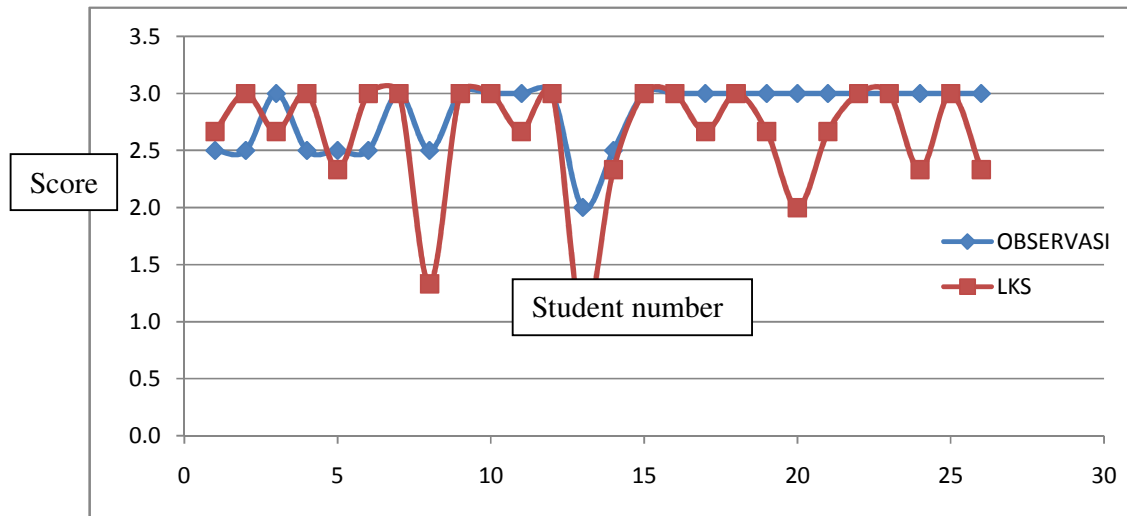
Table 2 Scenario of Cyclor 2

Learning activity	Scenario of learning
To walk forward in straight line on the board f.15	<ul style="list-style-type: none"> • Students went to sport ground • Students heard teacher's information • Students made attention to teacher's explanation • Students carried out the work in turn
Numbering with point the thing of 1 to 10, introducing the number of 1 to 10 k.8	<ul style="list-style-type: none"> • Students heard teacher's explanation about the work which had been to do • Students took pencil cases • Students took work papers • Students could do their works well
To carry our 2-3 orders well B.4	<ul style="list-style-type: none"> • Students heard teacher's explanation • Students made attention to example showed by teacher • Students could answer the question gave by the teacher
To stick on S.19	<ul style="list-style-type: none"> • Students heard teacher's explanation • Students made attention to example showed by teacher • Students prepared handkerchief as the pad for sticking • Students took the patterns being stuck • Students could stick well.
To read rhyme with expression S.26	<ul style="list-style-type: none"> • Students heard teacher's explanation • Students heard the example by the teacher • Students followed to read rhyme • Students read the rhyme completely by themselves • Students read the rhyme one by one

FINDINGS AND DISCUSSIONS

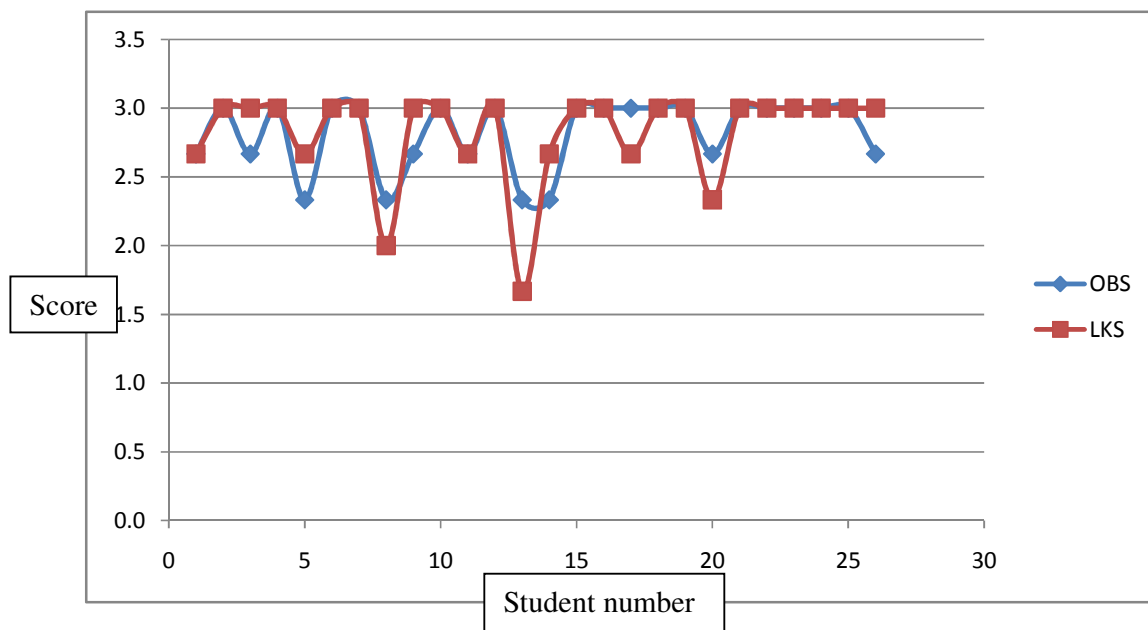
Classroom action research cyclor 1 was carried out by teaching numbering 1 to 10 using the Drawing Number Card. While the cards were divided, students were seemed so interested. The weak students were certainly needed more attention.

The results were described as in Figure 1 below.



Note: observasi = observation, LKS = work paper
Figure 1 Results of scoring observation and work paper

The curve showed that student with high score in observation had the trend of well known numbering. Students with low score in observation would get the low score too in work paper. The result showed that Drawing Number Card could support 80% of success. Result of classroom action research cyclor 2 was described as in Figure 2 below



Note: OBS = observation, LKS = work paper
Figure 1 Results of scoring observation and work paper

Classroom action research was carried out to make students understood the number concept. While teacher divided the card, all of students, not only the strong one but the weak one were very interested. At the period of asking and answer questions, almost of the students could answered well. The trend of curved results as described in Figure 2 was the same as occurred in cyclor 1: student with high score in observation had the trend of well known numbering and students with low score in observation would get the low score too in work paper.

CONCLUSION

Based on the analysis as above, it was concluded as follow:

1. The quality of carrying out teaching was very influenced to the teaching results and students learning score due to use Drawing Number Card method. It was shown by the average of observation score at cyclor 1 was 2.83 and cyclor 2 was 2.82.
2. Teaching result and learning result using Drawing Number Card was increased. It was shown that 80% of student at cyclor 1 and 90% of student at cyclor 2 understood the number concept. The average score of learning result at cyclor 1 was 2.64 and at cyclor 2 was 2.82

REFERENCES

1. Inan, Zeynep Hatice and Bayindir, Nida. 2009. Perspectives of Teacher Candidates on Measurement and Evaluation Methods Used to Assess Their Achievement at the University. *Research Journal of Social Sciences*, 4:15-20.
2. Montarjih, Lily (2009), *Petunjuk Praktis Penelitian Tindakan Kelas (PTK) Jilid 1*, Malang: Penerbit Universitas Negeri Malang (UM Press)
3. Soliman, Mona, Hasan and Ismail, Ayman Mohamed. 2010. Integrating Mulyi-Grade Collaborative Learning Pedagogy into Design Studios. *Journal of Education and Sociology*, p. 40-47
4. Stufflebeam, D.L. (1974), "Alternative approach to Educational" pada W.J. Popham (ed) *Evaluation in Education: Current Application*, Berkeley, Calif: Mc. Cutchan
5. Yusof, Yusminah Mohd and Zakaria, Effendi. 2010. Investigating Secondary Mathematics Teachers Pedagogical Content Knowkedge: a Case Study. *Journal of Education and Sociology*, p. 32-39

OCCUPATIONAL RISK FACTORS ASSOCIATED WITH REPRODUCTIVE HEALTH OF WORKING WOMEN: A CASE STUDY OF UNIVERSITY OF GUJRAT

Muhammad Shoaib
Department of Sociology,
University of Gujrat,
PAKISTAN
shoaibsoc@uog.edu.pk

Sarfraz Khan
Department of Sociology,
University of Gujrat,
PAKISTAN
sarfraz.khan@uog.edu.pk

Amara Ashraf
Department Population Sciences,
University of Gujrat,
PAKISTAN
amara.virgo@yahoo.com

ABSTRACT

Occupational risk factors are those factors which directly or indirectly influence the health and performance of the workers. Present study aims at understanding the association between occupational risk factors and reproductive health of married working women in University of Gujrat (UoG), Pakistan. In Pakistan the opportunities for working women is not appreciable as compared to developed countries. Women are mostly secluded from such opportunities. So in this study researchers try to highlight the importance of the issue in the context of the Pakistan and more specifically working women in UoG. For the present study 110 married working women were sampled from University of Gujrat through simple random sampling by using sample size determinant formula. The results showed that there is a positive association between occupational risk factors and reproductive health of married working women.

Key words: Occupation, Risk Factor, Reproductive Health, Working women, Pakistan

INTRODUCTION

There are different risk factors associated to the working people's reproductive health within the given environment of the workplace. There is greater possibility of the harm of the reproductive health of male and female working in the factories where gasses, radiation and related things are higher in capacity and magnitude. But in the case of jobs like, academia, banks, and like organizations the issue of the risk factors are totally different to the industries. Participation of women is ensured by the laps of globalization and demand of the hour. When we look into the role of women in today's world, women are employed in every industry and institute and hold nearly every kind of jobs. Comparable data for the last twenty years clearly indicate that substantial shift in the gender distribution of many occupations has occurred and, despite these shifts, women and men still tend to be concentrated in different occupations. Women are overrepresented in clerical, sales and services occupations, while men are disproportionately employed in craft and laborer jobs. Predominately female occupations such as nursing, secretarial, child care and textile sewing machine operators have remained dominated by women. Conversely, the proportion of females to males' engineers, lawyers, physicians, police and college teachers has changed, with females representing a large proportion in these occupations (USDOL, 1995).

In the case of the manual jobs and industrial sector jobs of the lower staff there is higher possibilities of being victimized by the hazardous chemicals and gasses. International Labour Organization (1998) identified that “Thousands of hazardous chemicals are produced and used in the wide variety of workplaces, all over the world. Some of these have negative effects on the reproductive health of both male and female workers who are exposed to them. There are also a variety of physical and biological agents (such as radiation and bacteria) used in many workplaces and expose workers to additional reproductive hazards. Additionally, there are many work situations (such as work which is highly stressful or shift work) that may cause negative effects on the reproductive systems of male and female workers.” But in the case of the academia, situation is not comparatively discouraging to the laboratory work. Women might be facing some of the stresses either to complete their tasks within the given time period or overburdened by the work. So in each case it might be affecting women’s reproductive health.

Talamanca and Hatch, (1994) have discussed that “The menstrual cycle can be disrupted by strenuous physical work, with manifestations of dysmenorrhea, amenorrhea, anovulatory cycles and reduction in fertility. Several studies have shown the effects of physically demanding and stressful work both in developing countries (agriculture, industry etc) and developed countries (service sectors, air transport, nursing, the armed forces etc).” There are some other issues likewise the undersocialization of the workplace which might cause problem for the women’s health issues. Blatter et al. (2003) assert that “Many work settings throughout the world, women labor under conditions that adversely affect their reproductive health. Physical, biological, psychological and chemical hazards in the workplace have been implicated as reproductive risks. Work involving plastic, lead, radiation, and antineoplastic drugs, anesthetic agents, solvents and other chemicals, and infectious agents present risks, as do job characteristics such as heavy workloads, shift work and stress. Physical condition of work setting, such as noise, air quality and sitting versus standing on the job, are also among the work conditions that represent potential reproductive risks for women. Women in the electronics, pharmaceuticals and metal industries, clerical workers, laundry workers, nurses, physicians and other health care workers are some of the groups on which attention has focused.”

In 1994, International Conference on Population and Development was organized by United Nations in Cairo to address the emerging issues in the world. Almost all governments recognized the need to advocate the reproductive rights for all men and women to be informed and to have an access to safe, effective, affordable, legal and acceptable methods of family planning of their choice. Conference also defines the concept of safe motherhood as, “Services based on the concept of informed choice, should include education in safe motherhood, prenatal care, maternal nutrition, adequate delivery assistance, referral services for pregnancy, child birth and abortions complications, post-natal care and family planning. All births should be assisted by trained persons (Sultana, 2008).”

Research into occupational exposure and effects on reproductive systems have made important scientific contributions in the past few decades. Early studies focused on possible effects on the fetus rather than the reproductive health of the woman. Later, it was realized

that reproductive toxins may also induce hormonal alterations affecting other aspects of reproductive health such as menstrual cycle, ovulation and fertility. Attention is now shifting from concern for the pregnant woman and the fetus, to the entire spectrum of occupational health hazards among women and reproductive health of both genders (Laskin et al., 2007). While on other side Selevan et al. (2003) have mentioned that “The changing nature of the work and the work environment and the emerging technologies in reproductive biology and exposure assessment are leading us to rethink approaches to studying exposures and traditional reproductive health outcomes. It remains important to emphasize that the spectrum of reproductive health outcomes includes not only women childbearing potential but also all working women, all working men and all of their potential off spring. Clinical outcomes among workers should include sexual dysfunction, infertility, pregnancy loss, male: female sex ratios of pregnancies, aberrations (for example early menopause and andropause), and reproductive organ and endocrine-mediated neoplasm’s.” In Pakistan the situations for the working women are stressful men seclude them form the job sector and manipulate them by harassment and like activities. In addition to this there are also some issues like stress and encumber which directly influence the reproductive health of the women. In academic institutions like UoG, women are overburdened and having lengthy hours. Due to these issues it affects the reproductive health of the women.

OBJECTIVES OF THE STUDY

1. To analyze the socio-economic characteristics of the respondents.
2. To find out the occupational risk factors of working women.
3. To find out the level of reproductive health of married women.
4. To find out the association of occupational risk factors and the reproductive health of working women.

MATERIALS AND METHODS

For present study 110 working women from University of Gujrat were selected through simple random sampling. Sampling frame was available and following formula (Yamane, 1967) was used to determine the appropriate sample size for the present study.

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{152}{1 + 152(0.05)^2}$$

$$n = 110$$

A well structured questionnaire was administered by researchers which contained different parts like a) socio-economic characteristics of the respondents b) occupational risk factors of working married women and c) reproductive health of working women. Further, the data was analyzed by using Statistical Package for Social Sciences (SPSS) version 16.0. Percentages and statistical test (Kendall’s tau-b & c) was used to draw conclusions and test the hypothesis.

RESULTS AND DISCUSSION

Table 1.1 reveals the age of the respondents. The data reveals that about 10.00 percent of the respondents were belonging to age group of 26-30 years, 30.90 percent of the respondents were

belonging to age group of 31-35 years, 33.63 percent of the respondents were belonging to age group of 36-40, 10.90 percent of the respondents were belonging to 41-45 years, 8.18 percent of the respondents were belonging to age group of 46-50 years, while only 6.36 percents of the respondents were belonging to age group of 51 & above years.

Table 1.2 depicted the family members of the respondents. According to the table majority of the respondents i.e. 65.45 percent had 4-6 family members. Education is one of the most important factors the influence the patterns of individuals directly or indirectly. It is proven by various researchers that educated person adopt innovation in the required field more easily as compared to an illiterate person. Table 3 indicated the educational attainment of the respondent. According to table No. 1.3, 80.0 percent respondents had masters and above. The main reason behind higher levels of the education of the respondents is that the entrance requirements in such organizations are higher qualification. Table 1.4 showed the family income of the respondents. According to the table 98.2 percent respondent's family income was 25001 and above, while only 1.8 percent respondent's family income was below 25000.

Table 1.5 reflected the age of the respondents at marriage. According to the table 33.64 percent of the respondents belonged to the age group of 26-30 years at the time of their marriage, 23.64 percent of the respondents belonged to the age group of 31-35 at the time of their marriage, 27.27 percent of the respondents belonged to the age group of 21-25 at the time of their marriage, 9.09 percent had age group of 16-20, while only 6.36 percent of the respondents belonged to the age group of 36 & above. Family is the group of intimate peoples emotionally related either by blood, marriage, responsible for the reproduction and rearing of children, living together. It found in all societies that unite people in cooperative groups to oversee the bearing and raising of children (Macionis, 2006). For the present study there were found three types of families.

Table 1.6 indicated the family structure of the respondents. According to the table majority i.e. 49.1 percent of the respondents were living in nuclear family system, while 45.5 percent respondents were living in joint family system and only 5.5 percent of the respondents were living in extended family system. Table showed that majority i.e. 49.1 percent of the respondents were living in nuclear family system because of rapid increase of change in living patterns and demands of the individuals. Table 1.7 showed the living status of the respondents. According to the table majority of the respondents i.e. 70.0 percent were living with their husband, while 18.2 percent respondents were living in University Residences and only 11.8 percent respondents were living with their parents.

Table 2.1 reflected the age of respondents at the time of first pregnancy. According to the table 28.18 percent belonged to 25-29 age group at the time of first pregnancy, 25.45 percent of the respondents belonged to the age group of 30-34 age group, 18.18 percent of the respondents belonged to the age group of 35 & above, while 10.91 percent of the respondents had no pregnancy. Table 2.2 showed the health facilities provided by the University of Gujrat. According to this table 70.0 percent respondents were to some extent agree about the health facilities of the university and 7.3 percent of the respondents to great extent and 22.7 percent of the respondents were not at all agree about the health facilities of Gujrat University. It was concluded that majority of the respondents were to some extent agree about the conduciveness of health facilities for working women. Paul (1993) the ergonomic factors, including poor workplace design, tend to affect female reproductive outcomes, due to the physical and physiological changes that occur during pregnancy. A woman's ability to work while pregnant will vary depending on her own individual characteristics and the nature of tasks. Women can continue to perform most tasks during pregnancy, some tasks such as standing and heavy lifting may no longer be advisable. The impact of ergonomic stressors will vary considerably depending on

the individual woman's physical fitness and strength, as well as her overall health status. An abortion is the termination of a pregnancy by the removal or expulsion from the uterus of fetus/ embryo, resulting in or caused by its death. Table 2.3 showed the abortion of pregnancy. According to data, 54.5 percent of the respondents did not abort any pregnancy during job, while 45.5 percent of the respondents aborted their pregnancy during job.

Table 1: Socio-economic Characteristics of the Respondents

1.1 Age of the Respondents			1.5 Age of the Respondents at Marriage		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
26-30	11	10.00	16-20	10	9.09
31-35	34	30.90	21-25	30	27.27
36-40	37	33.63	26-30	37	33.64
41-45	12	10.90	31-35	26	23.64
46-50	9	8.18	36 & above	7	6.36
51 & above	7	6.36	Total	110	100.00
Total	110	100.0			
1.2 Family Members of the Respondents			1.6 Family Structure of the Respondents		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
Up to 3	16	14.54	Nuclear	54	49.1
4-6	72	65.45	Joint	50	45.5
7-9	15	13.64	Extended	6	5.5
10 & above	7	6.36	Total	110	100.0
Total	110	100.00			
1.3 Educational Status of the Respondents			1.7 Respondents Living Status with (Residence)		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
Metric	1	.9	Husband	77	70.0
Intermediate	9	8.2	Parents	13	11.8
Graduation	12	10.9	University	20	18.2
Masters and above	88	80.0	Total	110	100.0
Total	110	100.0			
1.4 Family Income of the Respondents					
Categories	Frequency	Percentage			
Up to 25000	2	1.8			
25001 +	108	98.2			
Total	110	100.0			

Table 2 Occupational Risk Factors Associated with Reproductive Health

2.1 Age of the Respondents at first Pregnancy			2.5 Occupational Stress		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
No pregnancy	12	10.91	To Great Extent	71	64.5
Up to 24	20	18.18	To Some Extent	32	29.1
25-29	31	28.18	Not At All	7	6.4
30-34	28	25.45	Total	110	100.0
35 & above	19	17.27			
Total	110	100.00			
2.2 Health Facilities Provided by University			2.6 Stressful Work		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
Not At All	25	22.7	To Great Extent	63	57.3
To Some Extant	77	70.0	To Some Extent	29	26.4
To Great Extant	8	7.3	Not At All	18	16.4
Total	110	100.0	Total	110	100.0
2.3 Abort Pregnancy			2.7 Job Dissatisfaction		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
No	60	54.5	No	39	35.5
Yes	50	45.5	Yes	71	64.5
Total	110	100.0	Total	110	100.0
2.4 Abortion because of Occupational Stress			2.8 Reproductive Complications During Job		
Categories	Frequency	Percentage	Categories	Frequency	Percentage
No	34	30.9	No	22	20.0
Yes	76	69.1	Yes	88	80.0
Total	110	100.0	Total	110	100.0

Table 2.4 showed the reason of abortion. Majority of the respondents i.e. 69.1 percents respondents aborted their pregnancy due to occupational stress, while 30.9 percent of the respondents did not abort their pregnancy due to occupational stress. It was concluded that one of the main reason of the abortion of the respondents was occupational stress. Chistiani (1995) conducted a study on occupational stress and dysmenorrheal in women working in cotton textile mills. This study stated that although physical activity itself may not be considered a proven risk factor for pregnancy, some physically strenuous work conditions (e.g. heavy lifting, frequent bending) might increase the risk of negative pregnancy outcome, especially among women with other risk factors (e.g. with previous fetal

losses) or in the presence of other work-related risks. The mechanism of action of strenuous physical activity on fetus is not clear, and it might involve decrease not only in oxygen and nutrient supply but also in the endocrine system. This hypothesis is advanced by a recent prospective study which found that the time window of exposure to physical strain occurs.

Table 2.5 showed occupational stress of the respondents. According to this table 64.5 percent respondents were to great extent agree about the occupational stress and 29.1 percent respondents to some extent and only 6.4 percent respondents were not at all agree about the occupational stress for employees. It was concluded that majority of the respondents were to great extent agree about the occupational stress during job. Paul (1993) stated that the degree of stress on the spine caused by lifting is directly related to the distance from the body that the load is shifted, with greater distance causing greater stress. As the abdomen increase in size, pregnant women must bend over more and reach out further to pick up a load. The amount of stress on the lower back is greater in pregnancy because in the increase size of abdomen. As the pregnant woman's centre of balanced shifts, she may find it more difficult to carry awkward loads.

According to the (Schetter et al., 2000) it is estimated that "Preventing Stress at Work" have indicated that stress affects working women more than men. Several factors seem to magnify the impact of stress on women, such as the fact that women are often less paid than men; and many organizations lack policies that allow for family responsibilities and which account for stress at work, high job demands and low worker control over the job and work organization. Teachers and nurses who have responsibilities for the health, welfare and well-being of others, have been identified as being particularly at risk of stress. Table 2.6 indicated the stressful work for the respondents. According to this table 57.3 percent respondents were to great extent agree about the stressful work and 26.4 percent respondents to some extent and only 16.4 percent respondents were not at all agree about the stressful work for employees. It was concluded that majority of the respondents were to great extent agree about the stressful work. Table 2.7 described the satisfaction of the respondents with their jobs. It showed that 64.5 percent of the respondents were not satisfied with their jobs, while 35.5 percent respondents satisfied with their job.

Table 2.8 reflected the reproductive complications of female during job. According to the table 80.0 percent of the respondents faced reproductive complications during job, while only 20.0 of the respondents were not facing any reproductive complications during job.

Table No.3 Occupational Risk Factors and Reproductive Health of Female Faculty Members

Reproductive Health	Occupational Risk Factors			Total
	Low	Medium	High	
Low	1 (0.90%)	9(8.18%)	0(00.0%)	10(09.09%)
Medium	7(6.36%)	55(50.0%)	11(10.0%)	73(66.36%)
High	1(0.90%)	19(17.27%)	7(6.36%)	27(24.55%)
Total	9(8.18%)	83(75.45%)	18(16.36%)	110(100.0%)

Table 3 presented the trend of data. According to this table there was association between occupational risk factors of working women in Gujrat University and their reproductive health. According to data presented in cross tabulation 16.36% respondents had high, 75.45% had medium and 8.18% had low level of occupational risk factors and on the other hand 24.55% had high, 66.36% had medium and only 9.09% had low reproductive health status while working in University of Gujrat.

Table No.4 Symmetric Measures

		Value	Asymp. Std. Error	Approx. T	Approx. Sig.	Exact Sig.
Ordinal by Ordinal	Kendall's tau-b	.177	.079	2.139	.032	.048
	Kendall's tau-c	.118	.055	2.139	.032	.048
N of Valid Cases		110				

Table 4 showed the statistical test that was used to check the association of independent and independent variable. Kendall's tau-b & c test was used. Calculated value (P value: 0.032) was less than 0.05 level of significance. Therefore it showed that there was association between occupational risk factors and reproductive health of married working women in University of Gujrat.

CONCLUSION

This study outlines the situation of women workers regarding occupational health. It presents overwhelming evidence that woman workers suffer from inaccurate statistics, inadequate health care, legislation and policy that could have protected them from adverse working conditions and environment in view of their reproductive role. Our knowledge how occupational exposures affect the reproductive health of woman is not always conclusive. The data analysis presented in the table has shown that there is adverse situation of the working women in case of the physical and mental health. Further there is a need to improve the workplace situations for the married women as such adverse conditions of overburdened have made their life more difficult. There are number of problems these women are facing such as exposures to irregular work, work load, heavy physical work and other work risks such as exposure to psychosocial stress and occupational stress.

REFERENCES

- Macionis, J. John. (2006). Sociology. Pearson Education, Inc. India: Dorling Kindersley Publishing Inc.
- Blatter, B., N. Roeleveld, and G. Zielhuis, (2003). Maternal Occupational Exposure during Pregnancy and risk of Spina Bitida. *Occupational Environmental Medicine*, 53(2): 80-86.
- Christiani, D.C. (1995). Occupational Stress and Dysmenorrhea in Women Working in Cotton textile Mills. *International Journal of Occupational and Environmental Health*, 1(1): 9-15.
- International Labor Organization, (1998). Employment Report
- Laskin, C.A., C. Bombardier, M. E., Hannah, F.P., Mandel, J.W., Ritchie, and V. Farewell, (2007). Prednisolone and Aspirin in Women with Auto Antibodies and unexplained Recurrent Fetal Loss. *The New England Journal of Medicine*, 337: 148-154.
- Paul, M. (Ed). (1993). *Occupational and Environmental Reproductive Hazards: A Guide for Clinicians*, USA: Lippincott Williams & Wilkins Publishers.

Dunkel-Schetter, C., Gurung, R. A. R., Lobel, M., & Wadhwa, P. D. (2000). Stress Processes in Pregnancy and Birth: Psychological, Biological and Sociocultural Influences. In A. Baum, T. Revenson, & J. Singer (Eds.), *Handbook of Health Psychology* (pp. 495-518). Hillsdale New Jersey: Lawrence Erlbaum.

Selevan, S. G, D.C., Rice, K.A., Hogan, S.Y., Euling A., Pfahles-Hutchens J., Bethel, (2003). Blood Lead Concentration and delayed Puberty in Girls. *New England Journal of Medicine*, 348: 1527-1536.

Sultana, Aneela, (2008). Miscarriages and induced abortions! The plight of rural women: a case study of Punjabi village. *Journal of the Research Society of Pakistan*, 45(2): 1-10.

Talamanca, I. and M., Hatch, (1994). Reproduction and the workplace: What we know and where we go from here. *International Journal of Occupational Medicine and Toxicology* 3(3):279-303

United States Department of Labor (1993). *Hand Book on Women Workers*.

Yamane, Taro. (1967). *Statistics: An Introductory Analysis*, 2nd Ed. New York: Harper and Row.

PROTOTYPE FRAMEWORK: PROTOTYPES, PROTOTYPING AND PILOTING IN TERMS OF QUALITY INSURANCE

Muhammad Azeem
Punjab Education Assessment System (PEAS)
Education Department, Punjab, Lahore
PAKISTAN
knowledge_jhumra@yahoo.com

Dr Muhammad Bashir Gondal
Punjab Examination Commission (PEC),
Education Department, Punjab, Lahore
PAKISTAN.
bashiribd@yahoo.com

ABSTRACT

There is always a great uncertainty as to whether a new concept, model, or design—products from industry and assessment tools from education, will actually do what is desired. The quality of product is based on prototype, prototyping and piloting. The idea of prototype, prototyping is being incorporated in the development of educational assessment tools. Prototype is something that is representative of a category of things; it is early sample, model, or design built to test a concept or process. It is an original type, or form of something serving as a typical example, basis, epitome, or standard for other things of the same category. A prototype—sample test or sample test item, is built to test the function—assessment of performance, abilities or proficiencies, of the newly developed assessment tool, before using the test in students' assessment project. Developing valid test is often expensive and can be time-consuming, especially when repeated several times. As an alternative, "rapid-prototyping" techniques are used for the initial prototypes, which implement part—test items related to different constructs or various parts of a product, but not all, of the complete test. Prototyping is a process of quickly putting a prototype in order to test various aspects and features of an assessment, and gather early user feedback. Prototyping is often treated as an integral part of the assessment tools development process, where it is believed to reduce project risk and cost. Initially often one or more prototypes are made; in this way problem or deficiencies in assessment tool can be corrected. This allows manufacturers—industrialists or assessment organizations to rapidly and inexpensively test the parts of the product/assessment that are most likely to have problems, solve those problems, and then develop the assessment tool. When the prototype is sufficiently refined and meets the standards—benchmarks or objectives, the product—test is ready for production. Before going to use test, piloting help to make sure all types of evidences of validity—construct validity, result interpretive validity and usability. These validity evidences may guide the teacher about consequences of test results. Thus notion of prototype and prototyping has changed and shifted the idea of traditional assessments towards valid and marketable assessment tools.

Key words: assessment, prototype, prototyping, performance, assessment tools

INTRODUCTION

In many fields—industry and education there is always a great uncertainty as to whether a new concept, model, or design—products from industry and assessment tools from education, will actually do what is desired. Building the full—complete in all respect, design can be time-consuming and much more expensive. These two factors have deep affects on require product, especially when product is repeated several times. A prototype (proto means initial/first and type means version/category/sample) is the first working model which serves as a model on which successors are based. It is built to test the function of the new design before starting production of a product. The most common use of the word prototype is a functional. A parallel word “Service Test” is used in aviation and aircraft industry in place of prototype. The quality of product is based on prototype,

prototyping and piloting. Prototypes provide the design developers with a "working model" for demonstration of product analysis, quality-assurance, to confirm or make changes according to needs and requirements.

Prototyping is the process of quickly putting together a working model in order to test various aspects of a design, illustrate ideas or features and gather early user feedback. Prototyping is often treated as an integral part of the product design development process, where it is believed to reduce project risk and cost. Often a few prototypes are made initially and each prototype is influenced by the performance of previous designs, in this way deficiencies in design of the product can be corrected. When the prototype is sufficiently refined and meets the functionality, robustness, manufacturability and other design goals, the product is ready for production. The idea of prototype, prototyping is being incorporated in the development of educational assessment tools.

Concept and Purpose of Prototype

According to Fulcher and Davidson (2007) The Oxford Dictionary of Business (1996: 407) defines the prototype in this way:

“A preproduction model developed to evaluate the feasibility of new ideas, materials, technology, and techniques as part of new product development. In addition to the technological evaluation, consumer clinics may be used to establish the opinion of the potential customers on the acceptability of the product”.

The purpose of prototype in testing is similar to its purpose in engineering. The main objective of prototype is to construct an item, for a test, that is aligned with the purpose of the test and justification for the selection of item for test.

Significance of Prototypes and prototyping in Educational Testing

Today main goal of students' assessment is to assess *“Knowing What Students Know* provides us with a compelling view of the future of educational assessment, a future that includes better information about student learning and performance consistent with our understandings of cognitive domains and of how students learn. That future also promises a much tighter integration of instruction and assessment. Realizing these ambitions depends on progress in the fields of cognition, technology, and assessment, as well as significant changes in educational policy at local and national levels (Technology and Assessment: Thinking Ahead -- Proceedings from a Workshop, 2002)”. In educational testing, it is most important to unmask the constructs that are the targets of assessment. What do we mean by the unmasking of constructs and why is this important? Standardized assessments have often been characterized as irrelevant and arcane to the test taker. ETS experts have the view that most of the International standardized Tests are problematic, in part, because task types such as analogies are puzzle-like, limited in scope, and not directly linked to any frameworks. Thus, contends that preparing for such tests distracts students and teachers from focusing on the important learning goals articulated in content standards and access to the secrets of these tests is not equitably distributed in all societies.

Such criticisms are not unique, and they point to a historical problem with traditional tests—the masking of constructs, that is, a lack of clarity of the meaning associated with performance. On high

stakes tests, such ambiguity causes overwhelming attention to particular task types and to test questions themselves.

To make the constructs underlying standardized assessments more transparent to students and teachers, with the goal of altering the focus from the tasks themselves to the constructs they measure. Prototype for a new educational assessments are being used in modern digital age to evaluate the all types of validity, perceived authenticity, and educational appropriateness of these prototype for assessing students achievements and proficiencies in different subjects. The developer of an assessment item as prototype must explicitly consider the following:

The Domain—what concepts and skills constitute the domain, how are the various components related, and how are they represented? The domain representation becomes the vehicle to communicate, through the assessment process, the valued nature of understanding.

The Evidence—what are the data that would lead one to believe that a student did, in fact, understand some portion of the domain model? What would a student have to demonstrate to show that he or she could perform at a designated level of accomplishment? Clarifying what the evidence should be is important, not only for the shaping of tasks but also to help students understand in very clear ways what is expected.

The Tasks—In light of domain and evidence requirements, assessment tasks can be developed. If the tasks are driven by such requirements, there is a much greater likelihood that the tasks will be focused, relevant, and representative. Note that the path of moving from domain, to evidence, to task is quite different from many traditional test-development practices

These—the domain, the evidence, and the tasks, three constitute Evidence Centered Design framework. The tasks or items are the components of an assessment or test. Each item is the prototype for the test.

Example (Language Testing)

Circle the odd word.

1. Water
2. Milk
3. Petrol
4. Ice
5. Coffee
6. Jam-e-shireen

An expert in language assessment may have following question about this item as a prototype item.

- What the teacher think the item is supposed to measure?
- What knowledge would a student need to answer this item?
- Is there any problem with this item? If yes then what?
- How can improve the item?

All these questions are related to the validity and quality of the test.

The answer of first the question is related to the item specification and then to the objective of the test. The answer of second question is related to the instruction while question 3rd and 4th are related to the test development. Here we can discuss only 3rd and 4th question.

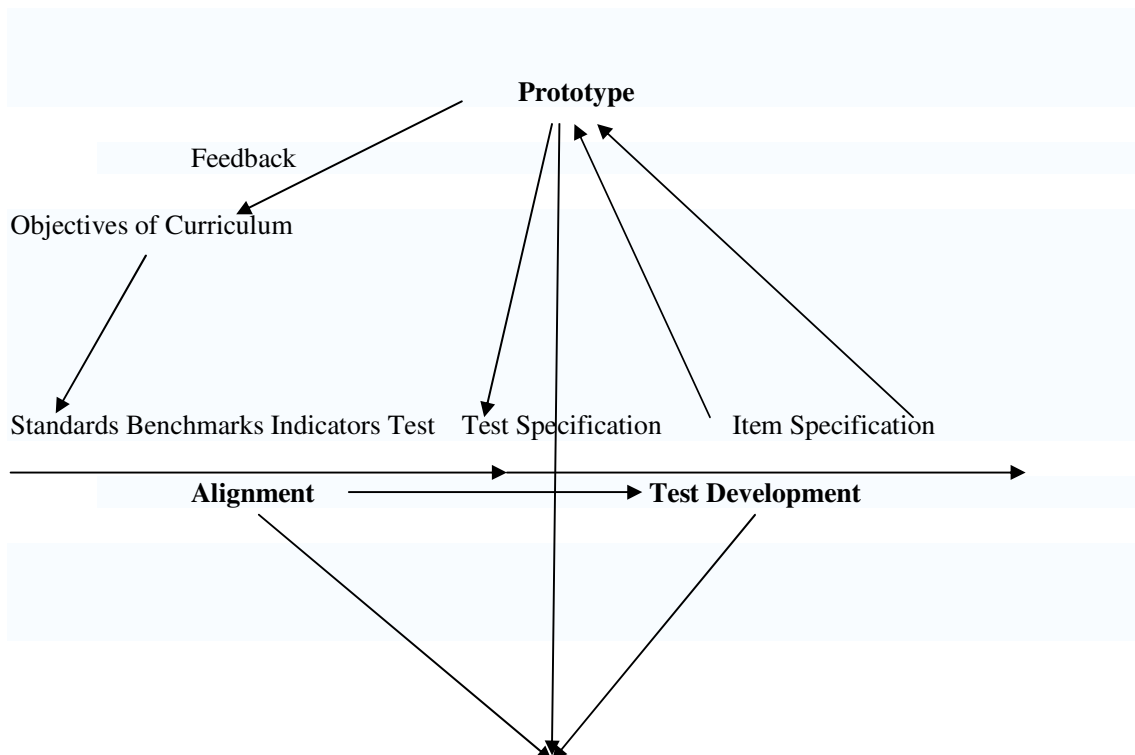
There is a problem with this item. In Pakistani society, especially in rural areas small children have no idea about coffee and jam-e-shireen even there are so many children that have never been seen coffee or jam-e-shireen. So this would influence item difficulty resultantly validity of the test in large scale assessment. This item may be improved by replacing coffee by *lussi* (mixing of yogurt + water) and adding word *shurbat* (mixing of jam-e-shireen + water).

The analysis of prototypes help the item writers in solving the issues related to:

- Cultural content
- Construct-irrelevant processes
- Claim we wish to make
- Expected difficulty drivers
- Assumptions
- Format and presentation
- Construct-irrelevant variance
- Context
- Correct response

Prototype Framework

Below framework explore the importance of prototype

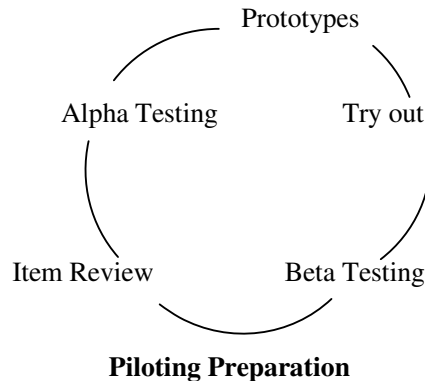


Valid Assessment of Students Performance

Prototypes authenticate validity of assessment. Standards, benchmarks and indicators are the bases of test and item specifications. Test and item specifications lead towards prototypes. Prototypes give feedback to curriculum objectives and Standards, benchmarks and indicators. Therefore prototypes are the mediators between test alignment and test development.

Prototyping

Prototyping forms an important link between theory and practice. It transforms ideas into practical form. It strengthens the piloting and field studies.



1) Alpha Testing

It is in-house testing (Fulcher & Davidson, 2007). The purpose of alpha testing is to remove faults/errors in stems, options, item context etc through expert judgment. Every item is review by experts' individually and by group of experts.

Item Review

The group leader—chief conduct item review by cross item reviewing among item writers. Faulty items will be revised by the item writers. Finally all the items are reviewed by the chief.

Panel Item Review

All item writers meet and review all prototypes items by the assistance of item writing experts, Psychometrician, subject teachers, and personals from testing service

2) Beta Testing

The purpose of beta testing is to test items with students of specified subject and grade. Beta testing use to ensure expected difficulty level, discrimination, and test format.

Try out/spot testing

The items selected by panel review tryout—spot testing, on small number of students. All items are divided in to small groups of items (approximately 10-20). Each group of item is tryout on five to ten students only.

Tryout Data Analyses

Main purpose of data analyses of tryout data is to check the quality of items according to the contents and competencies to be assessed.

Piloting

A pilot study is a standard scientific tool for research that allowing researcher to conduct a preliminary analysis before committing to a full-blown study. Therefore a good assessment or research strategy requires careful planning and a pilot study will often be a part of this strategy. A pilot study is normally small in comparison with the main research and therefore can provide limited but appropriate information on the sources and magnitude of variation of response measures.

A pilot study may address a number of issues. As part of the research strategy the following factors can be resolved prior to the main study:

- Check that the instructions given to investigators comprehensible;
- Check that investigators and technicians are sufficiently skilled in the procedures;
- Check the correct operation of test;
- Check the reliability and validity of results
- Detect a floor or ceiling effect (e.g. if a task is too difficult or too easy there will be skewed results)

Advantages of prototyping

- Assists to identify any problems with the efficacy of earlier design, requirements analysis and coding activities
- Helps to refine the potential risks associated with the delivery of the system being developed
- Early visibility of the prototype gives an idea of what the final assessment looks like
- Cost effective (Development costs reduced)
- Increases system development speed
- Fully functional testing before any commitment to tooling(Fulcher & Davidson, 2007)
- Encourages active participation of students
- May attract funding
- Enables a higher output for funding agencies

Disadvantages of prototyping

- Possibility of causing systems to be left unfinished
- Possibility of implementing systems before they are ready.
- Project management difficulties

REFERENCE

- Fulcher, G. & Davison, F. (2007). *Language Testing and Assessment an Advanced Resource Book*. UK: Routledge
- Grenda, E. (2006). The Most Important Commercial Rapid Prototyping Technologies at a Glance.
- Lancaster GA, Dodd S & Williamson PR (2004) Design and analysis of pilot studies: recommendations for good practice. *Journal of Evaluation in Clinical Practice* 10(2): 307-12
- Peter F. de Jong (1988) An Application of the Prototype Scale Construction Strategy to the Assessment of Student Motivation *Journal of Personality* 56 (3), 487-508.
- Prototyping. Retrieved from <http://en.wikipedia.org/wiki/Prototyping> on 02-08-2007
- Rose, D., & Meyer, A. (2002). *Teaching Every Student in the Digital Age: Universal Design for Learning*. Arlington, VA: ASCD
- Ruxton GD & Colegrave N (2006) *Experimental Design for the Life Sciences* (2nd edition). Oxford: Oxford University Press
- Singley, M.K., & Bennett, R.E. (2002). Item generation and beyond: Applications of schema theory to mathematics assessment. In S. Irvine & P. Kyllonen (Eds.), *Item generation for test development*. Hillsdale, NJ: Erlbaum
- Technology and Assessment: Thinking Ahead -- Proceedings from a Workshop (2002) retrieved from <http://books.nap.edu/openbook.php?isbn=0309083206>
- Wohlers, T. (2010). Rapid Prototyping Terms and Descriptions. Retrieved from <http://www.wohlersassociates.com/terms.html>
- Wright, Paul K. (2001). *21st Century manufacturing*. New Jersey: Prentice-Hall Inc.

PROBLEMS OF PROSPECTIVE TEACHERS DURING TEACHING PRACTICE

Muhammad Azeem

Punjab Education Assessment System (PEAS)
Education Department, Punjab, Lahore
PAKISTAN
knowledge_jhumra@yahoo.com

ABSTRACT

The teaching practice is designed to smooth the transition from teacher to student. At the same time the teaching practice assignment gives the teachers training institutions an opportunity to evaluate the students teaching capabilities. It is one of the most important components of the teacher training program. It is an opportunity for student teachers to put their theoretical studies into practice. There may be some inconsistencies between what has been learned in college or university and the actual situation in the classroom. The teaching practice exercise should help student teachers to integrate theory and practice. It is the responsibility of teacher education institutions to provide such learning experiences to student teachers that they may be able to identify, select and innovate organize such learning experiences which may develop competence in the student teachers to teach the course of their specialization on the one hand and recreational activities and social useful production work on the other hand. As teaching practice is an important component of teachers training program, considerable attention must be given to make it more effective and fruitful. Keeping in view the importance of teaching practice, the study was designed to identify the problems faced by the student teachers during teaching practice. The study was delimited to teacher training institutions of Lahore city. Hundred B.ED students were selected by convenience sampling. A questionnaire comprising thirty-five questions was prepared and administered personally. The data was collected and tabulated. Major finding are: 1) Majority of the schools do not prepared the timetable for the pupil teachers. 2) Pupil teachers are not imparted practical training of different methods of teaching before they are sent for teaching practice. 3) Majority of the students are not informed about the rules and regulations of the practicing schools.

Key words: teaching practice, training, student teachers

INTRODUCTION

Teaching is an exciting and rewarding activity but like other professions it is demanding. It requires that its practitioners clearly understand what should be done to bring about the most desirable learning in the pupil and be highly proficient in the skills necessary to carry out these tasks. Teaching is not the simple matter of profession one's message. It is complicated communication problem. Using different teaching methods, techniques and devices we can solve the communication problem. Teaching methods are means by which the teachers attempt to bring about the desired learning. A professionally trained teacher can use different methods of teaching successfully. It is really a very difficult task and only a professionally qualified teacher can do this. We cannot expect all this from a teacher professionally unqualified.

To provide professional education for teachers, colleges of education have been established almost all over the world. In Pakistan, teacher education program in consonance with various levels of education i.e. B.Ed and M.Ed have been introduced at certain colleges and universities. All the teachers training

institutions are not only imparting theoretical but also practical knowledge and skill in teaching different subjects to prospective teachers. At the end of the session, teaching practice is carried out for practical application of theoretical understanding about different teaching methods. It is generally of one month's duration.

Whereas teaching is the process by which a person helps other people to learn. It is one of our most important activities. Teaching helps people to gain the knowledge and attitudes they need to be responsible citizens, earn a living and lead a peaceful life. It also provides a chief mean of passing knowledge to the next generation. (Encyclopedia, 1988: P/65)

Efforts to define "teaching" have centered on explorations of various facts of the concept of teaching rather than on the formulation of explicit definitions. Altogether there have been four attempts to define "teaching", but none has resulted in an explicit definition. One takes its substance from precedent, two pursue the task through the techniques of linguistic analysis, and the remaining one is controlled by ideological consideration. A fifth definition, a scientific one, is beginning to take shape and in all probability will supersede the others. These five definitions are: teaching in the conventional sense, or the descriptive definition; teaching as success; teaching as an intended activity; teaching as a normative activity; and the emerging definition. They may admit the accuracy of the historical definition of teaching but still turn to their own programmatic definition of teaching as inquiry.

The forgoing definitions of teaching are rooted in the ordinary language and while they clarify to some extent and various senses in which the word "teaching" is used in pedagogical discourse, they are not precise enough for everyone to agree on their application. For the study of an occupation to become scientific, it is necessary to some extent to abandon lexical definitions even though terms of the ordinary language are retained. Every field of scientific endeavor has its beginnings in primitive observations and experiences and goes forward, at least initially, with words adapted from everyday language, "Work", "Force" and "Horsepower" have precise meanings in mechanics, but each one had a history of use before it was defined in mechanics in ways not derivable from its daily uses.

While "teach" is found in everyday language, it is retained in pedagogical science where it is defined by empirically confirmed statements of the effects of teacher performance. For example, if a teacher gives a definitional rule and positive and negative instances in teaching concrete concepts, the probability that the student will master the concept is increased; or if a teacher gives corrective feedback to a pupil who makes a mistake, the chances that the student will learn are enhanced.

The term teaching practice embraces all the learning experiences of student teachers in schools. The term practice teaching has three major connotations: the practicing of teaching skills and acquisition of the role of a teacher; the whole range of experiences that students go through in schools and the practical aspects of the course as distinct from theoretical studies (Stone and Morris: 1907 P/19).

According to Thomas, the period spent by a student teacher in an actual classroom situation in order to teaching practice skills under the supervision of an experienced teacher. According to Thomas, the activity referred to as teaching practice or student teaching consists of student teacher giving instruction to a regular classroom of pupils. The amount of such direct teaching experience can vary from one or two lessons to an entire year of full time or half time service in a school.

Holden suggests that the extended period of more or less full time teaching in a school found in conventional initial training course. (Holden: 1987 P/52).

Teaching practice refers to the opportunity given to the trainee to develop and improve his / her professional practice in the context of the real classroom, usually under some form of guidance and supervision. School experience means the total experience of working in a school in which trainees have when they are on placement in schools. (Wallac: 1991, P/121).

Perry says that teaching practice refers to the period of time in which a student teacher gains firsthand experience in working with a particular group of children. (Perry: 1997, P/3).

A number of terms such as the teaching practice, student teaching, field studies, infield experience, school based experience or internship are used to refer to this activity. Niak writes about teaching practice as in practice the embryo teacher, under the direct and continuing supervision of experience master, begins to teach, to apply the theory learned into practice. (Niak: 1998, P/133).

Khan writes about the concept of internship as it is the responsibility to teacher education institutions to provide such learning experiences to students teachers that they may be able to identify, select, innovate and organize such learning experiences which may develop competence in the student teachers to teach the course of their specialization on the one hand and games, recreational activities and socially useful productive work on the other hand. The program of internship in teaching other than traditional teaching practice program can play an effective role in developing these concepts in the student teachers.

Internship is a new experience in the profession of teaching. In which trainees are able to observe the entire work of the school and to participate actively in all the important professional activities of a teacher both in and out of the classroom (Khan: 1993, P/19).

According to Dreeben this phase of training contributes not only to the development of occupational norms but also to reducing anxiety about taching and to learning classroom techniques. It also seems to contribute most of discover workable conduct, where “workable” becomes characteristically defined as classroom management, following fixed schedules of instructions, simplifying lesson plans, getting through the material and cutting back on the breadth and richness of the material presented. (Dreeben: 1970, P/18).

Gower and Walters write that someone can learn about teaching by discussing it and talking about materials and techniques but like most skills one cannot really learn it without doing it. It is one of the few opportunities for prospective teacher ever have for trying out a new idea and perhaps having a critical but supportive set of observers. To focuses on: a) Classroom sensitivity to problems of teaching, b) Classroom sensitivity to learning problems, c) Basic classroom management skills, d) Teaching technique. (Gower and Walter: 1983, P/40).

Cohen and Manion described the need of teaching practice in these words. The theory and training in college prior to first practice cannot possibly provide with answers for all the problems and contingencies, a future teacher is likely to encounter in the school and the classroom. (Cohen and Manion: 1983, P/14).

According to Goodings by exposing teachers in training to the realities of their future carriers in a controlled situation, enable them to eliminate a variety of weakness characterized beginning teachers. Not only they are better prepared to teach but posses a high level of confidence in their own abilities. (Goodings: 1983, P/43).

According to Brown and Brown the teaching practice period is one of the most important components of the teacher-training program. It is an opportunity for students teachers to put their theoretical studies into practice. There will undoubtedly be some inconsistencies between what has been learned

in college or university and the actual situation in the classroom. The teaching practice exercise should student teachers to integrate theory and practice and to resolve some of these apparent discrepancies.

It is also the time of try out some of the ideas which have been developed in college or university and to experiment with the different approaches strategies and techniques of teaching raised in the methods course.

Practice training provides:

- An opportunity to gain confidence.
- Chance to put theories into practice.
- An opportunity to learn the skills and attitudes of a competent and affective teacher.
- The chance to learn about children in real life.
- An opportunity to improve the knowledge of subject mater.
- The chance to gain from the benefits of constructive criticism.
- An opportunity for self-evaluation and to discover strengths and weaknesses.
- An opportunity for the teaching institutions to evaluate itself.

(Brown and Brown: 1990, P/2, 3).

According to Merry field teaching practice provides the opportunity to students:

- To apply knowledge and skills acquired in teacher education course work.
- To demonstrate attitude consistent with good teaching.
- To apply multiple principles of learning and multiple teaching strategies.
- Begin to identify with the role of a teacher.
- Develop entry-level competence in the full range of teaching function.
- Demonstrate professional and ethical behavior. (Merryfield: 1997, P/124).

Perry narrates that teaching practice experiences contribute in some way to under standing of teaching. It helps to learn to use teaching experience it involves:

- Developing specialized knowledge
- Using the knowledge to access and make decisions
- Acquiring high standards of practice
- To develop knowledge and abilities in relation to each of these aspects.

(Perry: 1998, P/23).

Meetings are held to give the students the necessary information about their teaching practice. The teaching practice organizer together with the supervisors give out the necessary information of such as matters as procedure for observation days, on assessment, on appropriate dress, on learning aids etc. Students can ask questions about any aspect of teaching practice that concerns them. The students should be told about their transport and about the times they are supposed to board the buses to and

from the school. All the students going on teaching practice should attend teaching practice programs. (Macharia and Wario: 1994, P/8).

One of the principles of learning is to know the learners and start working with them. Student teacher is deeply concerned about knowing the situation in which he/she will work and the people with whom he / she will associate. He/she has also concern to know about the curriculum plans of school. Student teacher will need to become familiar with the particular units of work in which the pupils be engaged when he / she begins his/her student teaching.

The concept involved and the instructional material being used. Another whole area of concern is his / her relations to other staff members and the school administration to parents and school community. Students must know: School calendar, school hours, Reporting accidents, first aid service, health services, Playground rules, Lost and found articles, Duties of safety patrol, Passing in corridors, ground movement within the building, Use of library, auditorium, gymnasium, audio-visual materials, Use of duplicating equipment, requisitioning supplies and equipment, Testing program, Testing program, Teachers meeting, other professional and in-service meetings, Teachers library, Parent – Teachers meeting, Report to Parent, Central Record Office, Supervisory policy, principal central office personnel, Reporting pupil and teacher absence, Special school services, store, bank etc. (Stratemeyer and Lindsey: (1969, P/205).

Stratemeyer suggested a few tasks for students, which are as follows: a) To observe the work of other teachers (cooperating teachers) and of classes other than the one with which he / she is concentrating, b) To participate in all school projects in the total program of an educational unit and to develop a feeling for the responsibility and get the feel of the teachers work load, c) To participate in planning for and presenting school assembly programs, d) To observe the work of several clubs of different types and to share in the responsibility for guidance of and of special interest to him / her or to which he / she brings special competence, e) To study how administration affects teaching and teachers. To get a picture of the activities of school administrators a student might spend two or three days working full time with the school principal. It is important that the students do more than sit passively in an office and watch people come and go, f) Attending the regular faculty meetings in school. The nature of the meeting, its purposes and probable procedures and one's planning for contributing to the discussion at hand, g) Include to getting the responsibility for the guidance of pupils in dealing with their personal and education problems. (Stratemeyer: 1969, P/84).

Whereas Johnson and Deprin recommended the following tasks of students teachers: a) Observe the teaching procedures followed by the cooperating teacher, taking note of the general routine, b) Become familiar with available instructional materials, c) Make a special effort to become acquainted with the pupil's learning as many names as possible, d) Identify areas in which plans can be made for immediate participation with individual or small groups, e) Acquire background information on the pupils with whom he will be working, f) Attaining an understanding of school situation; the school program, physical surrounding and facilities and the responsibilities of the teacher to the school, community and profession, g) Obtaining experience in performing satisfactorily the routine tasks, which are normally the responsibilities of classroom teacher, h) Engaging in a wide range of professional activities like using available instructional media, arranging bulletin board, classroom and management, keeping attendance register etc, i) Making daily plans and unit plans. (John and Deprin: 1971, P/29-31).

OBJECTIVE OF THE STUDY

The followings were the objectives of the study:

1. To know the preliminary arrangements made by the supervisors for the students before the commencement of teaching practice.
2. To collect the information regarding the assistance of the supervisors, Headmistresses and concerned class teachers to prospective teachers.
3. To enlist the problems faced by the prospective teachers during class room teaching.
4. To highlight the need of teaching practice in different subject.
5. To present the suggestions for further studies.

SIGNIFICANCE OF THE STUDY

The study would provide useful information about the actual practice of the supervisors towards the training of the students. The study would reveal the problems faced by the students during the teaching practice. It would provide useful information for the improvement of the system of teaching practice.

PROCEDURE OF THE STUDY

It was a descriptive study. The survey technique was used for the collection of data. B.Ed students from teacher training institutions of Lahore constituted the population of the study. Through convenient sampling hundred students were selected. A questionnaire comprising thirty five items was prepared. The questionnaire had only closed questions. It questionnaire was distributed to the selected students by the researcher. After getting the responses from the students the data was tabulated and analyzed in the form of tables. On the basis of analysis of data, findings and conclusion were drawn and recommendations were made. The questionnaire was personally administered by the researcher to the entire respondent included in the sample. Almost all the students were cooperative except a few. A brief introduction about the purpose and nature of the questionnaire was made before the distribution of the questionnaire. Each respondent was given a reasonable time limit to tick mark question. The collected data had been tabulated form. Responses to each question were recorded in percentage of each response was calculated and presented in tabular form.

ANALYSIS OF DATA

The purpose of the study was to get information about the problems faced by the prospective teachers during teaching practice. The study was of descriptive nature. Survey method was used for getting data. A questionnaire comprising 29 items was prepared and administered to one hundred B.ED students of University of Education, Lahore. The data was collected, arranged and analyzed. Simple percentages were used as the standard measure of statistics.

FINDINGS

Following findings were prepared as a result of analysis of data:

- 85% the respondents were sent for teaching practice under proper planning.
- 45% of the respondents were consented before sending them for teaching practice.

- 40% respondents were provided with transport facility.
- 100% respondents were of the opinion that selected schools were informed of the expected arrival of the prospective teachers beforehand.
- 30% respondents indicated that an orientation was conducted for them before leaving for teaching practice.
- 22% respondents were informed about the rules and regulations of the schools.
- 100% respondents were not informed of the existing facilities available in the selected schools.
- 12% respondents were introduced to the academic and administration staff.
- 20% respondents responded that the administration of the schools prepared the timetable for them before the commencement of teaching practice.
- 64% respondents were offered the classes of their choice.
- 60% respondents were of the opinion that duration should be one half month.
- 100% respondents were not imparted practical training of different methods of teaching in various subjects before they were sent for teaching.
- 65% respondents taught the same subjects for whom they were imparted training.
- 73% respondents were given practical training for lesson planning before the commencement of teaching practice.
- 100% respondents responded that their supervisors were present during school hours and they pointed out their weaknesses in the lesson planning.
- According to 80% respondents their lessons were checked regularly by the concerned supervisors.
- According to 23% respondents, the class teachers were present in the classes during teaching.
- According to 15% respondents the class teachers guided and encouraged the pupil teachers and cooperated with them concerning the required teaching material.
- According to 78% respondents, there were proper arrangements for sitting in the school.
- 80% pupil teachers were allowed to use school library and laboratory.
- According to 18% respondents, students of their classes considered them their teachers.
- 89% of the respondents have given positive response towards the prepare planning before the teaching.
- 93% of the respondents used A.V aids during the teaching practice.
- 54% of the respondents reached in time during teaching practice.
- 57% of the respondents selected the class according to their own choice.
- 60% teachers cooperated with the pupil teachers during the teaching practice.
- 75% of the respondents planned activity during the teaching practice.

CONCLUSIONS

On the basis of analysis of data and findings the important conclusions were:

- a) Prospective teachers were sent for teaching practice under proper planning.
- b) Consent of the majority of the students regarding the choice of the schools were not considered important.
- c) Majority of the students were not provided with transport facilities.
- d) Schools selected for teaching practice were informed of the arrival of the prospective teachers beforehand.
- e) An introductory gathering of teaching practice was not arranged for the pupil teachers before the commencement of teaching practice.
- f) Majority of the students were not informed about the rules and regulations of the practicing schools.
- g) Pupil teachers were not informed of the existing practical facilities available in the schools.
- h) Majority of the schools had not prepared the timetable for the pupil teachers.
- i) Majority of the students were offered the classes of their choice.
- j) Pupil teachers were not imparted practical training of different methods of teaching before they are sent for teaching practice.
- k) According to hundred respondents, the season selected for teaching practice was suitable.

RECOMMENDATIONS

- i. Proper planning for teaching practice may be made before its commencement as like consent of students, transport facility, orientation of teaching practice, available facilities, and school rules and regulations.
- ii. Preparation of a feasible timetable for the pupil teachers in collaboration with school administration.
- iii. Pupil teachers should be imparted practical training in using different methods of teaching. They may particularly teach those subjects for which they have received training.
- iv. Pupil teachers may be trained practically for lesson planning in advance and allowed to use the available facilities. Regular supervision and guidance will increase the quality of output.

BIBLIOGRAPHY

- Brown, D.P. and R.N.Brown, (1990). *Effective Teaching Practice*. Lechhampton, Cheltenham: Thornes Publishers Ltd
- Cohen, L, and L. Manion, (1983). *A Guide to Teaching Practice*. London: Routledge
- Cyril and D. Poster, (1993). *Teacher Appraisal Training and Implementation*. London: Routledge
- Dart, L. and P.Darke(1993). *School based Teacher Training A conservative Practice*, J. Education for Teaching
- Dreeben, R, (1970). *The Nature of Teaching*, Scott, Foreman Company, London
- Goodings, R.M. Byram,(1984). *Changing Priorities in Teacher Education*. Nichols Publishing Co. New York,
- Gower, R. and S. Walters, (1983). *Teaching Practice Handbook*. Heinemann Educational Books, Oxford
- Hagger, H.K. Burn and D. McIntyre, (1995). *The School Mentor Handbook*. Kogan Page Limited, London
- Holden, S.(1987). *Teaching Training*, Modern English Publication Ltd. Hong Kong
- Jhonson, J.A. and L.D. Deprin, (1971). *Elementary Student Teaching*, Scott, Foresman and Company, London
- Khan, M.S,(1993). *Teacher Education in India and Abroad*. Ashish Publishing House, New Delhi.
- Kohl, V.K. (1992). *Teacher Education in India*. Vivek Publishers, Ambala
- Macharia and Wario. (1994). *Teaching Practice in Primary Schools*. Macmillan Education Ltd, London
- Misra, K.S, (1993). *Teachers and Their Education*, the Associated Publishers, Ambala,
- Moris, S, and E. Stone, (1977). *Teaching Practice*, Methuen and Co. Ltd
- Naik, S.P. (1998). *Theory of Teacher Training*, Anmol Publications, Pvt, Ltd. New Delhi.
- Pernell, H.R. and L. Baltra,(1987). *Teacher Training*, Modern English Publications Ltd.
- Reid Constable. I.H. and R. Griffiths,(1977). *Teacher Education Reform*, Paul Champman Publishing Ltd. London.
- Stratemeyer, F.B. and L. Lindsey(1969). *Working with Student Teachers*, Eurasia Publishing House, New Delhi
- Taylor, W,(1978). *Research Reforms in Teacher Education*, NFER. Publishing Company, Windsor Berks
- Thomas, R.M., I, (1991). *International Comparative Education*, Routledge and Kegan Paul, London
- Michael J. Dinkin (1987). *The Encyclopedia of Teaching and Teacher Education*. Pergamon Press, Headington Hill, England
- Vashisth, S.R. (1992). *Teacher Education in the Third World Countries*. Anmol Publications, New Delhi

SOME INITIATIVES ON ICT ENABLED TEACHER EDUCATION IN IRAN

Dr. Nayereh Shahmohammadi
Human Resource Training Centre,
Ministry of Education. Tehran,
IRAN
nsh_teh@yahoo.com

ABSTRACT

Like any other part of the world, the ICT revolution has influenced almost every aspect of public life in Iran including education. As a developing nation, the need to take appropriate measures to overcome the digital divide is being felt more urgently in Iran as compared to any other country. Iran is not a late starter by any means in this regard. The Government of Iran has initiated multiple actions to keep pace with the latest developments in information technology. The very fact that a large number of professionals engaged in knowledge industry the world over belong to Iran speaks highly of the Iran initiatives in IT education. However, this is only indicative of the qualitative aspect. In terms of quantity, a large number of people are yet to be covered to make a real breakthrough. It is being increasingly realized that a faster way of achieving competency in this field is to integrate it with general education at all levels. For this, the training of teachers in ICT skills is a must. The various schemes and programs have been launched both at government and non-governmental levels to develop ICT skills in teachers. Various universities in Iran have designed specific courses for this purpose. However, in a big country like Iran with millions of teachers at different levels, it is indeed difficult to produce ICT-enabled teachers at a large scale within a short period. The problems are complex and issues are numerous. The paper presents an overview of some of the initiatives in this area and highlights the relevant issues, and at the same time indicates directions for future course of action.

Key words: ICT, teacher education, computer education

INTRODUCTION

Emergence of Information & Communication Technology is a significant event in the contemporary history. It has brought in a new era in our civilization in which digitization has almost become a cult, because it has influenced every facet of human life including education. As far as education is concerned, with use of ICT a basic transformation is taking place in the way our teachers teach and students learn. As the world is going more and more digital, the need for overcoming or at least minimizing the Digital Divide is being strongly felt for creating a more equitable world order. In this digital era it is important to keep pace with rapid changes that are taking place in the world, especially for a developing country like Iran with strong emphasis on knowledge sector. For this, changes ought to be introduced in our education system and more specifically in the teaching-learning process. Teachers in Iran need to be prepared for imparting the new age education, and hence teacher education program in Iran should integrate ICT component in such a way that teachers are enabled to face the new demands in the profession.

The experts in the field of education are aware about this need and efforts are on to introduce ICT component in teacher education program. Even a cursory look at the B.Ed/ M.Ed syllabus of quite a few Iran universities will demonstrate this trend. But the efforts are generally of a sporadic nature and ICT is mostly introduced as optional parts. Possibly it is for this reason that teacher

education in Iran could not make significant impact in the changing scenario of education. What is needed is to design teacher education programs that make a balance between traditional pedagogy and ICT – a judicious mixture of both. Although such attempts are rare in the total Iran context, some of the recent initiatives are reported here as illustrative cases.

INITIATIVE AT THE UNIVERSITY LEVEL

Some Faculties of Education with collaboration of ministry of Education have been established the program, aims at developing IT skills in teachers by incorporating ICT components with conventional teacher education in-puts. It is essentially an enabling mechanism to make teachers truly computer savvy and thus professionally more competent.

Eligibility : Four years Graduation or equivalent

Medium of instruction : Farsi

Delivery : Distance mode

Duration : 2 semesters

Weightage : 32 credits

PROGRAM STRUCTURE

First		
Course	Title	Credit
BE01	Educational Psychology	4
BE02	Education and teacher function	4
BE03	Evolution of Teaching Technologies	2
BE04	Computer Fundamentals	2
BE05	Internet and Education	2
BE06	TV and Satellite based Education	2
Total Credits		16

Second		
Course	Title	Credit
BEO7	Elements of Instructional Design and Content Development	4
BE08	Elective Group 1: BE0801 Methodology of science teaching Group 2: BE0802 Methodology of non-science teaching	4
BE09	Educational Evaluation	4
BE10	Project	4
Total Credits		32

In addition, Department of Education at the University offers a course in Master in Educational Technology – Computer Applications. (MET –CA) The course aims at developing teachers, trainers, instructional designers for Distance learning mode specially for teaching through

Interactive Multimedia (CBT) and On line learning (WBT). This is the only Masters level formal course offered in Iran in Instructional design for CBT and WBT.

The basic features of the course are as follows:

Basic Features of the MET –CA

Eligibility	Graduate Women(any stream) from recognized university scoring 50% Marks Skill in English Communication and Comprehension desirable
Duration	Two years full-time(Four semesters)
Course Content	Concept and scope of Educational Technology Process and Theories of Learning to understand how people learn Theories and models of Instructional design Storyboard development for Educational multimedia Multimedia development process and Application Software such as MS-Office, corel Draw, Photoshop, Macromedia Flash, Director, Author ware etc. Orientation to editing of audio-video-graphics and animations Web-designing using HTML, Dream weaver, etc. Process of Online Course development Orientation towards Programming languages, Visual Basic script Research Methodology Project Seminar

A Certificate Course in Instructional Design has been launched for a varied group of learners including e-learning professionals, script writers, story board creations ,authoring and of course for training and teaching. The program offerings consist of the following.

- E-learning + traditional instructional methods
- Creating on-line learning experiences
- Developing innovative solutions
- Helping people learn better

Program objectives are: a) Acquisition of professional qualification in Instructional Design, b) Improvement of job skills and self enrichment. Topics covered are as follows:

- Introduction
- Learning theories
- Learning styles
- ADDIE Instructional Design Model
- Analysis : Need ,Audience, Task
- Structuring and Content outline
- Instructional objectives
- Bloom's Taxonomy

- Content Types
- Flow and Clarity
- Visualization and Storyboarding
- Assessment
- Technical Writing
- English Writing Tips
- Instructional Strategies/ID Models

In addition to the above mentioned structured programs, Ministry of Education enhance ICT enabled teacher education in Iran. Ministry of Education is working with educators in different states to expand Iran student networking. Schools in Iran have played a key role in the 'Laws of Life Project'. This is supplemented through a special project to use E-learning projects as a means of civic education, which will combine physical exchanges and telecommunications.

CONCLUSION

In the absence of any concrete data base as to how many institutions actually have launched ICT enabled teacher education programs in Iran, initiatives taken by few institutions highlight the special features of each. One common characteristic of these programs is that these are mainly designed focusing the needs of teachers in Distance learning methodology. But in Iran a vast majority of learners belong to conventional institutional education. The efforts to integrate ICT component in the teacher training for conventional schools is virtually non-existent. It is in this area that special attention should be given, if any significant impact is to be made in bridging the Digital Divide in Iran situation. In Iran ICT enabled teacher education has just made a beginning. Iran.

Being a developing country, it is a long drawn and continuous process to achieve the desired level. *"Although the use of ICT in education and teacher training will grow more rapidly than expected, traditional technologies will continue to exist alongside the newer ones. This is because of the tremendous amount of funds it would take to cross the digital divide. Concerted efforts of international organizations and governments will however make significant progress in bridging the chasm."* (Cabanatan 2001).

It is also noted that Instructional Design is the core of most of the available courses, and these are aimed at catering to the needs of a variety of professionals in e-learning industries. This trend in a way minimizes the emphasis on teacher preparation. Instructional Design has emerged as a specialized area within the discipline of education. The courses designed for the specialized purpose may not be applicable generally in teacher education. "Teacher education and training are evolving in ways which reflect instructional design concepts. Instructional design is now being influenced by the current developments in electronic technology and management. Nevertheless, the roots of the instructional design discipline are in the field of educational psychology, and it may be anticipated that designers will continue to draw upon it for new ideas and approaches to the learning process." (Dick 1987) What is needed is a blending of ICT component and teacher education. In this, Ministry of Education has a significant role to play. Many of the ICT enabled teacher education initiatives are outside the purview of these bodies, and hence no linkage is established with teaching profession. This is a lacuna in the way of popularizing ICT enabled teacher education.

REFERENCES

1. Cabanatan,P.G-ICT Trends in Teacher Training Curricula : An Asia pacific perspective www.undp.org.vn/mlist/cngd/062003/post8.htm p.21
2. Dick,W (1987). A history of Instructional Design and its impact on Educational Psychology. In Glover & Ronning (Ed) Historical Foundations of Educational Psychology. Plenum Press, New York. P-200
3. Kamat,V (2005). ICT initiatives in Teacher education. In University News. Vol 43.No 18,103-08
4. [www. Unesobkk.org](http://www.Unesobkk.org) www.scdl.com

RELATIONSHIP BETWEEN AGRICULTURE AND GDP GROWTH RATES IN PAKISTAN: AN ECONOMETRIC ANALYSIS (1961-2007)

Dr Anwar Hussain
Research Economist,
PIDE Islamabad,
PAKISTAN.
hello2anwar@yahoo.com

Dr Abdul Qayyum Khan
COMSATS, Institute of Information
Technology, Wah Campus,
PAKISTAN
qayyum_72@yahoo.com

ABSTRACT

The present study has been conducted in the year 2008 to make econometric analysis of the relationship between agriculture growth rate and GDP growth rate in Pakistan. Time series data ranging from 1961 to 2007 on the above variables has been taken from Economic Survey of Pakistan (Statistical Supplement, 2006-07) and Federal Bureau of Statistics (1998). Augmented Dickey Fuller (ADF) test has been used for checking the stationarity of the data. The Akaike Information Criterion (AIC) has been used to select the optimum ADF lag. Furthermore, the Johenson Co-integration test (Likelihood Ratio statistic) has been used to detect the long-term relationship among the series. The method of Ordinary Least Square has been used to show the contribution of agriculture growth rate towards GDP growth rate. The results revealed that 1% increase in the agriculture growth rate brings 0.34% increase in GDP growth rate. The explanatory variable (agriculture growth rate) is statistically significant at both 1% and 5% level of significance. It is recommended that the government should stimulate GDP growth rate through agriculture growth in the Pakistan.

Key words: Relationship; agriculture; GDP growth rate; econometric analysis

INTRODUCTION

To study the role of agriculture in the process of economic growth is of crucial important. In Pakistan, agriculture sector contribution towards GDP is 24% in 2005-06, which the largest as compared to all other sectors in the economy (Economic Survey of Pakistan, 2005-06). Further, this sector has not only absorbed lot of labor force but also is a big source of industrial growth in Pakistan. In Pakistan, the GDP growth rate was 6.6% while that of agriculture growth rate was 1.6% in the year 2005-06. In 2006-07, the GDP growth rate has been increased to 7% while that of agriculture growth rate has also been increased to 5% (at constant factor cost), (Statistical Supplement, 2006-07).

The overall development of a country depends upon the health of agriculture sector, because provides food, raw materials, and also to earn foreign exchange which further push industrialization in the country (Johnston, 1970). According to Gardner (2005), in some countries there is no significant evidence of agriculture leading overall economic growth. But Tiffin and Irz (2006) found that there are sufficient evidences which supports the conclusion that agricultural is the main cause variable of overall growth rate. Timmer (2005) correlated poverty with growth in agricultural output and concluded that at the provincial level roughly two-thirds of the reduction in poverty was due to growth in agricultural output.

The present study is different from all of the above studies conducted as it assess the relationship between agriculture growth rate and GDP growth rate in Pakistan during 1961-2007, using econometric techniques.

MATERIALS AND METHODS

The present study has been conducted in the year 2008 to show relationship between agriculture growth rate and GDP growth rate in Pakistan using econometric techniques. Time series data ranging from 1961 to 2007 on the above variables has been taken from Economic Survey of Pakistan (Statistical Supplement, 2006-07) and Federal Bureau of Statistics (1998). Augmented Dickey Fuller (ADF) test has been used for checking the stationarity of the data. The Akaike Information Criterion (AIC) has been used to select the optimum ADF lag. Variables, which were non-stationary at level, have been made stationary after taking first difference and second difference. Furthermore, the Johansen Co-integration test has been used to detect the long-term relationship among the series. To this end, the Likelihood Ratio (LR) statistic is used.

To show the contribution of agriculture growth rate towards GDP growth rate, the method of Ordinary Least Square method has been used and the following model was estimated inducting agriculture growth rate as explanatory variable while GDP growth rate as dependent variable.

$$GDPR = b_0 + b_1 AGR \text{ -----(1)}$$

Where, GDPR = GDP Growth Rate (%) at factor cost in Pakistan

AGR = Agriculture Growth Rate (%) at factor cost in Pakistan

The problem of autocorrelation has been solved by using Durbin two-step methods. At first step, the following model was estimated to find out the value of ρ^{\wedge} (i.e. coefficient of $GDPR_{-1}$, which is b_1 here).

$$GDPR = b_0 + b_1 GDPR_{-1} + b_2 AGR + b_3 AGR_{-1} \text{ -----(2)}$$

At second step, $GDPR^*$ has been regressed on AGR^*

Where

$$GDPR^* = GDPR - \rho^{\wedge} GDPR_{-1}$$

$$AGR^* = AGR - \rho^{\wedge} AGR_{-1}$$

A statistical package Eview has been used for deriving the results.

RESULTS AND DISCUSSION

The ADF test results have been presented in Table I and II. In Table I, the stationarity of the data has been checked including no intercept and no trend while both intercept and trend have been included in Table II. Variables which are not stationary at level have been made stationary after taking the first difference denoted by I(1) and then the second difference i.e. I(2) if needed. The values given in the brackets are the optimum lags selected on the basis of AIC criterion (i.e the lag t which the AIC value is minimum). According to Table I, both the variables i.e. AGR and GDPR are stationary at level. The results of stationarity are given in Table II, when both intercept and trend are included. Again AGR and GDPR are stationary at level.

Table 1. ADF test results for stationarity (including no intercept and not trend)

Variable	I(0)		I(1)		Results
	Test Statistic	Critical value	Test Statistic	Critical value	
AGR	-8.9442 [0] ¹	-3.58			I(0)
GDPR	-5.3642 [0]	-3.58			I(0)

- (1) Figures in square brackets besides each statistics represent optimum lags, selected using the minimum AIC value.

Table-II: ADF test results for stationarity (including both intercept and trend)

Variable	I(0)		I(1)		Results
	Test Statistic	Critical value	Test Statistic	Critical value	
AGR	-8.898 [0] ²	-4.168			I(0)
GDP	-5.4632[0]	-4.168			I(0)

- (2) Figures in square brackets besides each statistics represent optimum lags, selected using the minimum AIC value.

Furthermore, the regression results may be spurious due to no co-integration among the series. To this end, the Jhonson Co-integration test has been used. The likelihood ratios statistic values are given in Table III (including no trend and no intercept) and in Table IV (including both intercept and trend), which indicates the long-term relationship among the variables of the study and rejects the hypothesis of no co-integration. Because the absolute values of the LR ratios are greater than their relevant critical values which indicates the existence of one co-integrating equation at 5 percent in the former case and two co-integrating equation at 5 percent in the later case.

Table III Johanson Co-integration test results including no intercept and no trend

Series: AGR GDP				
Lags interval: 1 to 1				
	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.417167	25.55841	12.53	16.31	None **
0.027719	1.264987	3.84	6.51	At most 1

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Table IV Johanson Co-integration test results including both intercept and trend

Series: AGR GDP				
Lags interval: 1 to 1				
	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.437906	43.85011	25.32	30.45	None **
0.328580	17.92623	12.25	16.26	At most 1 **

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 2 cointegrating equation(s) at 5% significance level

Regression results with AGR as an independent variable, are given in Table V. The results indicate that 1% increase in the agriculture growth rate brings 0.34% increase in GDP growth rate. The coefficients are statistically significant at both 1% and 5% level of significance as indicated by low values of 'P' in Table V. The high value of R-square (0.81) suggests that the fit is good and the

included explanatory variable (agriculture growth rate) is responsible factor for changes in GDP growth rate.

Durbin-Watson value (1.24) suggests positive serial autocorrelation. To take away the autocorrelation, Durbin-two step method is estimated. The results of Durbin-two step method are given in Tables VI and VII. In the first step, the estimated value of ρ^{\wedge} is 0.382868. In the second step, putting this value in the transformed model, gave the Durbin-Watson value equal to 1.88, which is closer to 2 showing no problem of autocorrelation.

Table V Regression results of relationship between AGR and GDPR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.274589	0.382887	11.16411	0.0000
AGR	0.335278	0.074030	4.528924	0.0000
R-squared	0.813094	Adjusted R-squared		0.827829
Durbin-Watson stat	1.241905	Prob(F-statistic)		0.00043

Table VI Regression results applying Durbin first step

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.231305	0.805092	2.771492	0.0083
GDPR(-1)	0.382868	0.141795	2.700152	0.0099
AGR	0.370712	0.073613	5.035950	0.0000
AGR(-1)	-0.050540	0.086364	-0.585202	0.5615
Durbin-Watson stat	1.831907	Prob(F-statistic)		0.000030

Table VII Regression results applying Durbin second step

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.676027	0.283003	9.455831	0.0000
AGR*	0.325676	0.059545	5.469447	0.0000
Durbin-Watson stat	1.881992	Prob(F-statistic)		0.000002

CONCLUSION AND RECOMMENDATIONS

From the facts and figures it is clear that agriculture growth rate and GDP growth rate are positively correlated. One percent increase in the agriculture growth rate brings 0.34% increase in GDP growth rate. The explanatory variable (agriculture growth rate) is statistically significant at both 1% and 5% level of significance and reveals that the included explanatory variable is mostly responsible for variation in the response variable (GDP growth rate). Based on findings of the study, it is recommended that the government should make structural changes in agriculture sector so as to ensure agriculture leading overall economic growth in the Pakistan.

REFERENCES

- Gardner, B. 2005. Causes of rural economic development." Proceedings of the 25th Int. Conference of Agric. Econ. 21-41.
- Government of Pakistan, (2006-07). Statistical supplement, economic survey, finance division, economic advisor's wing, Islamabad.
- Government of Pakistan, (1998). Fifty years of Pakistan federal bureau of statistics, statistics division, Islamabad.
- Johnston, B.F. 1970. Agriculture and structural transformation in developing countries: a survey of research. J. Econ. Literature 8:369-404.
- Tiffin, R., and X. Irz. 2006. "Is agriculture the engine of growth?" Agric. Econ. 35:79-89.
- Timmer, C.P. 2005. "Agriculture and pro-poor growth: lessons from Asia and the literature." Washington DC: Cent.Global Dev. Processed.

REGIONAL DIFFERENTIALS IN STUDENTS' PREFERENCES REGARDING THEORY OF MULTIPLE INTELLIGENCES AT ELEMENTARY LEVEL

Maqsood Ahmed
Institute of Education &
Research, Kohat University
of Science & Technology,
PAKISTAN
maqsood517@yahoo.com

Dr Ishtiaq Hussain
Institute of Education &
Research, Kohat University
of Science & Technology,
PAKISTAN
dr.ishtiaqhussain@yahoo.com

Prof. Dr R A Farooq
Faculty of Social
Sciences, Northern
University, Nowshera,
PAKISTAN

Sarfraz Ahmed
Institute of Education &
Research, Kohat University
of Science & Technology,
PAKISTAN
sarfraz206@yahoo.com

ABSTRACT

The purpose of the study was to investigate the students' multiple intelligences according to their preferences and how students' multiple intelligences differ in terms of their region in which they live, at Elementary level. All the students studying in 7th class of age group 12+ in Government Middle and Secondary Schools of Khyber Pakhtunkhwa (Pakistan) constituted the population of the study. Total Eighty Government Middle and Secondary schools (20 from each district) from urban and rural regions were selected randomly to choose the students as the sample for the study. A total sample of 2000 respondents, in the age group of 12+ years studying in 7th class, was drawn out of the population using stratified random sampling technique. A tool "Multiple Intelligences Scale for Elementary Level", having eight sub scales, was used to examine students' preferences in different components of Multiple Intelligences. The results of the investigation revealed that majority of the respondents had average levels of intelligence for all the eight components of multiple intelligence, however the students' multiple intelligences showed variety according to their interests. When results were examined in terms of their locality i.e. urban and rural, significant differences were observed in the mean scores of Urban and Rural students for Bodily-kinaesthetic (-4.8) and Naturalistic (-8) intelligences. It was found that in case of Bodily-kinaesthetic and Naturalistic intelligences rural students took slight lead due to environmental factors.

Key Words: Multiple intelligences, preferences, urban, rural, linguistic, interpersonal, intrapersonal

INTRODUCTION

Education is the principal instrument in awakening the child's professional training and helping him to adjust normally in the society. It is the investment made by the nation in its children for harvesting future crop in the form of a responsible and productive adult of the society.

In teaching learning process perception of the thing, to be learnt, plays a vital role. So the educational institutions must divert attention towards concept building and recognizing the dominant Multiple Intelligence of the students before planning the learning or educational activities. We know that perception is the process by which organisms interpret and organize sensation to produce a meaningful experience of the world.

It is agreed upon that every individual has specific and varied abilities and it is essential to guide individuals in the right direction at right time in a right way. Generally, people in Pakistani follow their father's footsteps or they abide by what parents or friends expect from them or simply fell victim

to their aspirations without knowing their peculiar talents and the result is frustration and stress on the part of the students. However, a very significant reason could be the lack of precise and reliable instrument to identify the talent of the students (Hashmi, 2000).

According to Webster's Dictionary, "intelligence is a capacity to perceive and comprehend meaning, information, news". Nowadays a new, more complex and extensive concept of intelligence has been developed, and the definition can be simply expressed as: Intelligence is the ability to solve complex problems in changing circumstances.

Intelligence as a concept is very old and different philosophers, psychologists and educationists have defined it in the most varied ways over the centuries. According to Munn (1966); "Intelligence is an ability to carry on abstract thinking."

Bronowski (1977) defined intelligence as: "something which could be measured. There are three concepts related to intelligence referred by Freeman (1988): i) The ability to deal with abstract symbols, concepts and relationships, ii) The learning or ability to profit from experience, and iii) The ability to adapt to new situations or problem solving in the proudest sense.

According to Gardner (1983) intelligence is: a) The ability to create an effective product or offer a service that is valued in a culture, b) A set of skills that make it possible for a person to solve problems in life, c) The potential for finding or creating solutions for problems, which involves gathering new knowledge.

While intelligence was initially perceived as a unitary concept, Dr Howard Gardner proposed the theory of multiple intelligences and challenged the old beliefs about what it means to be smart. Gardner (1999) define intelligence as; "bio-psychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture". Intelligence is a dynamic, ever growing reality that can be expanded in one's life through eight intelligences:

In teaching learning process perception of the thing, to be learnt, plays a vital role. So the educational institutions must divert attention towards concept building and recognizing the dominant Multiple Intelligence of the students before planning the learning or educational activities

REVIEW OF RELATED LITERATURE

The MI (Multiple Intelligences) theory is based on the belief that we all possess at least eight unique intelligences. Although we each have all eight, no two individuals have them in the same exact amounts.

According to Howard Gardner (1983): a) All human beings possess all intelligences in varying amounts, b) Each person has a different intellectual composition, c) We can improve education by addressing the multiple intelligences of our students, d) These intelligences are located in different areas of the brain and can either work independently or together.

Multiple intelligences

According to Gardner (1999) intelligence is the ability to solve problems, or to create products that are valued within one or more cultural settings. Gardner (1993) noted the traditional IQ tests unfairly

measured only logic and language and disregarded other intelligences of the brain. He also added that all humans have these intelligences, but people differ in the strengths and combinations of them. Furthermore, he believed that all of the intelligences could be enhanced through training and practice (Babak, 2008).

Musical intelligence is the ability to perceive, transform, and discriminate between musical forms and includes sensitivity to rhythm, pitch and timber. Those who have a high level of musical-rhythmic intelligence display greater sensitivity to sounds, rhythms, tones, and music. It encompasses the capability to recognize and compose musical pitches, tones, and rhythms.

Bodily-kinaesthetic intelligence is the ability to solve problems or form products using all or part of one's body. People in this category often prefer activities which utilize movement. They are generally adept at physical activities such as sports or dance. It is also the ability to use one's mental abilities to coordinate one's own bodily movements.

Logical-mathematical intelligence is the ability to use numbers effectively, manage long chains of reasoning and involves an awareness of logical and numerical patterns. It is also defined as the ability for abstract deductive and inductive reasoning, inference and scientific thinking. It consists of the ability to detect patterns, reason deductively and think logically. This intelligence is most often associated with scientific and mathematical thinking.

Spatial intelligence is the ability to form a mental model of the visual-spatial world, and to be able to manoeuvre the model. It also includes sensitivity to colours, lines, patterns, spaces and forms, and the relationships between them. It gives one the ability to manipulate and create mental images in order to solve problems. This intelligence is not limited to visual domains--Gardner notes that spatial intelligence is also formed in blind children.

Linguistic intelligence is the capacity to use words effectively both orally and in writing. It comprises sensitivity to the sounds, meanings and functions of language. In this category, people have high verbal memory and have an ability to manipulate syntax and structure. It involves having a mastery of language. This intelligence includes the ability to effectively manipulate language to express oneself rhetorically or poetically. It also allows one to use language as a means to remember information.

Interpersonal intelligence is the area which is concerned with interaction with others. It is the ability to understand the feelings, motivations and moods of other people, and respond appropriately to them. People in this category are characterized by their ability to communicate effectively and empathize easily with others.

Intrapersonal intelligence is the ability to understand oneself, to assess one's strengths, weaknesses and emotional states, and act effectively using this knowledge. In this category people are highly aware of their abilities and are capable of understanding their own goals and motivations.

Naturalist intelligence designates the human ability to discriminate among living things such as plants and animals, as well as sensitivity to other features of the natural world such as clouds and rock configurations.

RESEARCH METHODOLOGY

Study was delimited to the Dr Howard Gardner's theory of Multiple Intelligences and included the boys and girls of Elementary level (class VII) from selected districts of Khyber Pakhtunkhwa. Out of 24 districts of Khyber Pakhtunkhwa, only four districts i.e. Kohat, Peshawar, Karak and Hangu were selected for administering the Scale.

All the students studying in 7th class of age group 12+ in Government Middle and Secondary Schools of Khyber Pakhtunkhwa constituted the population of the study. Category-wise sample was drawn out of the above-mentioned population using stratified random sampling technique:

- a) Total Eighty Government Middle and Secondary schools (20 from each district) were selected randomly to choose the students as the sample for the study.
- b) Half of the schools selected for the study were from urban areas while the rest of the schools were from the rural areas.

So a sample of two thousand students was taken randomly. A Multiple intelligence Scale having eight sub-scales was constructed using Dr Howard Gardner's theory of Multiple Intelligences for this study.

RESULTS AND DISCUSSION

Region wise Distribution of the Respondents for Performance on "Multiple Intelligences Scale for Elementary Level"

The students were distributed according to their region or locality i.e. rural and urban and significant differences were observed regarding their perception about various components of multiple intelligences.

From Table 1 it is clear that both Urban and Rural students showed their preferences well in all the components of Multiple Intelligences, however in some components significant difference was observed. The significance of difference between mean scores of Urban and Rural students was tested by the 'z' test. Table 16 shows that there are significant differences in the mean scores of Urban and Rural students for Bodily-kinaesthetic (-4.8) and Naturalistic (-8) intelligences as both of these computed Z values are greater than table value of Z i.e. 1.96.

From the preferences shown by the students on the M I Scale, it was clear that in case of Bodily-kinaesthetic and Naturalistic intelligences rural students took slight lead due to environmental factors. According to theory of multiple Intelligences environment play an important role in the development of particular intelligence. It is our observation also that rural students are not only strong physically but have a deep relationship with flora and fauna present in the nature.

CONCLUSIONS

From the preferences shown by the students on the M I Scale it is clear that:

1. For all the components of multiple intelligences, maximum number of respondents was falling in 'average' category of performance, followed by 'above average' and 'below average' categories. Average performers have particular intelligence up to an average extent, and they might be 'above average' performers in other type of intelligence.

2. The study reveals that the mean performance of rural students was better than that of urban students in case of Bodily-kinaesthetic and Naturalistic intelligences.

RECOMMENDATIONS

Following recommendations are suggested in the light of the results of the study:

- A. The same M I Scale for Elementary level may be administered to many samples of age 12+ students of Pakistan in order to compare the results from two different cultural back grounds.
- B. In the light of the results of the study it is suggested that greater attention towards the Multiple intelligence of 'above average' scorers is required so that their unusual talent is not wasted and they may be guided and directed to opt the field of studies and professions according to their natural abilities.
- C. Adolescence is a very crucial stage for identification and encouragement of particular intelligence as it is starting stage of career development. It is suggested that Parents and teachers should collaborate for identification and motivation strategies for maximum utilization of adolescent's talent which can be identified utilizing Multiple Intelligences Scales.
- D. It is recommended that schools should organize workshops, fairs and campaigns etc. to make the parents aware about multiple intelligences as even educated parents do not have knowledge about this concept and they still believe in IQ and give importance to mark sheets for judgment of their child's performance.

REFERENCES

- Babak Mahdavy 2008. The Role of Multiple Intelligences (MI) in Listening Proficiency. Asian EFL Journal. September 2008 Edition.
- Bronowski. 1977. Psychology for Classroom. Cambridge University Printing House.
- Gardner, H. 1983. *Frames of mind: The theory of Multiple Intelligences*. New York: Basic Books.
- Gardner, H. 1993. *Multiple intelligences: The theory in practice*. New York: Basic Books.
- Gardner, H. 1999. Intelligence reframed: *Multiple intelligences for the 21st century*. New York: Basic Books.
- Munn, N.L. 1966. Psychology- The Fundamentals of Human Adjustment. 5th Edition, Boston ; Houghton Mifflin Company.
- Freeman, F.S. 1988. Theory and Practice of Psychological Testing. 3rd Edition, New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd

WOMEN'S EMPOWERMENT THROUGH MICROCREDIT: A CASE STUDY OF DISTRICT GUJRAT, PAKISTAN

Sarfraz Khan

Lecturer, Department of Sociology,
University of Gujrat,
PAKISTAN
sarfraz.khan@uog.edu.pk

Mirza Rizwan Sajid

Lecturer, Department of Statistics,
University of Gujrat,
PAKISTAN
mirza.rizwan@uog.edu.pk

Prof. Dr. Hafeez-ur-Rehman

Chairman, Department of
Anthropology, Quaid-i-Azam
University, Islamabad,
PAKISTAN

ABSTRACT

Present study was conducted in District Gujrat to investigate the impact of the microcredit scheme of Punjab Rural Support Program (PRSP) on women's empowerment. Researches throughout the developing world have highlighted the impact of microcredit programs on women's empowerment. Present research was divided into three main sections. First section deals with the status of women at housed level before taking microcredit while second and third sections deal with the impact of microcredit in raising women's awareness and women's empowerment after taking microcredit. In the second section information was analyzed that whether microcredit increased the awareness among women regarding their status, legal rights and importance of say at household level. In the last section a situational analysis of the women after taking microcredit is presented. The data analysis has shown that there is a positive impact of microcredit program introduced by PRSP in the rural Gujrat on women's empowerment.

Keywords: Microcredit, Punjab Rural Support Program, Women's Awareness, Women Empowerment, Gujrat, Pakistan

INTRODUCTION

In recent years, governmental and nongovernmental organizations in many low income countries have introduced credit programs targeted to the poor. Many of these programs specifically target women, based on the view that they are more likely than men to be credit constrained, have restricted access to the wage labor market, and have an inequitable share of power in household decision making. The Grameen Bank of Bangladesh is perhaps the best-known example of these small-scale production credit programs for the poor, and over 90% of its clients are women. Earlier work (Pitt and Khandker 1998; Pitt et al. 1999; Pitt 2000; Pitt et al. 2003) has found that the effects of program participation differ importantly by the gender of program participant. For example, Pitt and Khandker (1998) find that the flow of consumption expenditure increases 18 taka for every 100 taka borrowed by women, but only 11 taka for every 100 taka borrowed by men. Pitt et al. (2003), using a totally different approach to parameter identification, find that credit provided women importantly improves measures of health and nutrition for both boys and girls, while credit provided men has no significant effect (Pitt et al. 2006).

The role of women in overall development has not been fully understood, nor has it been given its full weight in the struggle to eliminate poverty, hunger, inequality and injustice at the national as well as the international level. The continued assumption that the responsibility for child rearing and for family needs lies with women alone, as well as the persistence of intra household inequalities, place severe strains on women's health, limit their chances for a fair share in the benefits of society. It is perceived that majority of the poor belongs to the rural settings and most of these poor are women. In this context, Siyar and Afra (2011) mentioned that "Poverty spreading in village is a global issue.

According to the FAO finding about % 75 of world's poor people that are more than 1 milliard people are living in rural zone and more than % 70 of this poverty people are women. As the most of the people who are poor are living in village and are women is the reason for insufficiency of rural development programs." From the last two decades different programs have been launched throughout the world to eradicate the poverty from the world. Microcredit is one of them. In the developing countries with the monetary aids from the developed world this program is under progress to stabilize the situation and making some efforts to get the people out of this poverty.

In the context of Pakistan, microcredit programs have been launched to eradicate poverty. According PMN (2009) microfinance in Pakistan is at its initial stage. The organized microfinance activities started in 2001 as a result of Micro Finance Ordinance 2001. The establishment of first microfinance bank of Pakistan is the result of this ordinance. Jan and Hayat (2011) discussed that "It is now globally accepted that sustainable development is possible only if the beneficiaries of the development program participate in the process of development. This is why microcredit schemes, especially for women, are kept as an important component of the development Programs in Pakistan. The government financial institutions like Pakistan Poverty Alleviation Fund (PPAF), Zarai Taraqati Bank Limited (ZTBL), First Women Bank (FWB) and KhushaliBank (KB) give specific interest to microcredit Programs for women." Besides these programs of microcredit, there are also Rural Support Programs. In each province there is at least one program which mainly focusing on the poverty eradication. In Punjab province there is Punjab Rural Support Program, alongside few other programs like wise National Rural Support Program, which is working in almost every district of this province.

Conceptualizing Women Empowerment and Microcredit

Before defining the women empowerment we must understand the word empowerment. Empowerment in its broader sense refers to an individual's or group's increased "power" where as power means access to and control over material, intellectual and ideological resources (Batliwala, 1994). According to Adams (1994), "Empowerment is the means by which individuals, groups and communities to take control of their circumstances and achieve their own goals, thereby being able to work toward helping themselves and others to maximize the quality of their lives". In the following section we will conceptualize two terms, i) Women's Empowerment and ii) Microcredit. This will followed by the relationship between microcredit and women's empowerment.

Women's Empowerment

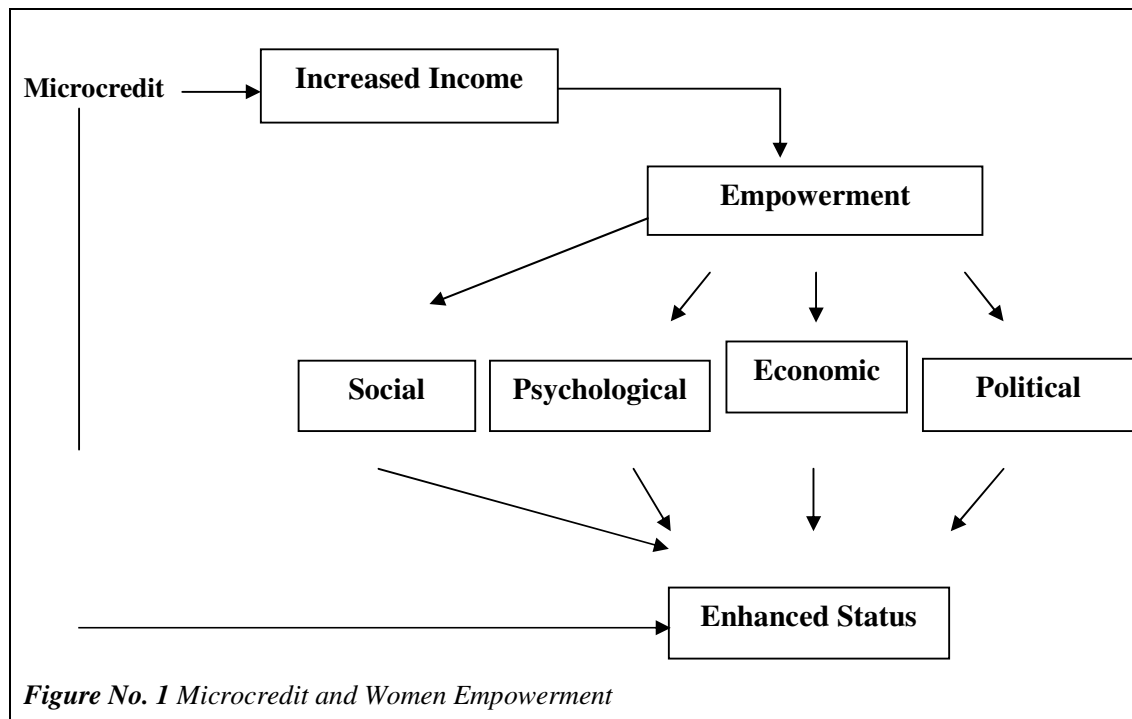
Different scholars have identified the indicators of women's empowerment, likewise, Schuler and Hashemi (1994) outlined six elements of women's empowerment in Bangladesh which includes a sense of self and vision of a future, mobility and visibility, economic security, status and decision-making power within the household, ability to interact effectively in the public sphere and participation in non-family groups. While on other hand, Friedmann's (1992) analysis of women's empowerment identified different kinds of power: economic, social, political and psychological. Economic power means access to income, assets, food, markets and decision-making power in the economic activities. Social power means access to certain bases of individual production such as financial resources, information, knowledge, skills and participation in social organizations. Political power means the access of individual household members to the process by which decisions, particularly those that affect their own future, are made. Psychological power means the individual's sense of potency, which is demonstrated in self-confident behaviour and self esteem. While on other hand Rowlands (1995) describe it as "a process whereby women become able to organize themselves to increase their own self-reliance, to assert their independent right to make choices and to control resources which will assist in challenging and eliminating their own subordination". For the analysis of the present research we will use both Schuler and Hashemi (1994) and Friedmann's (1992) definitions of the term women empowerment.

Microcredit

There is no proper definition of the microcredit but few scholars and organizations working on the same issue have given the working definitions. In the proceeding section we will discuss two working definitions of the term microcredit. Firstly, a report on microcredit in Europe, CGAP (2011), defines microcredit as “While no formal definition of ‘microcredit’ exists, there are many interpretations, each dependent on what the interlocutor is wishing to focus on. At it’s most basic, the provision of microcredit is, as we have implied so far, the extension of micro sized loans to the poor.” While on the other hand, Grameen Foundation defines this as “Micro-credit is a popular instrument used by many development and financial agencies in many parts of the world for serving low-income people. How this instrument works naturally depends on the setting in which it is applied, and the manner of applying it. Microcredit is not merely an instrument for credit extension to the poor borrowers. It is a movement to emancipate the poor-especially women-to alleviate their poverty, improve their quality of life, and build their capacity and awareness and to integrate them economically and socially into the mainstream of the economy. Microcredit’s contribution in terms of capacity building, awareness raising and empowerment is notable. Microcredit has helped Women to become aware about their political rights and build their awareness.”

Relationship between Microcredit and Women’s Empowerment

There is obviously a positive association between microcredit and women’s empowerment. White et al. (1992) identified that microcredit program has a positive impact on women empowerment, the largest part of the existing studies promotes a vision that microcredit contributes towards women’s empowerment. Zaman (2001) reported that micro-credit played valuable roles in reducing the vulnerability of the poor, through asset creation, income and consumption smoothing, provision of emergency assistance, and empowering and emboldening women by giving them control over assets and increased self-esteem and knowledge. Several recent assessment studies had also generally found positive impact in this connection (Simanowitz and Walker 2002; Lalitha and Nagarajan, 2002 and ESCAP, 2002). A primary function of offering women credit in this way is to enhance their economic status, that enables women to earn extra income through which they can gain greater financial autonomy (Malik and Luqman, 2005).



Through microfinance programs, poor women are targeted to get them out of the poverty. In this regard, Microcredit Summit Campaign Report (2011) stated that Of the 128.2 million poorest clients reached at the end of 2009, 81.7 percent or 104.7 million are women. The growth in the number of very poor women reached has gone from 10.3 million at the end of 1999 to 104.7 million at the end of 2009. This is a 919 percent increase in the number of poorest women reached from December 31, 1999 to December 31, 2009. The increase represents an additional 94.4 million poorest women receiving microloans in the last 10 years.” So, the focuses of the microfinance programs have been deeply concerned to the women. While on other hand few scholars working in the same line stated that the microcredit schemes of different banks, NGOs and other organizations reduced poverty, increased mobility and strengthened networks among women who were previously confined to their homes among other following researches are more important (Schuler and Hashemi, 1994; Hashemi and Morshed, 1997; Chowdhury and Alam, 1997; Carr *et al.*, 1996; Hulme and Mosley, 1996; Pitt and Khandker, 1996; Latif, 1994; Lovell, 1992; Rahman, 1990).

REVIEW OF LITERATURE

How microcredit impact women empowerment? To answer this question many studies have been conducted in the developing countries. Majority of these studies have been conducted in the Bangladesh because this was the country where microcredit schemes first time started by Grameen Bank in the late 1970s. The main objective of this initiative was to provide credit to poor people without collateral, alleviating poverty and unleashing human creativity and endeavor of the poor people (Chowdhury 2009; Hulme and Mosley 1996; Yunus 1999). Microcredit has proven its potential to generate results. However, these results are generally short-term and vary significantly among borrowers. In general, studies suggest the *poorest* seldom benefit from microcredit, while the *middle and upper* poor benefit the most. Women in particular face significant barriers to achieving sustained increases in income and improving their status, and require complementary support in other areas, such as training, marketing, literacy, social mobilization, and other financial services (e.g., consumption loans, savings). In fact, it is difficult to separate the impact of microcredit from that of other interventions (Maclsaac, 1997).

Further Maclsaac (1997) said that “most women borrowers have only partial control over loans, or have relinquished all control to male members of the family. This has serious implications for the impact of gender equity. However, this is not to say benefits are non-existent. As part of a broader effort to raise awareness and mobilize women, credit could play an important role as an “entry point” to strengthen women’s networks and mobility, increase their knowledge and self-confidence, and increase their status in the family.” In the context of Bangladesh, Al Mamun (2005) discusses that “during the last two decades, micro-credit approach has been increasingly incorporated in the development discourse. Specially the credit is given to the women and the popular belief is that women are benefited and empowered and are being acknowledged for having a productive and active role and thus it is the gateway of gaining freedom for themselves.”

There are few studies in the context of Pakistan which discussed the relationship between microcredit and women empowerment, one of them was a review based study done by Malik and Luqman (2005). They assert that “from the previous research studies it was concluded that micro finance and micro-credit programmes had the potential and powerful impact on women's empowerment. Although these were not always empowering all women, most women did experience some degree of empowerment because it was a complex process of change experienced by all individuals somewhat differently and varied from culture to culture. Microcredit programmes had both positive and negative impacts on women's empowerment and eradication of poverty throughout the world.” There are different perspectives on the issue of microcredit in connection with women empowerment. In few cases women were unable to use the microcredit to empower themselves. In this regard, Goetz and Gupta (1996) said that “most programs could not ensure that women retained control over the money. Women commonly hand over control of the loan or invest it in a family enterprise.”

OBJECTIVES

The objectives of the study were:

1. To study deeply the profiles of respondents.
2. To find out the relationship between microcredit and social awareness of women.
3. To identify the role of microcredit in economic independence of women.

MATERIALS AND METHODS

Present study was conducted in rural settings of the Gujrat to understand the role of the microcredit in empowering rural women. Basic information in this study regarding the number of women per village was provided by the PRSP regional office Jalalpur Jattan. Cluster sampling was used in this study. Every village from where women were getting microcredit was considered as a cluster. Among these villages three villages were randomly selected. All those women who were getting microcredit from PRSP were taken for the study. The total number of the selected women from the above mentioned villages was 75. A questionnaire was constructed and through face to face interview their responses were collected. This tool was consisting of four major sections. First section contains information of the respondents regarding their socio-economic and demographic profiles. Second deals with information on women's situation before getting microcredit. Third section inquires information regarding the impact of microcredit in creating awareness among women. Last section collected information regarding the post-microcredit situation of the women. SPSS 16.0 was used to analyze the data. Descriptive statistics was also calculated. Further, Wilcoxon Sign Rank Test was used to understand the difference between before and after empowerment levels in women.

RESULTS AND DISCUSSIONS

Table No. 1 Demographic Profile of the Respondents

Attributes	f	%	c.f	Attributes	f	%	c.f
1. Age				5. Husband's Education			
20-25	9	12.0	12.0	Illiteracy	30	40.0	40.0
26-30	9	12.0	24.0	Primary	17	22.7	62.7
31-35	10	13.3	37.3	Matriculation	19	25.3	88.0
36-40	19	25.3	62.7	Intermediate	8	10.7	98.7
41-45	15	20.0	82.7	Graduation and above	1	1.3	100.0
46-50	13	17.3	100.0	Total	75	100.0	
Total	75	100.0		6. Living with in-Laws			
2. Education				Yes	40	53.3	53.3
Illiterate	21	28.0	28.0	No	35	46.7	100.0
Primary	29	38.7	66.7	Total	75	100.0	
Matriculation	17	22.7	89.3	7. Financial Help			
Intermediate	6	8.0	97.3	Father	8	10.7	10.7
Graduation and above	2	2.7	100.0	Mother	3	4.0	14.7
Total	75	100.0		Brother	7	9.3	24.0
3. Marital Status				Father-in-law	1	1.3	25.3
Married	65	86.7	86.7	Mother-in-law	1	1.3	26.7
Widowed	5	6.7	93.3	Brother-in-law	1	1.3	28.0
Divorced	5	6.7	100.0	None	54	72.0	100.0
Total	75	100.0		Total	75	100.0	
4. Family Members				8. Family Monthly Income			

1-3	4	5.3	5.3	5000-7000	9	12.0	12.0
4-6	32	42.7	48.0	8000-10000	16	21.3	33.3
7-9	32	42.7	90.7	11000-13000	21	28.0	61.3
10-12	7	9.3	100.0	14000-17000	19	25.3	86.7
Total	75	100.0		18000-20000	10	13.3	100.0
				Total	75	100.0	

To get an idea about the socio-economic situation of the respondents following eight questions were asked: i) age, ii) education, iii) marital status, iv) total family members, v) husband's education, vi) living status, vii) seek financial help, and viii) monthly income. The data presented in the table no. 1 shows that majority (62%) of the respondents belong to age group more than 31 years. While there were only 24% respondents who were less than 31 years of age. The second information presented in the table is regarding education of the respondents, the data reveals that majority of the respondents in the present study were either illiterate (28%) or either have only primary (38%) qualification. There were only 10% respondents who have got intermediate and above qualification. Information regarding marital status of the respondents was also asked, the data shows that a majority (87 %) women were married while a remaining (13 %) women were either widowed or separated. The table shows that majority (91%) of the household were having up to 9 family members while there were only 9% households having 10 and above family members. Husband education is one of the major components of present study. The results presented in the table no. 1 shows that 63% respondents' husbands were illiterate or having primary qualification while on the other hand only 12% respondents' husbands have intermediate and above education. There was not a big difference between the respondents presently living with natal-family and in-laws. In the case of the financial help, majority of the respondents seek help only from their blood relatives either, father, mother or brother. Majority of the respondents' total family monthly income was between rupees 8000 to 13000.

Table No. 2 Women's Empowerment before Taking Microcredit

	F	%	c.f		f	%	c.f
Q.1 Were you able to make decisions about your children's education?				Q. 4 Were you able to go for shopping freely?			
To great extent	28	37.3	37.3	To great extent	5	6.7	6.7
To some extent	38	50.7	88.0	To some extent	19	25.3	32.0
Not at all	9	12.0	100.0	Not at all	51	68.0	100.0
Total	75	100.0		Total	75	100.0	
Q.1 Were you able to make decisions about your children dressing?				Q. 5 Were you able to make decisions about the budgeting of family expenses?			
To great extent	40	53.3	53.3	To great extent	15	20.0	20.0
To some extent	24	32.0	85.3	To some extent	38	50.7	70.7
Not at all	11	14.7	100.0	Not at all	22	29.3	100.0
Total	75	100.0		Total	75	100.0	
Q.3 Were you able to make decisions about small purchases?				Q.6 Were you able to make decisions regarding large purchases?			
To great extent	34	45.3	45.3	To great extent	14	18.7	18.7
To some extent	28	37.3	82.7	To some extent	33	44.0	62.7
Not at all	13	17.3	100.0	Not at all	28	37.3	100.0
Total	75	100.0		Total	75	100.0	

To evaluate the women's position about their empowerment few questions pertaining to the women's status before getting microcredit were asked and their responses were presented in the table no. 2. In response to the question decision making regarding children's education, majority (88%) of the respondents replied that they were consulted in this process either to great extent or some extent. In response to second question regarding children dressing majority of the respondents said that they were involved in their children dressing issues because in the rural settings of the Punjab dressing of the children is one of the responsibilities of the females. In response to the question regarding involvement in the household small purchases, data shows that majority (82%) of the respondents were involved in small purchases. Majority (68%) of the respondents said that before taking microcredit they were unable to go for shopping independently. In the rural settings women are secluded and they are not allowed to visit markets for shopping lonely. In case of visit to the market they accompanied by either an old lady from the household or any close male relative. Majority (71%) respondent were involved in decision making process regarding family financial budgeting but only for the daily consumptions. In the last question it was ask about whether they we involved in the family decision making regarding large purchases or not? 44% said that they were involved but only to some extent while on other hand 37% respondents said that they were not involved in the any kind of family decision making. Which shows that how patriarchal structure contained their women out of the decision making process. Those who were involved in the decision making were either having qualification more than intermediate level or involved in income generating activities. According to Acharya (2008) education may help a woman gain a better understanding of her rights and responsibilities, and make her more confident about her possibilities. Further Roth and Mbzyo (2001) opined that in couples with both partners educated and in couples in which women work for pay, both partners were significantly more likely to report that both of them participate in the final decisions than was the case in couples without education or in which the wife did not work for pay. So, women's involvement in household decision making process in purely depends on their education and their involvement income generating activities.

Table No. 3 Microcredit and Women's Awareness

	f	%	c.f		f	%	c.f
Q.1 After getting credit your immediate concern?				Q.4 Do you think that your awareness regarding children's education increased?			
Children's education	14	18.7	18.7	To great extent	21	28.0	28.0
Household monetary use	28	37.3	56.0	To some extent	42	56.0	84.0
Children's marriage	7	9.3	65.3	Not at all	12	16.0	100.0
Children's skill development	2	2.7	68.0	Total	75	100.0	
Start new business	24	32.0	100.0				
Total	75	100.0					
Q.2 Do you think that your awareness regarding maternity services increased?				Q.5 Do you think that your awareness regarding family planning increased?			
To great extent	15	20.0	20.0	To great extent	15	20.0	20.0
To some extent	43	57.3	77.3	To some extent	40	53.3	73.3
Not at all	17	22.7	100.0	Not at all	20	26.7	100.0
Total	75	100.0		Total	75	100.0	
Q.3 Do you think that your awareness regarding immunization of child increased?				Q.6 Do you think that your awareness regarding legal rights increased?			
To great extent	13	17.3	17.3	To great extent	19	25.3	25.3
To some extent	38	50.7	68.0	To some extent	34	45.3	70.7
Not at all	24	32.0	100.0	Not at all	22	29.3	100.0
Total	75	100.0		Total	75	100.0	

Among scholars, it is perceived that microcredit have a definite impact in escalating women's awareness regarding their autonomy and empowerment. To see the impact of the microcredit on women's awareness few questions were asked and analysis of these questions is presented in the table no. 3. In the first question it was asked about the immediate use of the microcredit, in response to this question majority (37%) respondents said that their prime concern was to fulfill the financial needs of the household. In response to second question majority (77%) respondents said that the microcredit has positively affected their maternal health care services utilization. Majority (68%) of the respondents said that after getting microcredit they were able to take care of their children's medical needs and they took care of the immunization of their children. Fourth question was asked regarding their awareness regarding children's education; majority (84%) said that their awareness regarding the education of their children increased due to the microcredit. A question was asked regarding the impact of the microcredit on family planning behavior of the respondents, in response to this 73% woman said that their awareness regarding family planning also increased due to the microcredit. Majority (70%) women said that after getting microcredit their awareness regarding legal rights increased. According to CGAP (2011), "In Bangladesh, a survey of 1,300 clients and non-clients showed that credit clients were significantly more empowered than non-clients in terms of their physical mobility, ownership and control of productive assets (including land), involvement in decision making, and awareness of legal and political issues."

Table No. 4 Impact of Microcredit on Women Empowerment

	f	%	c.f		f	%	c.f
Q.1 Do you have self identity?				Q.5 Are you able to go for shopping freely after taking micro credit?			
To great extent	27	36.0	36.0	To great extent	28	37.3	37.3
To some extent	40	53.3	89.3	To some extent	37	49.3	86.7
Not at all	8	10.7	100.0	Not at all	10	13.3	100.0
Total	75	100.0		Total	75	100.0	
Q.2 Do you think that microcredit has changed your position within the family?				Q.6 Microcredit helped to improve your literacy levels?			
To great extent	22	29.3	29.3	To great extent	21	28.0	28.0
To some extent	26	34.7	64.0	To some extent	41	54.7	82.7
Not at all	27	36.0	100.0	Not at all	13	17.3	100.0
Total	75	100.0		Total	75	100.0	
Q.3 Do you think that your decision making power within the family increased?				Q.7 Are you autonomous to make decisions regarding personal issues?			
To great extent	31	41.3	41.3	Strongly Agree	33	44.0	45.8
To some extent	33	44.0	85.3	Agree	22	29.3	76.4
Not at all	11	14.7	100.0	neutral	8	10.7	87.5
Total	75	100.0		Strongly Disagree	9	12.0	
				Missing value	3	4.0	
Q.4 Are you consulted in family budgeting?				Total	75	96.0	
To great extent	30	40.0	40.0				
To some extent	31	41.3	81.3				
Not at all	14	18.7	100.0				
Total	75	100.0					

To understand the impact of microcredit on women's empowerment different questions were asked from the respondents. In response to first question regarding self identity of women, majority (89%) of the respondents said that microcredit helped them to construct their self identity. Second question was regarding the change in the position of the women after taking microcredit. Majority (63%) of the respondents said that due to microcredit their position at household level is significantly changed. Further, it was also asked whether microcredit has affected their decision making at household or not? In response a majority (85%) respondents said that due to microcredit their say at household level is now considered. It was also asked whether they are involved in making family expenses budget. In response 81% respondents said that they are involved in household budgeting. So the results have shown the positive impact of the microcredit on women's empowerment in rural Gujrat. Further, question was asked regarding their independent movement for shopping; 86% said that they now they can go independently. But when we look into the frequency percentages of the same question, it shows that a majority 49% of the 86% are those who are under the category of to some extent. In this case women in general are restricted to move freely because of the patriarchal structure in Pakistan. The assumption that women after getting microcredit can freely move for shopping was accepted to some extent but it may vary from community to community. The main reason behind this movement is the microcredit. In the subsequent section of the table no. 4 responses on the question regarding the impact of microcredit on the literacy levels of respondents were presented. These responses have shown that the microcredit helped to improve the literacy levels of the respondents. Last question was asked regarding the autonomy of the respondents, in response 73% respondents said that they are now independent to make decision regarding their personal issues. So, the introduction of the microcredit in the life of the rural women not only financially benefited them but also made them autonomous regarding their personal issues. It also helped to get a status in the household. The Women's Empowerment Program in Nepal, for example, conducted a study that showed an average of 89,000 out of 130,000 or 68 percent of women in its program experienced an increase in their decision-making roles in the areas of family planning, children's marriage, buying and selling property, and sending their daughters to school-all areas of decision making traditionally dominated by men (Ashe and Parrott, 2001).

Table No. 5 Impact of Microcredit on Women Empowerment

		N	Mean Ranks	Sum of Ranks
Avgafter-AvgBefore	Negative Ranks	17 ^a	42.97	730.50
	Positive Ranks	54 ^b	33.61	1825.50
	Ties	1 ^c		
	Total	72		

a. AvgAfter < AvgBefore , b. AvgAfter > AvgBefore , c. AvgAfter = AvgBefore

Test Statistics

	Avgafter-AvgBefore
z	-3.137
Asymp. Sig. (2-tailed)	.002

Wilcoxon sign rank test was used to understand the relation between microcredit and women empowerment. This non-parametric test basically highlighted the difference between before and after empowerment status of women. Test results show that women's empowerment situation after getting the microcredit facility was improved significantly. The data presented in the table no. 5 shows that p-value is less than alpha (0.05) so we reject the null hypothesis (Empowerment of married women is same before and after usage of Micro Credit services). We conclude that microcredit services significantly effects the empowerment of married women. Such kind of conclusions has already been presented in the review of literature section such as, Malik and Luqman (2005), MacIsaac (1997),

Carr (1996), and Schuler and Hashemi (1994). So, on the basis of the results and review of literature mentioned above, it can be concluded that there is obvious impact of microcredit on the women empowerment. Microcredit help women to strengthen their economic activities and when they are involved in economic activities, their say at household level considered. Women's access to micro credit facilities has a positive relationship with their income generation activities and empowerment. As Khan (2008) elaborated that the impact of micro credit on communities in provision of credit benefits was significant as 75% women indicated that they owned their businesses and 70% told that their earnings are greater than before. It also had positive relationship with their monthly income, increase in assets, long-lasting house set up, nutrition, health and education.

CONCLUSION

The main purpose of the present research was to present a clear picture of the impacts of microcredit on women's empowerment in rural Gujrat. It can be safely derived that there is a positive impact of the microcredit on women's empowerment. Although this scheme has not made them so autonomous to make decision regarding their future but it helped them to evaluate their position in the household. It was also derived from the results that microcredit has a positive effect of the awareness rising of the women as well as their involvement in the children education; health care utilization; self identity; literacy levels; visiting relatives and shopping; and involvements in family budgeting.

REFERENCES

- Acharya, Y., 2008. Women's Education and Intra-Household Autonomy: Evidence from Nepal, J. of Devel. and S. Transformation, 5: 5-12.
- Adams, R (1996). *Social Work and Empowerment*. London: Macmillan Press Ltd.
- Al Mamun T. M. Abdullah (2005). Assessment of the role of Microcredit in the Development of Social Capital: A Field Study about Micro-credit Programme Clients in Bangladesh. *Unpublished M. Sc Thesis submitted to Centre for East and South-East Asian Studies*, Lund University, Sweden.
- Batliwala, S. (1994). *The meaning of women's empowerment: New concepts for action, in population policies reconsidered*. Cambridge: Harvard University Press, 127-138.
- Carr, M., M. Chen and R. Jhabvala (1996). *Speaking Out: Women's economic empowerment in South Asia*. London: IT Publications.
- CGAP (2011). What Do We Know about the Impact of Microfinance? Accessed from <http://www.cgap.org/p/site/c/template.rc/1.26.1306/>, Accessed on 1st August, 2011.
- Chowdhury, A.M.R. and MA Alam. (1997). BRAC's poverty alleviation programme: What it is and what it achieved. In Wood, G. and I. Sharif, (eds.) *Who needs credit: Poverty and finance in Bangladesh*, Dhaka: The University Press.
- Chowdhury, Jahangir. 2009. *The Role of Micro-Credit in Alleviation of Poverty: A Study of the Grameen Bank in Bangladesh*. Dhaka: University of Dhaka.
- ESCAP. 2002. *Social Safety Nets for Women, Studies on Gender and Development # 4*. United Nations publications. New York. www.unescap.org.
- Friedmann. J. (1992). *Empowerment: The Politics of Alternative Development*. Oxford: Blackwell Publishers.
- Goetz, A.M. and R.S. Gupta. (1996). Who takes the credit? Gender, power, and control over loan use in rural credit programs in Bangladesh. *World Development* 24: 45-63.

- Hashemi, S.M. and L. Morshed (1997). Grameen Bank: A case study. In Wood, G. and I. Sharif (ed.). *Who needs credit? Poverty and finance in Bangladesh*, Dhaka: The University Press.
- Hulme, D. and P. Mosley. (1996). *Finance against Poverty, Vol. 1*. London: Routledge Publishers.
- Jan, Inayatullah and Saleh Hayat (2011). Empowerment of Rural Women through Micro-Credit: an Example of Rural Support Programs in Pakistan. Working Paper, Accessed from <www.wbiconpro.com/262-Inayatullah%20Jan.pdf> accessed on 1st August, 2011.
- Jeffrey Ashe and Lisa Parrott (2001). Impact Evaluation of PACT's Women's Empowerment Program in Nepal: A Savings and Literacy Led Alternative to Financial Institution Building, Cambridge: Brandeis University.
- Khan, A. (2008). Tackling the Failure of Microfinance Efforts Through amalgamating Microfinance with Charity: Two Variable Alternatives in the Context of Pakistan." *Australasian Accounting Business & Finance Journal* 3:96.
- Lalitha, N. and B.S. Nagarajan. 2002. *Self-help Groups in Rural Development*. New Delhi: Dominant Publishers and Distributors.
- Latif, M.A 1994. Programme Impact on Current Contraception in Bangladesh. *The Bangladesh Development Studies*, Vol. XXII, (I). pp. 27-61.
- Lovell, C.H. 1992. *Breaking the Cycle of Poverty: The BRAC Strategy*. USA: Kumarian Press.
- MacIsaac, Norman (1997). The Role Of Microcredit in Poverty Reduction and Promoting Gender Equity A Discussion Paper, *Strategic Policy and Planning Division Asia Branch CIDA*.
- Malik, Niaz Hussain and Muhammad Luqman (2005). Impact of Micro Credit on Women Empowerment. *Pakistan Journal of Agriculture Sciences*, 42(3, 4): 100-105.
- MCS (2011). State of the Microcredit Summit Campaign Report, Microcredit Summit Campaign, Washington D.C.
- Perspectives (2006). *Microcredit in Europe: The Experience of Saving Banks*. World Saving Banks Institute and European Savings Banks Institute, Report No. 50.
- Pitt, M.M. and S.R. Khandker. (1996). Household and intra-household impact of the Grameen Bank and similar targeted credit programs in Bangladesh. *World Bank Discussion Paper* 320, USA: WS.
- Pitt, Mark M. Shahidur R. Khandker, Jennifer Cartwright (2006). Empowering Women with Micro Finance: Evidence from Bangladesh. *Economic Development and Cultural Change*, 54 (4): 791-831.
- Pitt, Mark M., (2000). The Effect of Nonagricultural Self-Employment Credit on Contractual Relations and Employment in Agriculture: The Case of Microcredit Programs in Bangladesh." *Bangladesh Development Studies* 26 (2-3):15-48.
- Pitt, Mark M., and Shahidur R. Khandker (1998). The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of the Participant Matter? *Journal of Political Economy* 106:958-96.
- Pitt, Mark M., Shahidur Khandker, O. Choudhury, and D. Millimet (2003). Credit Programs for the Poor and the Health Status of Children in Rural Bangladesh. *International Economic Review* 44: 87-118.
- Pitt, Mark M., Shahidur R. Khandker, Signe-Mary McKernan, and M. A. Latif (1999). Credit Programs for the Poor and Reproductive Behavior in Low Income Countries: Are the Reported Causal Relationships the Result of Heterogeneity Bias? *Demography* 33 : 1-21.
- PMN. 2009. *Microfinance in Pakistan*. Islamabad: PMN.
- Rahman, R. (1990). An Analysis of Empowerment and Earning of Poor Rural Women in Bangladesh. Thesis submitted for a Ph. D degree at the Australian National University, Canberra, Australia.

- Roth, D. M. and Mbzyo, M. I., 2001. Promoting Safe Motherhood in the Community, In Jan, M. and Akhtar S., (2008). An Analysis of Decision-Making Power among Married and Unmarried Women, *Stud. Home Comm. Sci.*, 2(1): 43-50.
- Rowlands, J. (1995). Empowerment Examined ('Empowerment' à l'examen / Exame do controle do poder / Examinando el apoderamiento (empowerment)). *Development in Practice*, 5(2): 101-107
- Schuler, S.R. and S.M. Hashemi. (1994). Credit Programmes, Women's Empowerment and Contraceptive use in Rural Bangladesh. *Studies on Family Planning*, 25(2): 65-76.
- Simanowitz, A. and A. Walker (2002). Ensuring impact: reaching the poorest while building financially self sufficient institutions, and showing improvement in the lives of the poorest women and their families. *Unpublished background paper for the Microcredit Summit 5*, New York.
- Siyar, Khatereh and Zahra Geraeli Afra (2011). Effective factors on improving criteria of rural women's empowerment. *New York Science Journal*, 4(6): 33-36.
- White S.C. (1992) 'Arguing with the Crocodile. *Gender and Class in Bangladesh*' London, Zed Books.
- Yunus, Muhammad (1999). *Banker to the Poor, The Autobiography of Muhammad Yunus: Founder of the Grameen Bank*. London: Aurun Press Ltd.
- Zaman, H. 2001. Assessing the poverty and vulnerability impact of microcredit in Bangladesh: a case study of Bangladesh Rural Advancement Committee (BRAC). *Unpublished background paper for World Bank, World Development Report*, Washington, DC.

DEREGULATION OF SECONDARY EDUCATION IN PORT HARCOURT: ISSUES AND CHALLENGES

Florence Imaobong Archibong
Department of Educational Management
University of Port Harcourt, Rivers State
NIGERIA
Floxyarchibong@yahoo.com

ABSTRACT

This paper addressed deregulation of secondary education in Port Harcourt: issues and challenges. The population of this study comprised of administrators and teachers numbering 450. A research sample of 250 was used. Document analysis, a self designed questionnaire, "Deregulation of Secondary Education: Issues and Challenges Questionnaire (DSEICQ)" were used to elicit information. Four research questions were formulated for the study. Data from document, verbal interview conducted and percentage counts were used to find solution to the research questions. The major findings of the study include the status of public and private secondary schools, some problems encountered in course of managing the schools and strategies for improvement. Based on these findings it was recommended that Government and Proprietors should provide finance and instructional materials, employ Guidance Counselors and conduct regular seminar/workshop and follow it up with qualitative supervision/inspection. They should employ only professional teachers, provide proper remuneration, strict adherence to WAEC marking scheme, maintain a good communication system, close down unapproved schools and complementarily public-private partnership (PPP) was recommended to contribute their views/resources so as to reduce the burden on the government.

Keywords: deregulation, secondary education, issues and challenges

INTRODUCTION

Education is the biggest instrument for academic progress, social mobilization, political survival and effective national development of any country. It constitutes the single largest enterprise in the country like Nigeria (Lomak, (n.d) in Akpa, 2002:54).

Secondary education is the education children receive after primary education and before the tertiary stage. This level of education is for children of the age range of 12 to 18 years, excluding the teacher training, technical and vocational institutions. The duration of the academic program is 6 years which is split into 3 years each, known as the Junior Secondary School (J.S.S) and Senior Secondary School (S.S.S). The J.S.S emphasized both academic and vocational (technical) curriculum while the S.S.S is oriented towards academic curriculum. Since the curriculum of the secondary school (J.S.S and S.S.S) caters for varied needs, ability and interests, it is usually regarded as comprehensive. The broad goals are to prepare the individual for useful living within the society and higher education under the context of the 6-3-3-4 system of education.(Federal Republic of Nigeria, 2004:18-20).

Education has witnessed active participation by non- governmental agencies, communities and individuals as well as government intervention. However, government welcomes the participation of voluntary agencies, communities and private individuals in the establishment and management of secondary schools. State government shall prescribe conditions to be met by the communities and

others wishing to establish secondary schools as well as regular supervision and inspection of these schools.(Federal Republic of Nigeria, 2004:4,22).

Formal education was the modern innovation brought to Nigeria with the coming of the Christian missionary. During the monopoly of the church mission, it was religions based, intensely denominational and shallow in content. The schools in this era were maintained with grant from home churches, donations from group and individual outside the country, contributions by local Christian churches and parents. The colonial government was reluctant to get involved until 1882 when education ordinance provided for the financing of schools established by missions and private individuals. Even though the Christian mission were credited for their pioneering efforts in spreading western education, some shortcomings were highlighted like the establishment of mushroom and enviable schools and colleges, seeing education as an instrument for evangelism and gross misuse of fund among others.

The relevance of Ashby commission of 1959 and the above shortcomings prompted government to take over schools to facilitate the process of rehabilitation, reconstruction and re-integration, after the civil war in 1970.

But as the number of schools increased with more enrolment at the primary, secondary and tertiary levels, government discovered that the responsibility of funding and managing schools in Nigeria cannot be handled by them alone. This led to the policy statement in the National Policy on Education (1998) section 11 paragraphs 109 which states:

“Government’s ultimate goal is to make education free at all levels. The financing of joint responsibility of the federal, state and local governments, and the private sector. In this connection, government welcomes and encourages the participation of local communities, individuals and other organizations”.

From the above brief historical overview of education in Nigeria, one can realize that privatization of education has been a practice that is traceable to the traditional system of education and formal education was introduced by the Christian missionaries through private enterprise. (Adeogun and Aigboje; Alani (n.d) in Akpa, Udoh and Fagbamiye 2005:226-227, 43).

Deregulation in the economic sense means freedom from government control. It is the removal of government interference in the running of a system. This means that government rules and regulations governing the operations of the system are relaxed or held constant in order for the system to decide its own optimum level through the forces of supply and demand. Deregulation allows enterprises and services to be restricted as little as possible as well as the withdrawal of government controls in the allocation of resources and the production of goods and services. (Akinwumi, Isuku and Agwaranze (2005) in Ajayi and Ekundayo 2008:214).

According to Ekpo and Anuna(n.d) in Akpa, Udoh and Fagbamiye (2005:1) the concept of deregulation is synonymous with laissez-faire and private enterprises. Deregulation in economics and industries means non-intervention by government in individual or industrial monetary affairs. The doctrine is hinged on self-interest, competition and natural consumers’ preferences as important factors for enhancing prosperity and freedom as opposed to government’s absolute control of economic activities in a state. Deregulation as a new applicable concept in education means government diverting its interest in it and encouraging private sector participation in the management of the education system for the achievement of the pre-determined objectives and goals of education. Privatization is an important tenet in the deregulation process. It is the economic activity in the private sector as opposed to the public sector (federal, state and local government).

Encarta (2004) as cited by Ekpo and Anuna (n.d) sees deregulation as a private enterprise by private individuals who hope to realize a profit from their activities and who bear any risk associated with those activities. Proponents of private enterprise believe that it promotes individual ingenuity and efficiency, particularly when such enterprises are free from government regulation. It is obvious that private sector involvement is necessary in order for our schools to be effective and efficient.

In another perceptive, deregulation of education means breaking the government's monopoly of the provision and management of education by giving free hand to private participation in the provision and management of education in the country. It is argued that it will help schools to become self-managing. Also, it means relaxing or dismantling the legal and governmental restrictions on the operations of education business. Moreover, it is described as a sale of knowledge to the highest bidder, which has effect of lowering standards for the attraction of customers. As a deregulated sector, education will become a private enterprise undertaken by private individuals or cooperate bodies that hope to maximize profit from their investment in education. (Caldwell and Spinks (1992); Olatunbosun (2005) cited in Ajayi and Ekundayo 208:214).

The theory of deregulation as an economic term developed from the free market economy is bequeathed to Adam Smith. The term favours capitalist self-interest, competition and natural consumer preferences as forces leading to optimal prosperity and freedom. (Encarta Encyclopedia (2003) cited in Akpa, Udoh and Fagbamiye (2005:24)).

In explaining the concept of deregulation, Obasanjo (1999) posited that "the enterprises to be privatized suffered fundamental problems such as: defective capital structure, excessive bureaucratic control or intervention, inappropriate technology, gross incompetence and mismanagement, blatant corruption and crippling compliancy which monopoly often engenders. Inevitably, these short comings take a heavy toll on the national economy. These are the compelling reasons to divert government of the burden of running these companies at a loss. Instead the private sector which can do the job better is now invited to acquire them" (p1).

Exploring the concept further, McFetridge and Lall (1991) affirmed that "deregulation involves the virtual elimination of price, entry and exit controls, the elimination of monopoly in any individual sub-market. It is the absence of ownership restriction and separation, internationalization of the institutions and the enforcement of free trade agreement. Deregulation of the educational system therefore implies private participation in the ownership, finance control and management of educational institutions".

Similarly, Omolayole (1997), Babarinde (1997) and Ikoya (2004) separately affirmed that privatization enhances individual or corporate bodies' involvement in educational management. Other studies have revealed that privatization is popular and thus been effective in the provision and management of education in both developed and developing countries.

In Sri Lanka, for example, James (1982) reports that individuals and voluntary organizations established and managed day-care centres, nursery schools, vocational training and non-formal educational institutions.

Moreover, Kaplan (2003) describes deregulation of education as a sale of knowledge to the highest bidder, which has the implication of lowering standards for the attraction of customers. Deregulation of education means relaxation or disseminating of legal and governmental restrictions on the operations of education business.

In the same vein, Hanson (1998:111-28) and Bayliss (2000) cited separately in Uwakwe, Falaye, Emunemu and Adelere (2008:164) that "privatization is a term that has been associated with the transfer of assets of ownership from the public to the private sector. The policy encompasses the private initiative in education, implying that decentralization involves the transfer of decision making, authority, responsibility and tasks from higher to lower organizational levels or between organizations. The World Bank promotes privatization in developing countries as a policy, principle, primarily, if not exclusively to reduce poverty through the development of the private sector".

Surprisingly, Findlaw (2004) cited in Uwakwe, Falaye, Emunemu and Adelere (2008:164) opined that "A blending of public and private education is advocated under this deregulation policy" and the researcher shares his view hence education has variety of stakeholders, it is imperative for secondary education to be managed by the public-private partnership (PPP) as an assistance since the burden of financing education is too much for the government.

STATEMENT OF PROBLEM

Government gave freedom to private individuals to manage secondary schools through National Policy on Education. This invariably gave people the liberty to attend either public or private secondary schools.

However, certain issues and challenges evolved and so this study seeks to find out the quality of instruction/teachers and problems encountered in course of managing secondary schools in Port Harcourt.

PURPOSE OF THE STUDY

The purpose of this study is to find out the status of secondary school management in Port Harcourt.

Specifically, this study seeks to:

1. Find out the status of public secondary schools
2. Find out the status of private secondary schools.
3. Find out the problems encountered in course of managing secondary schools.
4. Determine the strategies for improvement in the management of secondary education.

RESEARCH QUESTIONS

1. What is the status of public secondary schools?
2. What is the status of private secondary schools?
3. What are the problems encountered in course of managing secondary schools?
4. What are the strategies for improvement in the management of secondary education?

METHODOLOGY

The survey (descriptive) design was adopted. The study population comprised of 250 administrators and 200 teachers. This made a total population of 450. The sample size was 250 comprising of 150 administrators and 100 teachers which was selected by stratified random sampling.

The instruments used were document analysis and questionnaire. The specimen of document analysis was data from Rivers State Ministry of Education, Port Harcourt. A self designed questionnaire known as "Deregulation of Secondary Education: Issues and Challenges Questionnaire (DSEICQ)" was used to elicit responses from the respondents. It had two sections: A and B, section A generated demographic data while section B elicited information related to the research topic. The response scale used was Agree or Disagree. The instruments were validated by Lecturers in the Department of Educational Management. A test-retest method was adopted to find out the degree to which the instrument would be consistent in measuring what it should measure.

The questionnaire was personally administered by the researcher and she retrieved same on completion for analysis. The data on document analysis was stated accordingly to indicate the status of secondary schools, while the data on questionnaire was tabulated and analyzed using simple percentages and deductions from the tables were used to find solution to the research questions.

PRESENTATION AND ANALYSIS OF RESULT

Research Question 1

What is the status of Public Secondary Schools?

1. The total number of public secondary schools in Port Harcourt is 12.
2. Public schools are managed by the government through an administrator (Schools Board).

3. The total number of teachers is 1,385(S.S.S.819 & J.S.S.566) while total number of students is 57,542(S.S.S.36, 495 & J.S.S.21, 047).
4. They are all professional teachers.
5. They get fund from the government
6. There is quality and regular supervision through the inspectorate division.
7. They are model schools hence they provide free, qualitative and functional education.
8. They are affordable and accessible.
9. Erring staff are queried.
10. Mass promotion is not common in public schools.

What is the status of Private Secondary Schools?

1. The total number of private secondary schools in Port Harcourt is 50.
2. Private secondary schools are managed by Proprietors and they are result/performance oriented.
3. The total number of teachers and students have not been analyzed.
4. Most of them are professionals due to the recruitment process where there is no favouritism
5. They secure fund from school fees, registration, levies, loans and sale of books.
6. There is quality supervision of teaching and learning and most private schools have standard facilities.
7. Though there is the existence of some unapproved secondary schools, these schools are not permitted to conduct external examination.
8. There is high degree of discipline in the private school hence erring staff suffer penalties like unpaid salaries in cases of absenteeism and other forms of indiscipline.
9. Some private schools are expensive and thus widen the gap between the rich and the poor.
10. Some private schools are managed by non-professionals.

Research Question 3

What are the problems encountered in course of managing secondary schools?

Table 1: Percentage counts for administrators and teachers on the problems encountered in course of managing secondary schools.

S/N	ITEMS	AGREE	DISAGREE
	(A) Problems encountered in course of managing secondary schools.		
1	Financial constrain	231(92.4%)	19(7.6%)
2	Lack of instructional materials	180(72%)	70(28%)
3	Poor study habits of some students	175(70%)	75(30%)
4	The issue of examination malpractice	160(64%)	90(36%)
5	Recruitment of non-professional teachers	216(86.4%)	34(13.6%)
6	Staff attitude to work	210(84%)	40(16%)
7	Geographical location of a school	197 (78.8%)	53(21.2%)
8	Poor teaching method and supervision/inspection	185(74%)	65(26%)
9	Poor performance in external examination	145(58%)	105(42%)
10	Existence of communication gap	155(62%)	95(38%)

Number of Respondents = 250

Research Question 4**What are the strategies for improvement in the management of secondary education?**

Table 2: Percentage counts for administrators and teachers on strategies for improvement in the management of secondary education.

S/N	ITEMS	AGREE	DISAGREE
	(B) Strategies for improvement in the management of secondary education.		
11	Availability of finance	220(88%)	30(12%)
12	Availability of instructional materials	190(76%)	60(24%)
13	Regular counseling in school to improve study habits and reduce examination malpractice	226(90.4%)	24(9.6%)
14	Recruitment of professional teachers	165(66%)	85(34%)
15	Counseling of staff to improve work attitude	199(79.6%)	51(20.4%)
16	Increment of teachers salary and better working condition	170(68%)	80(32%)
17	Schools should be situated in serene environment conducive for learning to attract both students and teachers	173(69.2%)	77(30.8%)
18	Introduction of regular workshops, seminars and enlightenment programmes for teachers to meet up with contemporary demands. It should be followed up with quality supervision/ inspection	215(86%)	35(14%)
19	Strict adherence to WAEC marking scheme by encouraging teachers to go for co-ordination and marking of WAEC questions.	150(60%)	100(40%)
20	There should be good communication system and rapport with the management, teachers, students as well as a good PTA in secondary schools .	162(64.8%)	88(35.2%)

Number of Respondents = 250

DISCUSSION OF FINDINGS

The study revealed the status of public secondary schools in Port Harcourt as been 12 in number, being managed by the government, having 1,385 number of teachers and 57,542 number of students, having professional teachers and being funded by the government. Others are quality and regular inspection, providing free, qualitative and functional education, being affordable and accessible, issuing queries to erring staff and not been in support of mass promotion.

The status of private secondary schools were recorded as been 50 in number, being managed by proprietors, but the total number of teachers and students have not been analyzed, having professional teachers and securing funds through school fees, registration, levies, loans and sale of books.

Others are quality supervision of teaching/learning as well as standard facilities, existence of some unapproved private schools which do not partake in external examination, high degree of discipline, some being expensive and some being managed by non professionals.

The status of public and private secondary schools conforms to the summary of number of institutions by LGA as published by the Government of Rivers State – Ministry of Education (2010). Also, secondary schools are either owned by Government or by Private individuals as seen in the Federal

Republic of Nigeria (2004:22) where it was stated that “Government welcomes the participation of voluntary agencies, communities and private individuals in the establishment and management of secondary schools as well as regular supervision and inspection of these schools”. With reference to the status of private schools which involved the existence of some unapproved schools and being expensive, Adiotomre (n.d) in Akpa, Udoh and Fagbamiye (2005:93) stated that “Educational management must ensure effective monitoring of schools to avoid unnecessary increment of tuition fees as envisaged in a deregulated school system. They must manage schools effectively and if need be, sanction any school that fall below standard both in academic, physical structure and moral standard”.

With reference to research question 3, most administrators and teachers agree that the problems encountered in course of managing secondary schools are financial constrain, lack of instructional materials, poor study habit of some students, examination malpractice, recruitment of non-professional teachers, staff attitude to work, geographical location of a school, poor teaching method, poor performance in external examination and the existence of communication gap.

These findings were supported by Barko and Ramadan (n.d) cited in Akpa (2002:138-139) who recounted the challenges of the Principal in the 21st century as shortage of funds and equipment necessary for effective teaching and learning, unpredictable and volatile staff agitation, inadequate remuneration of teachers/delay in the payment of even the little salary, failure of government and other school proprietors to implement the payment of allowances of teachers and inadequate on-the-job training programmes for school Principals and teachers to update their knowledge.

With reference to research question 4, the respondents are of the view that the strategies for improvement in the management of secondary education are availability of finance, availability of instructional materials, regular counseling in school to improve study habit and reduce examination malpractice, recruitment of professional teachers, counseling of staff to improve work attitude, increment of teachers salary/better working condition, situating schools in serene environment, regular workshops/seminars/enlightenment programmes for teachers, strict adherence to WAEC marking scheme and having good communication system and rapport with the management/teachers/students as well as a good PTA in secondary schools.

These findings approximates to Barko and Ramadan (n.d) in Akpa (2002:141-142) who opined that the Principal should be innovative and resourceful by coming up with alternative sources of staff motivation and funding in the face of dwindling financial support for the school and the ability to communicate effectively with others.

It is also supported by Gloria and Amini (n.d) cited in Pokalas, Lawani, Gambo and Mohammed (2002:27) who posited that the quality of education should be seen in terms of quality of teaching materials, quality of educational environment like classroom and quality of infrastructure. This was further strengthened by Ezewu (1987) in Nnabuo, Okorie, Agabi and Igwe (2004:217) who posited that the academic inspection should include the input variables (teacher), process variable (teaching) and output variable (achievement).

IMPLICATIONS OF FINDINGS

If the strategies are employed to cater for the problems enumerated in course of managing secondary schools, then secondary education will have a qualitative standard as well as a smooth administration so as to achieve the set pre-determined goals.

SUMMARY

The status of public and private secondary schools in Port Harcourt were highlighted as well as the problems encountered in course of managing secondary schools like financial constrain, lack of instructional materials, poor study habit of students and the existence of communication gap among

others were discussed. Strategies for the improvement of secondary education were enumerated like availability of finance and instructional materials, regular counseling in school, recruitment of professional teachers, increment of staff salary and better working conditions among others were not left out.

CONCLUSION

Deregulation has increased the private sector participation in education delivery in Port Harcourt in line with the status of secondary school where private school numbered 50 and public schools 12. It has also broadened access to education hence parents are guaranteed the freedom of choice to either send their children to public or private schools. However, the exercise has to be guided so that it does not lead to commercialization of education as recorded that some private schools are expensive.

Conclusively, this study was not conducted to criticize either public or private secondary schools but to highlight the state of art (status) in both schools and proffer a complementary management to improve the standard of secondary education.

RECOMMENDATIONS

Based on the results of findings in this study, the followings are advanced:

- i. The government should improve on its budgetary allocations to education. This is to raise the standard of education in public schools while private proprietors should source additional funds to boost the financial base of the schools.
- ii. The government and proprietors should endeavour to put in place instructional materials and infrastructural facilities to facilitate teaching-learning process.
- iii. The services of guidance counselors should be employed for regular counseling of students, teachers and school administrators.
- iv. Only professional teachers should be allowed to teach
- v. There should be increment in teachers' salary and better working condition to motivate and retain staff in public and private schools.
- vi. Both public and private schools should be situated in serene environment for effective teaching-learning process.
- vii. There should be regular workshop, seminar and enlightenment programmes for teachers to improve and it should be followed up with quality supervision/inspection.
- viii. Ministry of education should ensure that both public and private schools adhere to WAEC marking scheme for success in external examinations.
- ix. There should be good working relationship between staff and management.
- x. Government should close down private schools operating below standards.
- xi. Private schools that are not adequately staffed should be sanctioned.
- xii. To complement government effort, public-private partnership (PPP) is recommended to accommodate the varieties of stakeholders in education. This makes for joint views/resources to be pulled together so as to reduce the burden on the government.

REFERENCES

- Ajayi, I.A., & Ekundayo, H.T. (2008). *The Deregulation of University Education in Nigeria: Implications for Quality Assurance*. Retrieved December 27, 2010; from <http://www.nobleworld.biz/images/Ajayi.Ekundayo> .
- Akpa, G.O., (Ed.). (2002). *The 21st Century Principal in Nigeria*. Jos: Ichejim Publications.
- Akpa, G.O., Udoh, S.U. & Fagbamiye, E.O. (Eds.). (2005). *Deregulating the Provision and Management of Education in Nigeria*. Jos: NAEAP Publications.
- Babarinde, K. (1997). The Challenges of Democratic Governance as Manifested in Current Debate over Private and Community Participation in Education. In Badmus, A. & Osiyale, A. (Eds.). *Private and Community Participation in Education in Nigeria*. (Pp. 54-58). Lagos: Nigeria Academy of Education.
- Federal Republic of Nigeria. (2004). *National Policy on Education*. Yaba – Lagos :NERDC Publishers.
- Government of Rivers State of Nigeria.(2008).*Post Primary Schools Enrolment by LGA*. Port Harcourt: Planning, Research And Statistics Department-Ministry of Education.
- Government of Rivers State of Nigeria. (2010). *Summary of Number of Institutions by LGA After Merging*.Port Harcourt: Ministry of Education.
- Government of Rivers State of Nigeria. (2010). *List of Junior Secondary Schools in Rivers State by LGA*. Port Harcourt: Ministry of Education.
- Ikoya, P.O. (2004). *Variability in the Implementation of Educational Decentralization Provision in Nigeria*. In press.
- James, E. (1982). *The Non-Profit Sector in International Perspective: The case of Sri Lanka*. The Journal of Comparative Economics, 6, 99-109.
- Kaplan, D. (2002). “*Education is not a Commodity*”. A Paper Presented at the International Conference Against Deregulation held in Berlin, February.
- McFetridge, D.G. & Lall, A. (1991). *Is there a theory of Deregulation?* Breaking the Shackles of Deregulating Canadian Industry.
- Ministry of Education.(2011).*List of Private Secondary Schools in Port Harcourt LGA*. Port Harcourt: Planning, Research And Statistics Department.
- Nnabuo, P.O.M., Okorie, N.C., Agabi, O.G., & Igwe, L.E.B. (2004). *Fundamentals of Educational Management*. Owerri: Versatile Publishers.
- Obasanjo, O. (1999). *The Embassy of Nigeria: Privatization Programme*. Retrieved December 27, 2010. The Hague, Nether Lands.
- Omelayole, M.O. (1997). Community and Private Participation in Education in Nigeria. In Badmus A.& Osilaye, A. (Eds.), *Private and Community Participation in Education in Nigeria*. Lagos: Nigerian Academy of Education.

Pokalas, T., Lawani, D.O., Gambo, E.K. & Mohammed M. (Eds.). *Democracy and Educational Management in Nigeria: Agenda For Mission – A Book of Readings*. Bauchi: League of Researchers in Nigeria Publishers.

Uwakwe, C.B.U., Falaye, A.O., Emunemu, B.O. and Adelere O. (2008). *Impact of Decentralization and Privatization on the Quality of Education in Sub-Saharan Africa: The Nigerian Experience*. European Journal of Social Sciences – Volume 7, Number 1. Retrieved December 27th, 2010; from <http://www.eurojournals.com/ejss7114.pdf>

Verbal Interview Conducted on the 4th February, 2011. Permanent Secretary of Education Office. Port Harcourt: Ministry of Education.

Verbal Interview Conducted on the 7th February, 2011. Some Proprietors of Secondary Schools. Port Harcourt.

E-LEARNING ADOPTION AMONG ADULT WORKERS IN JORDAN

AHMAD ISSA AL-ZOUBI
Technology Management Department
University Utara Malaysia
MALAYSIA
ahmad12348899@yahoo.com

THI LIP SAM
College of Business
University Utara Malaysia
MALAYSIA

ABSTRACT

The purpose of this study is to investigate e-learning adoption among adult workers in Jordan. More specifically, the objectives of the study are twofold: (a) To determine the extent of e-learning uptake among working adults in Jordan. (b) To identify the technological, organizational and personal factors that influences the uptake of e-learning among working adults in Jordan. For purpose, an integrated theoretical framework for assessing e-learning adoption, beyond initial adoption was developed. The data were collected from adult workers in Arab Open University in Jordan were used to determine the relationships between technological, organizational, and personal factors and adoption of e-learning. It is found that higher explicitness and accumulation of technology can help the transfer of technological knowledge within the organization and can raise the capability to adopt innovative technologies.

Keywords: E-Learning; Online Learning; Learning; K-Means Cluster; Hierarchical Cluster

INTRODUCTION

There is an increasing demand around the world for learning. However, many people live in locations which education or training they want to undertake is not available. Under such conditions, they will be forced to leave their home and work, in order to attend classes (Dodd, Kirby, Seifert & Sharpe, 2009). Another category of people who need to pursue learning on a continuous basis is the working population. As they are working on a full-time basis, they require a flexible educational system that caters their learning needs, at the same time considering their personal commitments such as family responsibilities. In fact, such group of workers faced with decision between learning, leaving their homes and their jobs to gain access to education. These working adults may learn for their career enhancement as they are motivated by being promoted and being paid higher salary based on additional academic qualifications they have obtained (Asaari & Karia, 2005).

In the era of knowledge and technological advancement, educational institutions all over the world are seeking to fill the needs for education particularly, the working adults. One of the significant solutions is by taking advantage of the various communication technologies available today. The rapid growth of information technologies has influenced the way in which education is being delivered (Dodd et al., 2009). Due to the exponential growth of information and communication technology, electronic learning or e-learning has emerged as the new paradigm in modern education (Olaniran, 2006).

In general, the advantages of e-learning include freeing interactions between learners and instructors, or between learners and learners, from limitations of time and space through the asynchronous and synchronous learning network model (Olaniran, 2006). The new technology offers great benefit to

those who work full time in any organisations and have the desire to further their study. In the past, those who want to study may have to leave their jobs because they have to attend classes. With the advent of e-learning, not only individuals can keep their jobs but also further their study at any institutions that offer education with the use of ICT tools.

E-learning is not only useful for such group of individuals; it is also beneficial for the educational institutions that offer such services where adults are working. The benefits of e-learning include provide learning opportunities to all at a reduced cost and increased access to learning for disadvantage groups due to geographical barriers (Jihad & Sondos, 2006). Furthermore, the participants of e-learning will not be constrained by locations, but also time constraint because learning is determined by their own pace. In addition, e-learning has the potential to provide a high quality education and training, producing competitive workforce and increases the level of literacy among citizens (Engelbrecht, 2003). Alexander (2001) summed up the benefits of e-learning in terms of improving the quality of learning, improving access to education and training, reducing the costs of education and improving the cost-effectiveness of education.

The significance of identifying the factors that influence the e-learning adoption become more urgent as it helps government and educational institutions to improve existing practices on teaching and learning. E-learning helps to create a flexible and interactive e-learning environment. Past studies have identified several factors that influenced the e-learning environment in general (Papp, 2000; Selim, 2007; Ndubisi, 2004; & Chang & Tung, 2008). Some of these factors are related to the technological factors, organisational environment and to the individual's behaviour and culture. Johnson et al. (2009) highlighted that organisations played a key role in promoting continuous learning through e-learning. He added that it is imperative to understand the drivers and inhibitors of e-learning as this subject is relatively new compared with the conventional classroom learning. Furthermore, Nedelko (2008) emphasised the importance of personal characteristics of participants on the uptake of e-learning.

It was argued that e-learning and participants' success in e-learning process depends on multiple interdependent factors other than the technology and/or organisational factors such as course materials, and participants' personal characteristics (Wools et al., 2002; & Lee et al., 2007). However, most of the previous studies in the context of e-learning adoption focused on technological factors (e.g. Wang & Liu, 2003; & Roffe, 2002), or at the best technological and organisational factors (Macpherson et al., 2005), while the participants' personal attributes and their interest in enrolment in e-learning process was neglected in literature (e.g. Gonc, 2006; Bose, 2003; Nedelko, 2008; Wools et al., 2002; Learning Online, 2008). As such, it becomes important to identify the personal factors that drive adult's.

workers to engage in e-learning programmes in Jordan, taking into consideration the technological and organisational factors as well. In fact, e-learning in Arab region including Jordan is a new method for learning and teaching. As mentioned previously, Jordan was the first county to adopt e-learning in year 2002 (MoED, 2009). In this context, Arab Open University (AOU) was the first Jordanian university to adopt distance learning on a widespread basis and plays a critical role in e-learning development nationally. AOU is the only university in Jordan that provides distance learning programs (Dirani & Yoon, 2009; personal communication, 2011). Therefore, Jordan universities face many problems in delivering their educational programs. These problems are mainly related to the costs, availability of facilities and shortage of professors (Dirani & Yoon, 2009; & Abbad et al., 2009). However, Jamlan (1995) highlighted that most universities in the Arab countries create their own policies and make decisions about specialization and curriculum depended on requires of the host country without cross-national or institutional comparisons.

In summary, this research attempts to examine the uptake e-learning, the factors that influence adult workers to participate. This research hopes to bridge the gap mainly the limited studies conducted in the uptake of e-learning among working adults in Jordan.

REVIEW OF THE LITERATURE ON E-LEARNING ADOPTION

The literature review highlighted that developing countries face a numerous challenges regarding the adoption of e-learning such as a lack of vital e-learning components, technological infrastructure, negative perceptions of online degrees and learning, skills and unstable socio-political environments (Dirani and Yoon, 2009; Rennie and Mason, 2007; Eneku and Ojogwu, 2006). However, lack of researches on e-learning adoption in developing countries remains the main challenge in this regard. That is because e-learning is still young, whereas in the developed countries there is far more research on e-learning (Andersson and Gronlund, 2009; Rajesh, 2003; Heeks, 2002; Dhanarajan, 2001). Consequently, developing countries should get better understanding regarding these challenges in order to quickly adopt and implementing e-learning in their countries (Andersson and Gronlund, 2009).

Andersson and Gronlund (2009) carried out a study on challenges for e-learning with a particular focus on developing countries in order for understanding how to implement and adopt e-learning in developing countries. A comprehensive literature review including 60 papers on e-learning challenges was undertaken. In their study they found 30 specific challenges which were divided into four categories. These categories are: technology, individuals, context and courses. The overall conclusion is that these challenges are equally valid for both developed and developing countries. However, Andersson and Gronlund's (2009) findings revealed that developing countries focus on access to technology and context for adoption of e-learning and individuals' characteristics was neglected, whereas in developed countries more researchers concern individuals' characteristics for adoption of e-learning.

Based on the study by Andersson and Gronlund (2009) it is obvious from the comparison above that developed countries paid attention to the individual in implementing e-learning, whereas the developing countries concerned with the technology factors.

It was stressed by Moussa and Moussa (2009) in several developing countries including Arabic countries, the current situation of education generally and especially of e-learning is quite poor because numerous factors. Some of the most essential factors are as follows: increasing number of commercialized universities and schools, lack of measures for quality assurance of e-learning and education, lack of accreditation by internationally acknowledged organisations, poor usage of modern technologies in and outside classrooms due to lack of financial and technological resources, little effort to update existing curricula giving higher priority to quantity against quality of material taught, neglecting interactive teaching and teamwork in class rooms and dependence on memorization instead of critically thinking, logically analyzing, objectively criticizing and creatively proposing by the students at universities and especially at schools.

In general, numerous studies have been undertaken on the practical of e-learning adoption such as implementation issues (Newton and Ellis, 2005; Xu and Wang, 2006), e-learning readiness (Smith et al., 2003), e-learning evaluation (Piccoli et al., 2001; Bernard et al., 2004; Papastergiou, 2006; Wang et al., 2007), quality standard (Frydenberg, 2002; Roffe, 2002; Julien, 2005), e-learning infrastructure (Davis, 2004; Fahy 2004; McGreal and Elliott, 2004; Jones and McCann, 2005), and most researches seem to focus on technological, design and delivery issues (Volery and Lord, 2000; Soong et al., 2001; Testa and de Freitas, 2003). Moreover, Chu and Chu (2010) stated that numerous studies which concerned with e-learning have also focused on business area as well. Ho and Kuo (2010) and Liao and Lu (2008) reported that numerous prior studies on e-learning are concerned with learning performance and effectiveness. Thus, it can be stated that few theoretical researchers undertaken for e-learning in both higher education and workplace learning (Chu and Chu, 2010; and Daneshgar et al., 2008). Further, McPherson and Nunes (2006) emphasized that few studies have discussed institutional and organisational aspects of e-learning adoption and implementation, which is vital to the process at all levels. A study done by Ho and Kuo (2010) recommended direction for future studies to investigate that the impact of the adult workers' structural variables. Studies that have been conducted with aim of identifying the antecedence factors associated with e-learning adoption has been limited

in general especially in the context of adult worker adoption in the developing countries (Dirani and Yoon, 2009).

Therefore, this research aims to examine e-learning adoption among adult workers' who are working full time and learning part time in Jordan. For example, a study by Dirani and Yoon (2009) aimed to investigate the factors that affect on Open Distance Learning (ODL) quality in the Arab Open University in Jordan (AOUJ). The study used a qualitative approach, which included five lengthy semi-structured interviews with the program director, two instructors, and three students. The findings revealed that three significant conclusions can be drawn from the study about e-learning in the Arab region: (1) the existence of adverse conditions, (2) the presence of strong instructional practices, and (3) the need to improve administrative support.

Tyan (2004) pointed out the challenges of the diffusion process of e-learning in corporate Taiwan. That is, a number of factors affect the implementation of corporate e-learning, such as maturity of e-learning, corporate readiness, the cost of ownership, government support, and employees' personal characteristics (such as attitudes, personality, background, gender, age). The findings of his study indicates that both situational factors such as technological infrastructure, politics, policies, organisational culture and personal factors such as age, gender, personality, values, prior experiences, attitudes, skills, knowledge are considered critical elements in obtaining successful e-learning outcome.

This study varies from other studies in a sense it aims to adopt e-learning among adult's worker in Jordan. Further, the literature review of this study identifies the three major factors that uptake on e-learning among adult workers. These factors are: technological factors such as relative advantage, compatibility, complexity, trialability and observability, organisational factors such as top management support, culture and structure and personal factors such as social contact, social stimulation, professional advancement, external expectations and cognitive interest that are associated with such uptake.

THEORETICAL FOUNDATION

Numerous theories have been developed to explain organisation and individual's adoption of innovations. Among these are Fishbein and Ajzen's (1975) theory of reasoned action (TRA); Ajzen's (1985) theory of planned behavior (TPB); Davis's (1989) technology acceptance model (TAM); Roger's (1995) theory of diffusion of innovation (DOI).

Based on the two above theories (TRA and TPB), several models have been proposed in order to explain an individual acceptance and adoption of innovations. Davis (1989) created TAM model based on TRA by Ajzen and Fishbein (1975) in order to explain diffusion and adoption of computer utilization behaviour (see figure 2.3). TAM is well recognized and widely used of technology acceptance and technology adoption in the information systems field (Gefen and Straub, 1997). As suggested by TAM model, two basic factors were created to explain diffusion and adoption, these factors involved in explaining the variance in user's intention or behaviour of intention. The two key factors in TAM model are Perceived Ease of Use (PEU) and Perceived Usefulness (PU). Davis (1989) defines PEU as the degree to which an individual believes the given Information System would be free the intensity of their job. While PU can be defined as the degree to which an individual believes using the information system would improve her or his job performance.

TAM has been used in prior studies in the adoption of virtual learning environment (Raaij and Schepers, 2008), Blackboard system (Liaw, 2008) and the WebCT (Ngai, Poon, and Chan, 2007). Specifically, TAM was also expanded and developed to include the attitude toward using Information Technology (IT) including computer utilization behaviours (Duan et al., 2010; Nichols and Levy 2009; McFarland and Hamilton, 2006; Roca et al., 2006; Noyes and Garland, 2006).

Moreover, the acceptance of technology model was also utilized to examine the part of perceived resources such as in online learning adoption (Lee, 2008), the impact of system attributes on e-learning utilize (Pituch and Lee, 2006), the influence of media richness and flow on e-learning technology acceptance (Liu, Liao, and Pratt, 2009), and factors influencing engineers' acceptance of asynchronous e-learning systems in high tech companies (Ong, Lai, and Wang, 2004). Based on the theory of reasoned action, technology acceptance model looks at how ease of use and perceived benefits influence technology acceptance.

Beside TAM model, Venkatesh and Davis (2000) created TAM2 model extension into the original TAM model developed by (Davis, 1989). As suggested by TAM and TAM2 models, an individual's uptake to use a system is determined by two major factors. The key factors perceived usefulness and perceived ease of use. In order to better perceive the determinants of perceived usefulness, TAM2 model incorporates two additional theoretical constructs: social influence processes and cognitive instrumental processes. Three social forces influence perceived usefulness: subjective norm, image, and voluntariness. Four cognitive factors influence perceived usefulness: job relevance, output quality, result demonstrability, and perceived ease of use.

Based on the above review of literature, TAM and TAM2 model is broadly applied to IT acceptance, specifically to explain computer usage behaviour. This study argues that e-learning represents innovation adoption in educational services including e-learning adoption among adult workers, rather than just an IT technology.

The theory of adoption and Diffusion of Innovation (DOI) was developed by Rogers (1995) to explain diffusion of innovation and adoption of new technology such as e-learning adoption at individual levels. Rogers (1995) defined diffusion as the procedure by which an innovation is communicated through certain channels over time among the members of a social system. Further, an innovation is a new idea, object, or practice that is described as new idea by the relevant unit of adoption. The novelty of the idea for the individual determines his or her reaction to it. In other words, an innovation is regarded as new idea, practice or material artefact as perceived to be new by an individual or other unit of adoption (Zaltman et al., 1973).

Rogers (1995) identifies the rate adoption as the relative rapidly with which an innovation is adopted by members of a social system. Rogers's theory suggested that the adoption of an innovation is effected through a number of factors, these factors are as follows: the individual's perception of the attributes of the innovation, the nature of the communication channels diffusing the innovation, the nature of the social system, and the extent of change agents' efforts in diffusing the innovation. The adoption phase includes sub-phases of knowledge, learning and persuasion, and decision; these phases drive to the factual adoption decision. The implementation phase is described the events, actions, and decision involved in making an innovation to use.

Although adoption often includes usage, and has even been used to cover the entire process, usage is commonly referred to as implementation (Prescott and Conger, 1995). Scheirer (1983) described implementation such as synonymous with procedure and usage evaluation. However, he has highlighted the innovation implementation as a neglected area in a quickly growing literature on innovation research.

According to Rogers (1995), the model of diffusion of innovation can be categorized as knowledge, persuasion, decision, implementation, and confirmation. Knowledge as learning of being (awareness-knowledge) and acquire an understanding of how it functions. In the persuasion stage as the development of a positive or negative attitude toward using the innovation through seeking information that reduces uncertainty about the expected consequences of the innovation. Adoption or rejection of the new idea is the decision stage. Confirmation stage as the feedback on the basis experiences can lead to reconfirm or reverse the adoption decision.

In his study, Rogers (1995) examined the attributes that affecting the adoption and diffusion of innovations. These attributes are: relative advantage, compatibility, complexity, trialability and observability. Engel, Blackwell, and Miniard (1995) and Hansen and Salter (2001) argued that the

Rogers' diffusion of innovations model is the most important model for adoption and adaption and widely tested model and well suited as a research framework.

E-learning is an innovation method of learning to numerous people; it was suitable to consider utilizing theory of diffusion of innovation in the study of e-learning adoption (Liao and Lu, 2008; Duan et al., 2010) and how potential adopters' perceptions of the innovation characteristics impact their adoption. According to Moore and Benbasat (1991) one of the important models which can explain and describe innovation characteristics is that from Rogers (1995).

Table 1

Summary of Models in Adoption

Theories (Author)	Factors	Usage	Selected Articles using the Theory
Diffusion of innovation (DOI) (Rogers, 1995)	Relative Advantage Compatibility Complexity Triability Observability	Acceptance of any new innovation Such as e-initiative, computer, internet	Duan et al., 2010; Liao and Lu 2008; Hsbollah and Idris, 2009; Samarawickrema and Stacey, 2007; Wu, 2008; Martins et al., (2004)
Technology Acceptance Model (TAM) (Davis, 1989)	Perceived Usefulness (PU) Perceived Easy Of Use (PEOU)	Acceptance of innovation of technology such as mobile, e-initiative, PDA, e-vommerce, internet banking	Nichols and Levy, 2009; Lee, 2010; van Raaij and Schepers, 2008; Liaw, 2008; Ngai, Poon, and Chan, 2007; Nichols and Levy, 2009; McFarland and Hamilton, 2006; Lee, 2008; Liu, Liao, and Pratt, 2009
Theory of Planned Behaviours (TPB) Ajzen's (1985)	Attitude toward Using (A) Subjective Norm (SN) Perceived Behavioral Control (BC)	Improved the predictability of intention in various health-related fields such as condom use, leisure, exercise, diet	Nichols and Levy, 2009; Lee, 2010
Theory of Reasoned Action (TRA) Fishbein and Ajzen's (1975)	Attitude Toward Behavior (A) Subjective Norm (SN)	Most use in medical innovation such as dieting, condom, limiting sun exposure	Nichols and Levy, 2009; Lee, 2010

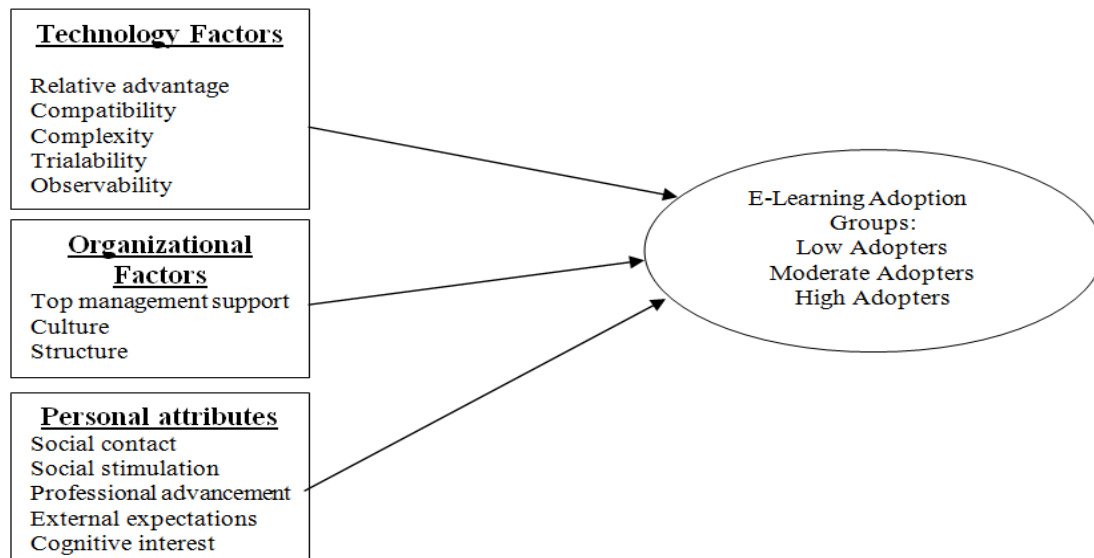
By comparing DOI model with TAM model, it could be infer that in spite of its popularity and considerable empirical support, a common criticism about TAM its parsimony when compare it with DOI model (Hu, Clark, and Ma, 2003). Previous authors highlighted similarity between the TAM model and DOI model by comparing the factors utilized in the two models. They have found that relative advantage in Rogers's model is similar to the perceived usefulness in TAM, and the

complexity construct is similar to the perceived ease of use (Premkumar, Ramamurthy, and Liu, 2008; Moore and Benbasat, 1991). Nevertheless, compatibility, trialability and observability constructs in Rogers's model have been not studied by TAM. As such, Rogers's model will be used in this research over the TAM model as it is more suitable in understanding the characteristics of adoption that impede or facilitate diffusion of innovation in an organisation (Rogers, 1983).

E-learning is an innovation and pedagogical service utilizing emerging ICT. Although e-learning provision would be different in platforms terms, application contexts and technologies, the major innovation attributes remain the same. Therefore, Rogers's model will be employed in this context to study the perceived innovation characteristic and its influence on e-learning adoption among adult workers. Eventually, Rogers (1995) focuses on a narrower view of innovators and on individual adoption. In addition, comparing previous widely used models, Roger's theory (1985) diffusion of innovation (DOI) has some attributes or characteristics that can be applied in this study.

This study is based on individual adoption innovation decision, in adopting a particular technology. The intention is on the adoption of e-learning among individuals (adult workers) that are being determined by e-learning technology itself. It was argued that e-learning degree adoption is not only an IT acceptance, but also an adoption of new innovative educational services which are materially different from traditional ones. Summary of previous discussed four models is shown in Table (1).

As the main goal of this research is to identify the factors that influence the uptake of e-learning among adult workers in Jordan, this study will adopt Rogers's DOI theory which focuses consideration the influence of the both organizational as well as technological factors. However, the literature review identified that understanding of the motivation which drives adults to commit to, and complete, higher education through distance learning is an important requirement for the design and the delivery of adult programmes (Abdullah et al., 2008). Therefore, beside the organizational and the technological factors, the personal factors will be other factors that will be used in this study.



OPERATIONALIZATION OF VARIABLES

In this research, the proposed framework comprise of two parts. The first part is the e-learning's antecedent's factors which are the technological, organisational, and personal factors. The second part is the e-learning adoption among adult workers in Jordan which is operationalized in general as the adult worker's uptake and use of the various available functions and services provided by the Arab Open University in Jordan. Table 2 below shows the items of the variables used in this study.

Table 2. Research variables

Variables	Number of Items	Items Source
e-learning adoption	4	Rogers (1995)
technological attributes	32	Duan et al. (2010)
Organizational factors	9	Yap et al. 1994; Deshpande and Farley's 1999; Zmud 1982
Personal Attributes	21	Kim and Merriam (2004)

DATA COLLECTION AND DATA ANALYSIS

In this study, the target population is the adult workers who are working fulltime and learning part-time at the Open Arab University in Jordan (OAUJ). For the purpose of this study, a decision was taken to include all OAUJ students in the sample and was used E-mail. . A total of 335 responses were received representing 44.4% response rate. Statistical Package for Social Science (SPSS) was used to determine the causal relationship among the variables as proposed in the framework.

The reliability of the scale can be measured by Cronbach's alpha which is ranged from 0 to 1. According to Hair et al. (2007), the value of 0.7 is the acceptable alpha value for research in general. In this study, the internal consistency using Cronbach's alpha was computed to ascertain the internal consistency of the measurement items. On the other hand, factor analysis was used to test the reliability and construct validity for this study. The results of the reliability test for each factor were summarized after each factor analysis.

Factor analysis founded by Karl Pearson, Charles Spearman, and others in the early 20th century (Johnson & Wichern, 2007). Zikmund (2003) describes factor analysis as a kind of data reduction approach employed to discriminate the fundamental dimensions from the original variables. In other words, its main objective is to sum-up a large number of variables into a smaller number of factors. . During factor analysis, variables were retained according to the following criteria: (1) factor loading greater than 0.5 and (2) no cross-loading of variables (king and Teo, 1996). In other words, variables will be dropped when loading are less than 0.5 or where their loading are greater 0.5 on two more factors (king and Teo, 1996).

A principal component analysis with varimax rotation was executed to examine the factor structure of e-learning adoption antecedent measures. Five technological factors with the eigenvalue above 1.0 arose and they were generally consistent with the constructs proposed, representing the themes of complexity, compatibility, relative advantage, observability and trialability. Six different factors with the variables in each factor were identified. From factor analysis, twenty nine items were retained by the six factors which explained about 73.015 percent of the variance. In order to provide meanings to each factor, these factors were labeled based on the meanings of the variables in each factor.

Factor 1 had five variables related to complexity. This factor was labeled as complexiy. Factor 2 consists of six variables related to compatibility; therefore, this factor was labeled as compatibility.

Factor 3 had five variables related to relative advantage. Hence, this factor was labeled as relative advantage. Factor 4 had five variables related to observability, so this factor was labeled as observability. Factor 5 had four variables and all of them were related to trialability, hence, it was labeled as trialability. Factor 6 had three variables related to flexibility. Hence, this factor was labeled as flexibility. The results indicated that the new factors were similar to the original dimensions in this phase except the relative advantage where its items loaded on two factors which named as relative advantage and flexibility.

Table 3. Comparing original dimensions to final dimension after factor analysis

Original dimension	Dimension derived after factor analysis	N. Items	Alpha (a)
Technology Factors			
Complexity		6	.905
Compatibility		6	.892
Relative advantage	Relative advantage	5	.924
	Flexibility	3	.905
Observability		5	.885
Trialability		4	.894
Organisational Factors			
Top management support	Top management support	5	0.922
Culture	Culture	5	0.875
Structure	Structure	6	0.885
Personal Factors			
Professional advancement	Professional advancement	5	.924
Social contact	Social contact	4	.917
External expectations	External expectations	4	.881
Social stimulation	Social stimulation	4	.889
Cognitive interest	Cognitive interest	4	.834

Three organisational factors with the eigenvalue above 1.0 arose and they were generally consistent with the constructs proposed, representing the themes of top management support, organisational structure, and organisational culture. Three factors were extracted which explained about 65.813 percent of the variance. The eigenvalues for each factor in the scree plot provided support for the extraction results using latent root criterion. In order to provide meanings to each factor, these factors were labeled based on the meanings of the variables in each factor. Factor one had five variables

related to organisational top management support; therefore, this factor was labeled as top management support. Factor two had six variables related to organisational culture, so this factor was labeled as organisational culture. Factor three consists of five variables all related to organisational structure; therefore, this factor was labeled as organisational structure.

Five personal factors with the eigenvalue above 1.0 arose and they were generally consistent with the constructs proposed, representing the themes of professional advancement, social contact, external expectations, social stimulation, and cognitive interest. Five factors were extracted which explained about 75.459 percent of the variance. The eigenvalues for each factor in the scree plot provided support for the extraction results using latent root criterion. In order to provide meanings to each factor, these factors were labeled based on the meanings of the variables in each factor. Factor 1 consists of five components related to professional advancement. Hence, this factor was labeled professional advancement. Factor 2 had four components related to social contact. This factor was labeled as social contact. Factor 3 consisted of four variables related to external expectations. Consequently, this factor was labeled as external expectations. Factor 4 had four components related to social stimulation. This factor was labeled as social stimulation. Factor 5 has four variables related to cognitive interest. Thus, this factor was labeled as cognitive interest.

Testing for reliability could be achieved by calculating the Cronbach alpha. All the constructs were found to have adequate alpha value (>0.7) (Table 3).

5.1 K-Means and Hierarchical Cluster

Everitt et al. (2001) hierarchical clustering is a one of the most significant and straightforward approaches for merges similar groups of points. It should be either divisive or agglomerative. Agglomerative hierarchical clustering begins with every case being a cluster unto itself. To achieve the method of hierarchical clusters, the researcher should specify how distance or similarity is defined, how many clusters are needed and how clusters are aggregated (or divided). In addition, Corter (1996) argued that the hierarchical clustering generates all possible clusters of sizes (1-k), but this method is utilized only for relatively small samples.

In hierarchical clustering, the clusters are nested rather than being mutually exclusive, as is the usual case, that is, in hierarchical clustering; larger clusters created at later stages may contain smaller clusters created at earlier stages of agglomeration (Sharma 1996). Hierarchical clustering which allows users to select a definition of distance, then select a linking method of forming clusters, then determine how many clusters best suit the data (Sharma 1996). Large datasets are possible with K-means clustering, unlike hierarchical clustering, because K-means clustering does not require prior computation of a proximity matrix of the distance/similarity of every case with every other case (Hair et al, 2007).

Looking at the results shown in the table (4.) below, the researcher has decided to use K-means analysis rather than hierarchical one due to many reasons. Initially, the results which have been gotten by using hierarchical analysis were inconsistent and not systematically analyzed. For example, hierarchical analysis has considered the low applications' adopters as moderate applications' adopters and vice-versa. In addition, the adopters who adopted all of the applications (10 out of 10) and who adopted of the applications (9 out of 10) have been considered as moderate adopters rather than high applications' adopters. In a diverse way, the data obtained by using k-means analysis were more accurate and systematic as proven in the results of this study. K-means clustering method is much less computer-intensive and is hence often prefer to choose k-means when datasets are large (Sharma 1996). Therefore, the researcher has decided to use k-means analysis in order to get more consistent and systematic data, the k-means is appropriate for this study.

Table 4 Results of Hierarchical and K-means

No. of Sample	Email	Registration	Library	Grades	Video	Chat	Audio	Course	Assessment	Test	K-means	Hierarchical
30	1	3	3	2	2	1	1	2	1	2	1	2
37	1	3	3	2	2	1	1	2	1	2	1	2
64	2	3	3	2	2	2	1	2	2	2	1	2
100	1	3	3	2	2	1	1	3	1	2	1	2
145	1	3	3	3	2	1	1	1	1	3	1	2
149	2	3	3	2	2	2	1	2	2	2	1	2
162	1	3	3	2	1	1	1	2	1	2	1	2
186	1	3	3	2	2	1	1	2	1	2	1	2
239	1	3	3	2	2	1	1	2	1	2	1	2
310	1	3	3	2	2	1	1	2	1	2	1	2
332	1	3	3	1	2	1	1	2	1	4	1	2
58	1	4	4	2	4	1	2	3	2	2	2	1
121	1	4	4	2	4	1	2	4	2	2	2	1
123	1	4	4	2	4	1	2	4	2	2	2	1
166	1	4	4	2	4	1	2	3	2	2	2	1
173	1	4	4	2	4	1	2	3	2	2	2	1
241	1	4	4	2	4	1	2	3	2	2	2	1
278	1	4	4	2	4	1	2	4	2	2	2	1
318	1	4	4	2	4	1	2	4	2	2	2	1
47	3	3	4	3	4	3	3	4	3	4	3	2
69	2	3	3	2	3	2	3	3	2	3	3	2
88	1	4	4	1	3	1	4	2	4	2	3	2
89	2	3	3	2	2	2	3	2	3	2	3	2
117	3	4	4	2	4	3	3	3	3	3	3	2
139	3	3	3	2	4	3	3	3	3	3	3	2
178	3	3	4	3	4	3	3	4	3	4	3	2
184	1	4	4	1	3	1	4	2	4	2	3	2
198	2	3	3	2	3	3	3	3	3	3	3	2
228	1	4	4	1	3	1	4	2	4	2	3	2
258	3	3	3	1	3	3	3	3	3	3	3	2
268	2	3	4	2	3	2	3	3	3	3	3	2
276	2	3	4	2	3	2	3	3	3	3	3	2
296	3	3	3	1	3	3	3	3	3	3	3	2
311	3	3	3	2	4	3	3	3	3	3	3	2

The study was aimed to exploratory study in the field of innovation diffusion. K-means method was used in this study to identify the different types of e-learning adoption patterns. Hair et al, (2007) stressed that the most important basis for k-means cluster is used Euclidean distance which is the most common distance measure. Nevertheless, the researcher should specify in advance the desired number of clusters, K. Initial cluster centers are chosen in a first pass of the data, and then each additional iteration group's observations based on nearest Euclidean distance to the mean of the cluster. Cluster

centers change at each pass. The process continues until cluster means do not shift more than a given cut-off value or the iteration limit is reached (Corter 1996).

The determination of the appropriate K of clusters is a critical issue in cluster analysis. The researcher is a need to determine a natural K of clusters (2, 3 and 4) that are interpretable in terms of the research question of this study. Therefore, the K three-cluster solution was chosen for the results of this study due to it provides to group the respondents into different adoption groups such as low adopters, moderate adopters and high adopters. These three groups of adopters were more meaning full because it looks at three perspectives of their adoption.

Table (5) below, indicated the number of cases in each cluster, the first group consisted of 125 adult workers which presented 37.3%, and this group considered as low adopters. Second group consisted of 173 adult workers which presented 51.6%, and this group considered as moderate adopters. Third group consisted of 37 adult workers which presented 11%, and this group considered as high adopters.

Table 5 Number of Cases in each Cluster

Cluster	1	125
	2	173
	3	37
Valid		335
Missing		000

Table 6 Initial Cluster Centers

	Cluster		
	1	2	3
E-mail	4	3	3
Online registration	2	3	3
Online library	1	4	2
Grades	1	4	2
Live video	1	4	2
Live chat	1	4	2
Live audio	1	2	4
Online course	1	2	4
Online assessment	1	1	3
Online test	1	1	4

Table 7 above revealed the initial cluster centers, which comprise of three clusters as desired, and gives the average value of each application in each cluster. It can be observed that the first cluster has the lowest averages with each application. The second cluster indicates a highest value, while cluster three reports the moderate average value.

Table 7 Final Cluster Centers

	Cluster		
	1	2	3
E-mail	3	3	3
Online registration	3	3	3
Online library	2	3	3
Grades	2	3	3
Live video	2	3	3
Live chat	1	3	2
Live audio	1	2	3
Online course	1	2	3
Online assessment	1	1	3
Online test	1	1	3

Table 4.48 above shows the final cluster centers, it gives the mean averages of each application in each cluster, which enables a descriptive name to be given to each cluster based on their dominant averages.

Binary Logistic Regression

In this section, the binary logistic regression analysis was conducted to explore factors that were associated with adoption groups namely, low adopters; moderate adopters and high adopters as the three-group dependent variable and 13 predictor variables refer. Backward eliminations, a method of stepwise regression were used as it would retain only the predictor variables that were statistically significant in the model (Menard, 2002).

The preliminary results of the chi-squared tests and pseudo R square values that measure the effectiveness of the regression model (testing the overall fit of the model) showed that the chi-squared differences was significant at 0.00 level (Table 8 below). In other words, the improvement in the results after the predictor variables were included provides evidence that the predictors were indeed associated with adoption.

Table 8 Model Fitting Information

	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	638.142			
Final	511.194	126.948	26	.000

In addition, Table 9 below shows that Nagelkerke R square value of 0.371 for the overall model. The results indicate the model could explain approximately 38% of the variance in the dependents variables. Nagelkerke R square is chosen because it is a modification over the Cox and Snell R square and has a range of 0 – 1.

Table 9 Pseudo R-Square

Cox and Snell	.315
Nagelkerke	.371

Table 10 Binary Logistic Regression Model

	Low-adopters vs. High-adopters		Moderate-adopters vs. High-adopters		Moderate-adopters vs. Low-adopters	
	Coff (β)	Wald p-value	Coff (β)	Wald p-value	Coff (β)	Wald p-value
Relative	-.612	.045	-.112	.705	.501	.001
Flexibility	-.224	.398	.099	.700	.323	.036
Compatibility	-1.002	.001	-.346	.247	.656	.000
Complexity	-.467	.170	.032	.921	.500	.018
Trialability	-.607	.077	-.306	.322	.300	.183
Observability	-.286	.426	.088	.783	.374	.133
Management	.965	.013	.025	.944	-.940	.000
Structure	-.616	.031	-.355	.173	.261	.143
Culture	-1.131	.002	-1.061	.002	.070	.771
Social contact	-.464	.130	-.136	.639	.328	.043
Professional advancement	.116	.618	.514	.021	.398	.010
Social stimulation	-.311	.350	-.670	.036	-.359	.069
External expectations	-.274	.324	.076	.775	.350	.040
Cognitive interest	.456	.245	.051	.887	-.405	.096

The Wald statistic is used to evaluate the statistical significance of each predictor variable in explaining the dependent variable, and Wald statistic indicates whether the β -coefficient for a predictor is significantly different from zero. If so, then the predictor variable is assumed to make a significant contribution to the prediction of the outcome of the dependent variable.

The summary of the results from the binary logistics regressions were shown in table 10. Eleven predictor variables, namely relative advantage, flexibility, compatibility, complexity, top management support, culture, structure, social contact, professional advancement, social stimulation and external expectations were found to be significantly associated with e-learning adoption with various groups of adoption.

DISCUSSION

In this section discusses the result that emerged from the data analysis. Attempts will be made to explore how the result related to the findings from previous studies. The approaches adopted in this section are that the discussion will reiterate the highlights if the results are as expected, and if the results are unexpected, the discussion will be an attempt to reconcile. The results obtained from interpreting the adoption level and matrix will be discussed and followed by discussion on factors associated with e-learning adoption.

Characterizing E-learning Adoption

This study has developed a framework to characterised and measure e-learning adoption on a two-dimensional matrix representing level of adoption and extent of usage. The level of adoption was represented by teen types of e-learning application. The extent of usage was measured using four category scale represented by not using, use sometime, use most of the time and use all the time with e-learning applications.

Previous studies have approach to examine the e-learning adoption by two perspectives which are "adopted or net adopted". Also, these studies were focused just in one perspective in order to examine the e-learning adoption (e.g. Duan et al. 2010; Hung et al. 2009). While, this study has aimed to examine adoption by focusing on both the range of e-learning applications adopted and the extent of usage of each one in order to provide a comprehensive picture of the adoption of e-learning among adult workers in Jordan.

In order to capture information on the extent of usage for each e-learning application, a K-mean clustering has been conducted for this study. Depend on a study sample of 335 responding adult workers; the K-mean has successfully identified diverse e-learning applications' adoption groups among adult workers in Jordan. These groups were considered as low adopters, moderate adopters and high adopters. The important of K-mean lies in its flexibility, without being restricted by the measurement scale when identifying adoption patterns. Also, this method enables various adoption patterns to be identified the two-dimensional.

The first group is the low adopters presented about 37.3% of the study sample. In this group, the choice of application being adopted by these adult workers is limited. Adult workers have mainly adopted e-learning adoption such as e-mail, registration, online library, grades and video. The findings of this study suggest that, these applications methods are more widely used by adult workers than others applications. Also, as discussed in the literature review (chapter two) many students including adult workers have a lack of experience with using the new technology especially in Jordan due to e-learning adoption is still innovation method of learning to numerous students (Abbad and Nahlik, 2009).

The next group is the moderate adopters presented about 51.6%, of the study sample. The adult workers have mainly adopted e-learning adoption such as e-mail, registration, online library, grades, video, online chat, audio and online course. This group of adopters is similar to the adoption stage (Hung et al. 2009). Moderate adopters have taken the first step to adopt more advanced internet

technologies, and have partially integrated e-learning applications both internally and across-worker. However, full integration of e-learning applications has not been implemented. Rogers (1995) stated, “after being adopted by only a few people in a system, the innovation may ultimately be rejected, so that its rate of adoption level off and, through discontinuance, nose-dives”. This made it worthwhile to analyze the rate of discontinuation of e-learning applications in this research study.

The third group is the high adopters which presented about 11% of the study sample. This group has placed a strong emphasis on the nine out of ten or ten out of ten applications adopted by other lower adoption groups. The adult workers have mainly adopted e-learning adoption such as e-mail, registration, online library, grades, video, online chat, audio, online course, online assessment and online test. Third group of this study is that adult workers are more likely to adopt e-learning applications than lower and moderate adopters, due to Adult workers who are frequent and/or heavy users of the Internet are more likely to use e-learning systems, adult workers who are confident in their ability to master an e-learning system, without help, are more likely to become users, adult workers are reassured by the availability of back-up technical support and adult workers believe that an e-learning system will be more useful to them if it is easy to use.

In terms of extent of usage, we could observe the extent to which adult workers migrate from traditional methods of conducting learning to adopt internet technologies. As proposed by Chin and Marcolin (2001), actual usage of the innovations provides a clearer understanding on innovation diffusion but has been neglected in previous innovation adoption studies. In this study, the adoption is described as triggering usage of applications on a limited basis leading to the final stage whereby an application would be substituted for an existing traditional business transaction method.

Findings from present study showed that most of the e-learning applications provided by the Arab Open University in Jordan (AOUJ) to Adult workers are mainly used on most of the time. This trend suggests that the outcomes of adoption depend how adopters have accumulated knowledge and experience in using these applications. When adult workers have adopted e-learning applications on a most of the time, positive feedback would reinforce their usability, and would set the stage for subsequent usage of the application, and application from other levels.

For the low adopters, they mainly adopt applications that indicate their web presence, mainly on a use most of the time and use sometime. Numerous adult workers from this group have substituted e-learning applications for traditional methods of conducting learning.

Moderate adopters, however, they are using a majority of applications indicating their web presence on a use most of the time. A number of adult workers from this group have substituted e-learning applications for traditional methods of conducting learning. Compared to the moderate adopters, high adopters are using the e-learning applications adopted on a use most of the time, while very few adult workers from high adopters have substituted e-learning applications for traditional methods of conducting learning. The findings from the matrix also reveal a number of adult workers which have adopt e-learning applications ranging from e-mail to online audio, solely on use most of the time.

FACTORS ASSOCIATED WITH E-LEARNING ADOPTION

The results indicate a set of significant factors that could differentiate between each group of adopter, namely low, moderate and high adopter. The study found that the relative advantage, compatibility, flexibility and complexity had a positive impact on the probability of e-learning adopting for (low-adopters vs. high-adopters) and (moderate-adopters vs. low-adopters) compare to (moderate-adopters vs. high-adopters). The relative advantage, compatibility, flexibility and complexity are significantly related to adult workers' adoption to use e-learning. The result supported findings from prior studies of the significant of relative advantage, compatibility, flexibility and complexity on e-learning adoption among adult workers (Liao and Lu, 2008; Hung et al., 2009).

In addition, the findings indicated that organizational structure, organizational culture and top management support were significantly impact on e-learning adoption among adult workers. This implied that organizational structure, organizational culture and top management support could

promote the initial phase of e-learning adoption by the adult workers in Jordan. These findings support previous studies in the literature (Hung et al., 2009; Naveh et al. 2010). Consequently, four factors of personal were significantly impact on e-learning adoption among adult workers, namely social contact, professional advancement, social stimulation and external expectations. These findings support previous studies in the literature (Miller, 1992; Kim and Merriam, 2004). The figure (4.10) showed the summery of the significant of factors that assessed with e-learning adoption's group.

CONCLUSION

Unlike previous studies that described adoption based mainly on one dimension, i.e. level of adoption, this study has given due consideration to both the level of adoption and the extent of usage for each application. More importantly, a framework was developed which also allowed current status of e-learning applications to be taken into account, thus providing a more comprehensive picture of the nature of e-learning adoption by the adult workers.

The finding suggested that the types of application adopted, and the extent of usage, measured in terms of not using, use some time, using e-learning application most of the time, and using e-learning application all the time, could be used to characterize e-learning adoption. More important, both dimensions could form the basis for classifying adult workers in future studies, whereby causal models could be built to examine the relationships between variables such as factors associated with adoption and impact on adult workers.

In this case, K-means clustering method analysis is used as the most popular method and the most suitable for the purpose of this study. Hence, this K-means provided a richer source of information that reflected the nature of e-learning adoption, where adoption behaviour was discussed on the basis of level of adoption and extent of usage. The profile generated for all adult workers based on the above dimensions could increase our knowledge about what applications has been adopted, and the extent they been used by Learning Management System. As far as the author can establish this are the fewest studies of e-learning adoption which has utilised the statistical technique of cluster analysis to classify, or group, learners which were the basis of the study.

The finding suggested that the types of application adopted, and the extent of usage, measured in terms of not using, use some time, using e-learning application most of the time, and using e-learning application all the time, could be used to characterize e-learning adoption. More important, both dimensions could form the basis for classifying adult workers in future studies, whereby causal models could be built to examine the relationships between variables such as factors associated with adoption and impact on adult workers.

This study also found factors such as relative advantage, flexibility, compatibility, complexity, top management support, culture, structure, social contact, professional advancement, social stimulation and external expectations were significantly linked to adult workers e-learning adoption initiative, suggesting researchers will need to give renewed thought to the roles played by each individual external party, including adult workers, when researching technology adoption. More importantly, the analysis of factors associated with e-learning adoption showed that causal models can be built and tested.

The second implication for theory concerned the assumption made in past studies, which examined factors that drive adoption, mainly between binary groups, e.g. non-adopters versus adopters.

This study identified three adoption groups, and has provided evidence that apart from some common factors that were associated with all adoption groups, some group had distinct factors to drive their adoption of e-learning. In other words, certain factors were perceived to be more important for a particular adoption group.

The findings suggested that relative advantage characteristics needed to be given greater emphasis in researching e-learning adoption among adult workers. In particular, , the adopter tends to utilize e-

learning as a tool for increasing learners satisfaction and improving service quality in order to help the workers gain relative advantage ultimately increase operation performance. The variable relative advantage discussed in this research showed a positive result concluding that the more benefits seen to be gained from adopting e-learning, the more willingness the adult workers would have to adopt e-learning.

The Arab Open University in Jordan (AOUJ) should enhance the quality of e-learning and at the same time consider relative advantages and trialability, when introducing new technologies. Consistent with Wild et al. (2002), it is agreed that combining the characteristics of effective traditional learning with those of effective online learning will provide a rich and varied presentation environment that will satisfy individual need of users. In addition, it can also be enhanced by educating the lecturers and also students including adult workers about the importance and advantages of using e-learning in teaching and learning processes. In addition, the e-learning adoption profile described in this study provided an overview of e-learning adoption among adult workers.

This is an empirical study and the research model provides a way of viewing the real world, but at the same time simplifying things. In the complex world of adult workers, there are potentially other factors that could influence the adoption of e-learning and implications for adult workers. However, for the purpose of this study, these factors are controlled. In other words, the adoptions, and the links between e-learning adoptions, are hypothesized to exist. These causal relationships cannot be established based upon a cross-sectional study approach. Hence, the findings derived from this study may have limited ability to be applied to other university that have adopted e-learning. This will help to further improve our knowledge and understanding of the factors which influence e-government adoption.

The Jordanian government may have to concentrate on achieving high quality low level informative services before moving to more advanced levels. This will give the government the time to focus on simple e-learning adoption that are more responsive to their needs and at the same time establish a positive online relationship with workers, while at the same time working on increasing the number of internet users in Jordan before paving the way to more advanced levels of e-learning adoption.

The participant was drawn from a single university in Jordan. Therefore, the findings derived from this study may have limited ability to be applied to other university. In order to have a complete picture of e-learning adoption, future research should also be conducted on other sectors such as hotel, hospital, and communication sectors. Finding from other organizations would be useful in providing a comparison of the nature of e-learning adoption between other organizations.

REFERENCES

- Abbad, M. M., Morris, D., & Nahlik, C. d. (2009). Looking under the Bonnet: Factors Affecting Student Adoption of E-Learning Systems in Jordan. *International Review of Research in Open and Distance Learning*, 10(2), 1492-3831.
- Alexander, S. (2001). E-learning Developments and Experiences. *Education and Training*, 43(4), 240-248.
- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In. Heidelberg: Springer.
- Andersson, A., & Gronlund, A. (2009). A Conceptual Framework for E-Learning in Developing Countries: A Critical Review of Research Challenges. *EJISDC*, 38(8), 1-16.
- Asaari, M. H. A. H., & Karia, N. (2005). *Adult Learners and E-Learning Readiness: A Case Study*. Paper presented at the European College Teaching & Learning Conference.
- Bernard, R. M., Brauer, A., Abrami, P. C., & Surkes, M. (2004). The Development Of A Questionnaire for Predicting Online Learning Achievement. *Distance Education*, 25(1), 31 – 47.
- Bose, K. (2003). An E-Learning Experience a Written Analysis Based on my Experience in an E-

- Learning Pilot Project. *Campus-Wide Information Systems*, 20(5), 193-199.
- Chang, S., & Tung, F. (2008). An Empirical Investigation of Students' Behavioral Intentions to Use the Online Learning Course Website. *British journal of Education Technology*, 39(1), 71-83.
- Chu, R. J., & Chu, A. Z. (2010). Multi-level Analysis of Peer Support, Internet Self-Efficacy and E-Learning Outcomes – The Contextual Effects of Collectivism and Group Potency. *Computers & Education*, 55, 145–154.
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease-Of-Use, and End User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 318-339.
- Daneshgar, F., Toorn, C. V., & Chan, S. C. E. (2008). E-Learning in Workplaces. *IEEE*, 11-70.
- Davis, A. (2004). Developing an Infrastructure for Online Learning. in TAnderson and F Elloumi (eds), *Theory of Practice in Online Learning* (pp. 97 – 114), Athabasca AB: Athabasca University, Canada.
- Dhanarajan, G. (2001). Distance Education: Promise, Performance and Potential. *Open Learning*, 16(1), 61-68.
- Dirani, K. M., & Yoon, S. W. (2009). Exploring Open Distance Learning at a Jordanian University: A Case Study. *International Review of Research in Open and Distance Learning*, 10(2), 1492-3831.
- Dodd, C., Kirby, D., Seifert, T., & Sharpe, D. (2009). The Impact of High School Distance E-Learning Experience on Rural Students' University Achievement and Persistence. *Online Journal of Distance Learning Administration*, 7(1).
- Duan, Y., He, Q., Feng, W., Li, D., & Fu, Z. (2010). A Study on E-Learning Take-Up Intention from an Innovation Adoption Perspective: A Case in China. *Computers & Education*, xxx(1), xxx-xxx.
- Engel, J. F., Blackwell, R. D., & Miniard, P. W. (1995). *Consumer Behavior* (8th ed.). Fort Worth, TX: The Dryden Press.
- Engelbrecht, E. (2003). A Look at E-Learning Models: Investigating their Value for Developing an E-Learning Strategy. *Progressio*, 25(2), 38-47.
- Enuku, E. U., & Ojogwu, C. N. (2006). Information and Communication Technology (ICT) in the Service of the National Open University in Nigeria. *Education*, 127(2), 187-195.
- Fahy, P. J. (2004). Media Characteristics and Online Learning Technology. in T. Anderson and F. Elloumi (eds), *Theory of Practice in Online Learning* (pp. 137 – 174), Athabasca AB: Athabasca University, Canada.
- Fishbein, M., & Ajzen, I. (1975). Beliefs, Attitude, Intention and Behavior: An Introduction to Theory and Research. In *Addison-Wesley, Reading, MA*.
- Frydenberg, J. (2002). Quality Standards in E-Learning: A Matrix of Analysis. *The International Review of Research in Open and Distance Learning*, 3, 1 – 15.
- Gonc, V. (2006). *E-education and Its Role in Higher Education in Slovene*. Paper presented at the International Conference on Organizational Science Development, Portoroz, Slovenia.
- Hansen, S., & Salter, G. (2001). The Adoption and Diffusion of web Technologies into Mainstream Teaching. *Interactive Learning Research*, 12(2/3), 281-299.
- Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success and Local Improvisations. *The Information Society*, 18(2), 101-112.
- Ho, L.-A., & Kuo, T.-H. (2010). How Can one Amplify the Effect of E-Learning? An Examination of High-Tech Employees' Computer Attitude and Flow Experience. *Computers in Human Behavior*, 26(1), 23–31.
- Hair, J., Money, A., Page, M., and Samouel, P. (2007). *Research Methods for Business*. New York:

John Wiley & Sons, Ltd.

Hu, P., Clark, T., & Ma, W. (2003). Examining Technology Acceptance by School Teachers: A Longitudinal Study. *Information & Management*, 41(1), 227–241.

Jamlan, M. H. (1995). Proposal for an Open University in the Arab World. *Technological Horizons In Education*, 22(6), 53–57.

Jihad, A. A., & Sondos, A. A. (2006). The Impact of Applying IT and E-Learning in Economic Information Systems. *American Journal of Applied Sciences*, 3 (2), 1722–1725.

Jones, S., & McCann, J. (2005). Virtual Learning Environments for Timestressed and Peripatetic Managers. *Workplace Learning*, 17(1), 359 – 369.

Johnson, R. D., Gueutal, H., & Falbe, C. M. (2009). Technology Trainees Metacognitive Activity and E-Learning Effectiveness. *Managerial Psychology*, 24(1), 545–566.

Johnson, R.A. and D.W. Wichern, 2007. Applied Multivariate Statistical Analysis. 6th Edn., Pearson Prentice Hall, Upper Saddle River, NJ., ISBN: 0135143500 pp: 773.

Julien, A. (2005). Classifying E-Trainer Standards. *Workplace Learning*, 17(1), 291 – 303V.

Lee, B.-C., Yoon, J.-O., & Lee, I. (2009). Learners' Acceptance of E-Learning in South Korea: Theories and Results. *Computers & Education*, 53 (1), 1320–1329.

Lee, Y. C. (2008). The Role of Perceived Resources in Online Learning Adoption. *Computers and Education*, 50, 1423–1438.

Learning Online. (2008). An Introduction to E-learning., from <http://pbl-online.org/LearnOnline/elearning.htm>

Liaw, S. S. (2008). Investigating Students' Perceived Satisfaction, Behavioural Intention, and Effectiveness of E-Learning: A Case Study of Blackboard Systems. *Computers and Education*, 51(2), 864–873.

Liao, H. L., & Lu, H. P. (2008). The Role of Experience and Innovation Characteristics in the Adoption and Continued Use of E-Learning Websites. *Computers and Education*, 51(4), 1405–1416.

McPherson, M., & B., M. B. N. M. (2006). Organisational Issues for ELearning: Critical Success Factors as Identified by HE Practitioners. *International Journal of Educational Management*, 20(1), 542 – 558.

McGreal, F., & Elliott, M. (2004). Technologies of Online Learning. in T. Anderson & F. Elloumi (eds), *Theory of Practice in Online Learning* (pp. 115 – 136), Athabasca AB: Athabasca University, Canada.

McFarland, D., & Hamilton, D. (2006). Factors Affecting Student Performance and Satisfaction: Online Versus Traditional Course Delivery. *Computer Information & Management*, 46(2), 25–32.

Moore, G. C., & Benbasat, I. (1991). Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research*, 2(1), 192–222.

Ndubisi, N. O. (2004). *Factors Influencing E-Learning Adoption Intention: Examining the Determinant Structure of the Decomposed Theory of Planned Behaviour Constructs*. Paper presented at the HERDSA. from <http://www.herdsa.org.au/conference2004/Contributions/RPap>.

Nedelko, Z. (2008). Participants' Characteristics for E-Learning. *E-leader Krakow*, 22, 1–7.

Newton, D., & Ellis, A. (2005). Effective Implementation of E-Learning: A Case Study Of The Australian Army. *Journal of Workplace Learning*, 17(1), 385 – 397.

Nichols, A. J., & Levy, Y. (2009). Empirical Assessment of College Student-Athletes' Persistence in E-Learning Courses: A Case Study of a U.S.National Association of Intercollegiate Athletics (NAIA) Institution. *Internet and Higher Education*, 12, 14–25.

- Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H. C. (2007). Empirical Examination of the Adoption of WebCT Using TAM. *Computers & Education*, 48(1), 250-267.
- Noyes, J., & Garland, K. (2006). Explaining Students' Attitudes Toward Books and Computers. *Computers in Human Behavior*, 22, 351-363.
- Olaniran, B. A. (2006). Applying Synchronous Computer-Mediated Communication Into Course Design some Considerations and Practical Guides. *Campus-Wide Information Systems*, 23(1), 210-220.
- Ong, C. S., Lai, J. Y., & Wang, Y. S. (2004). Factors Affecting Engineers' Acceptance of Asynchronous E-Learning Systems in High-Tech Companies. *Information and Management*, 41, 795-804.
- Papastergiou, M. (2006). Course Management Systems as Tools for the Creation of Online Learning Environments: Evaluation from A Social Constructivist Perspective and Implementations for their Design. *International Journal on E-Learning*, 5(4), 593 – 622.
- Papp, R. (2000). *Critical Success Factor for Distance Learning* Paper presented at the American Conference on Information System, Long Beach CA, USA.
- Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based Virtual Learning Environments: a Research Framework and a Preliminary Assessment of Effectiveness in Basic IT Skill Training. *MIS Quarterly*, 25(1), 401 – 426.
- Pituch, A. K., & Lee, Y. K. (2006). The Influence of System Characteristics on E-Learning Use. *Computers and Education*, 47(2), 222-244.
- Prescott, & Conger. (1995). Information Technology Innovation: A Classification by IT Locus of Impact and Research Approach. *Data Base for Advance in Information Systems*, 26(2-3), 20-41.
- Premkumar, G., Ramamurthy, K., & Liu, H. N. (2008). Internet Messaging: An Examination of the Impact of Attitudinal, Normative, and Control Belief Systems. *Information and Management Science*, 45, 451-457.
- Rajesh, M. (2003). A Study of the Problems Associated with ICT Adaptability in Developing Countries in the Context of Distance Education. *Distance Education*, 4(2).
- Rennie, F., & Mason, R. (2007). The Development of Distributed Learning Techniques in Bhutan and Nepal. *International Review of Research in Open and Distance Learning*, 8(1), 1-10.
- Roffe, I. (2002). E-Learning – Engagement, Enhancement and Execution. *Quality Assurance in Education*, 10(1), 40-50.
- Rogers, E. M. (1983). *Diffusion of innovations* (3 ed.): New York: Free Press.
- Rogers, E. M. (1995). *Diffusion of Innovations* (4 ed.). Free Press: New York.
- Roca, J. C., Chiu, C. M., & Martinez, F. J. (2006). Understanding E-Learning Continuance Intention: An Extension of the Technology Acceptance Model. *Human-Computer Studies*, 64(8), 683-696.
- Scheirer. (1983). Approaches to the Study of Implementation. *IEEE Transactions on Engineering Management*, 30(2), 6-18.
- Selim, H. (2007). Critical Success Factors for E-Learning Acceptance: Confirmatory Factor Models. *Computers and Education*, 49(1).
- Smith, P. J., Murphy, K. L., & Mahoney, S. E. (2003). Towards Identifying Factors Underlying Readiness for Online Learning: an Exploratory Study. *Distance Education*, 24, 57 – 67.
- Testa, M. G., & H M R de Freitas, H. M. R. (2004). *Critical Success Factors of E-Learning Programmes: An Exploratory Study in the Brazilian Context*. Paper presented at the In Proceeding of the 8th Association of Information and Management Conference on New e-usage? Their Integration

in Companies and the Society, May 21st - 23rd 2003, Grenoble, France, available at: www.aim2003.iut2.upmf-grenoble.fr/Communications/TESTA%20-%20FREITAS.rtf (accessed 15 April 2004).

Tyan, K. J. (2004). *Diffusion Barriers to E-Learning in Corporate Taiwan: A Factor Analysis of Practitioners' Perspectives*. Indiana University, United States.

van-Raaij, E. M., Jeroen, J. L., & Schepers. (2008). The Acceptance and Use of a Virtual Learning Environment in China. *Computers & Education*, 50, 838–852.

Volery, T., & Lord, D. (2000). Critical Success Factors in Online Education. *Educational Management*, 14(1), 216-223.

Wools, B. (2002). Distance Education – Changing Formats. *The Electronic Library*, 20(5), 420-424.

Wang, C., & Liu, Z. (2003). Distance Education – Basic Resource Guide. *Collection Building*, 22(3), 120-130.

Wang, Y. S., Wang, H. Y., & Shee, D. Y. (2007). Measuring E-Learning Systems Success in an Organisational Context: Scale Development and Validation. *Computers in Human Behavior*, 23(1), 1792 –1808.

Xu, D., & Wang, H. (2006). Intelligent Agent Supported Personalization for Virtual Learning Environments. *Decision Support Systems*, 42(1), 825 – 843.

Zaltman, G., Duncan, R., & Holbel, J. (1973). *Innovations and Organizations*. New York: John Wiley.

JOB SATISFACTION AMONG TEACHERS OF TECHNICAL TRAINING CENTERS (T.T.Cs.) IN BANGLADESH

Md. Aktaruzzaman
Assistant Professor, Dept. of ITS
Islamic University of Technology
Dhaka, BANGLADESH
akhtar.iut@gmail.com

Prof. Dr. Che Kum Clement
Head, Dept. of ITS
Islamic University of Technology
Dhaka, BANGLADESH
chekum@iut-dhaka.edu

Md. Faisal Hasan
MScTE Student, Dept. of ITS
Islamic University of Technology
Dhaka, BANGLADESH
moha_faisal@yahoo.com

ABSTRACT

Job satisfaction is considered as an important catalytic agent worldwide in improving the quality of education. The purpose of the present study is to identify the level of job satisfaction among teachers of technical training centers in Bangladesh and to see what the main factors are for job satisfaction. Due to some constraints teachers of 7 out of 38 technical training centers were considered as sample for the study. A comprehensive questionnaire was mailed to these institutions and in some cases the researchers themselves collected data. The responses were analyzed and interpreted by using weighted average. The study revealed that the factors like salary, promotion, facilities, teaching load and provision for higher education and training contributed significantly towards job dissatisfaction of the teachers whereas administration support, working condition, transfer, residence facilities, honor and social status did not cause much in this regard. From the study the researchers recommended that teachers' salary structure should be reviewed so that their basic needs can be fulfilled as also teaching load should be reduced to a satisfactory level. Teachers should be promoted in time and there must be provision for teachers to go for higher studies.

Keywords: Job Satisfaction, Technical Training Center (T.T.Cs.), Factors of Job Satisfaction.

INTRODUCTION

Technical and Vocational Education and Training plays a vital role in national development through the production of essential skilled middle and lower level labor required by the economy in almost all fields. Technical/Vocational institutions including T.T.Cs. train learners as skilled technicians, master craftsmen/women who support the professional personnel. It is very important that well trained and professional teachers should be involved to impart effective technical and vocational education because the teachers play crucial role in the overall development of the individual student. The teacher can make positive difference in the daily and future life of the student. The teachers in the T.T.Cs. have therefore got to be well motivated towards their job.

In a very simple term job satisfaction is when any job fulfills one's expectation. It is about liking one's job and finding fulfillment in what one does. Our concern is job satisfaction from administrative, socio-economic and organizational context. According to the Dictionary of Education by J. Bellingham (2002), job satisfaction is defined as: "the extent, to which a job provides general satisfaction to the worker, meets personal and / or professional needs and goals and is congruent with personal values. From the point of view of salary, status, general surroundings, social position or from all these combined. Actually job satisfaction can come only after one has entered in the job". Job satisfaction has been defined as a pleasurable emotional state resulting from the appraisal of one's job (Locke, 1976 cited in Brief, & Weiss, H. M., 2001); an affective reaction to one's job (Cranny, Smith & Stone, 1992 cited in Weiss, H. M., 2002); and an attitude towards one's job (Brief, 1998 cited in

Weiss, H. M., 2002). Weiss (2002) has argued that job satisfaction is an attitude but points out that researchers should clearly distinguish the objects of cognitive evaluation which are emotion, beliefs and behaviors.

Technical Training Centers (T.T.Cs) are those institutions which offer two years' S.S.C. (Secondary School Certificate) in different technologies to students who have passed class VIII (eight) examination. Therefore, these centers are playing a major role in creating middle level technicians.

BACKGROUND

Job satisfaction is a frequently studied subject in work and organizational literature, which is mainly due to the fact that many experts believe that job satisfaction trends can affect labor market behavior and influence work productivity, work effort, employee absenteeism and staff turnover. Moreover, job satisfaction is considered a strong predictor of overall individual wellbeing (Argyle et al., 1993).

The existing theories of worker satisfaction are complementary to and interrelated with psychological theories of needs and values. Intrinsic sources of satisfaction are explained by need theories, defined by Maslow, whose study suggested general groups of human needs were arranged in the following hierarchical order beginning with the most basic human needs: physical, security, love, self-esteem and self-actualization. Maslow's premise is that the needs served as motivators until they were satisfied. Herzberg (1972) continued to refine the needs theory by investigating the deficiencies in specific work environments resulting in a Hygiene Motivation Theory.

The Hygiene Motivation Theory postulated that people have two sets of needs: one for psychological growth (a motivational component) and another to avoid unpleasantness (a state of non-dissatisfaction). Herzberg (1972) identified criteria for meaningful work, including (a) opportunities for growth and achievement, (b) recognition for achievements, (c) increased responsibility for one's job, and (d) opportunities to advance to higher task levels. A job enrichment model for classroom teachers that would meet the intrinsic sources defined by Maslow and the four criteria recognized by Herzberg is needed in the school workplace environment.

Teachers are an essential element of educational opportunity, and the lack thereof, for poor children and communities. Therefore, it is disturbing to find that many of today's teachers are dissatisfied with their jobs. The correlation between teacher motivation and student self-esteem has been shown by Peck et al., (1977). "Teachers with strong positive attitudes about teaching had students whose self-esteem was high". Rothman (1981) suggests that this association exists because teachers serve as more than just educators; they are role models. It has been proved by the work of Michaelowa (2002) and Tasnim (2006) that there is a positive impact of teacher job satisfaction on education quality; therefore, education quality can be influenced by job satisfaction of the teacher.

This study undertakes an examination of how teachers of technical training centers feel about the job on some factors associated with their job satisfaction. The specific objectives of the study were to:

1. find out the educational qualification and professional experience of the teachers of T.T.Cs.
2. identify the level of job satisfaction among teachers of T.T.Cs. in Bangladesh,
3. identify the factors contributing significantly to job satisfaction of the teachers in T.T.Cs.,
4. provide necessary recommendations for improving the overall job satisfaction of the teachers of technical training centers (T.T.Cs.).

METHODOLOGY

The study was based on the government technical training centers (T.T.Cs.) of Bangladesh. Due to shortage of time and other constraints, only seven out of thirty-eight T.T.Cs were purposively selected for this study. Those were: T.T.C. Mirpur, Bangladesh German T.T.C., T.T.C Mymensing, T.T.C. Comilla, T.T.C. Rajshahi, T.T.C. Khulna, T.T.C. Barisal. All the teachers of these T.T.Cs. were provided with one questionnaire.

In this study a structured questionnaire was used as tool for data collection. The questionnaire had two main parts. The first one was about personal information about the respondents including educational qualification and professional experience. The second part regarding their opinion about their job, and the responses were also taken on 5 point rating scale as Strongly Agree (SA = 5), Agree (A = 4), Undecided (U = 3), Disagree (D = 2) and Strongly Disagree (SD = 1). A questionnaire package, which contained a cover letter, questionnaire and return envelope, was sent to each T.T.C. outside Dhaka city. The respondents of T.T.C. Mirpur and Bangladesh German T.T.C. were approached directly by the researchers with the questionnaires. The results of the responses of teachers were presented in tabular and graphical form. All data were analyzed using the Statistical Package for Social Science (SPSS for windows, version-15.0). Appropriate statistical procedures for description and inference were used. The calculated mean (M) were interpreted as: $M \geq 4.5$ is "SA"; $4.5 > M \geq 3.5$ is "A"; $3.5 > M \geq 2.5$ is "U"; $2.5 > M \geq 1.5$ is "D"; $1.5 > M$ is "SD".

FINDINGS

The total number of respondents (teachers) in this study was 142 with different designations from the 7 technical training centers across the country. Among them 2 were principals, 1 vice principal, 17 chief instructors, 42 senior instructors and 80 instructors. Teachers who took part in the data collections were classified based on their teaching experience as seen in table1:

Table 1: Professional experience of the teachers in the technical training centers

Professional experience →	0 – 5 Years	5 – 10 Years	10 – 15 Years	15 – 20 Years	20 – 25 Years	25 Years & above	Total
No. of respondents	2	19	45	24	25	27	142
Percentage (%)	1	13	32	17	18	19	100

The above table reveals that 32% respondent has 10-15 years experience, 19% has more than 25 years, 18% has 20-25 years, 17% has 15-20 years and 13% has 5-10 years of experience. It is matter of hope that most of the teachers of T.T.Cs have more than 10 years of experience.

However, the responses of teachers about their educational qualification are shown in table 2.

Table 2: Educational qualification of the teachers in the technical training centers

Name of the degree →	SSC (VOC)	HSC (VOC)	Diploma	DTE	BA/BSc (Engg /TE)	PGDTE	MA/MSc (Engg/TE)	Total
No. of respondents	17	6	89	8	16	2	4	142
Percentage (%)	12	4	63	6	11	1	3	100

It indicates that the maximum percentage (63%) of the teachers have the degree of diploma only which is not a good sign at all for quality education. And 11% teachers have Bachelor or equivalent degrees and 3% have Masters or equivalent degree. From table 1 and 2 it can be stated that the teachers have good professional experience but their educational qualifications are not at the satisfactory level at all. It implies that the provisions for higher education for the teachers of T.T.Cs. are not well-structured. Bureaucratic complexities, political influence, nepotism, etc. may cause these provisions stagnant.

The teachers were asked to give their opinions about their level of satisfaction on some factors related to their job. Table 3, shows the teachers' opinion about their level of satisfaction on some factors.

Table 3: Overall mean score for some factors on job satisfaction

Factors	Overall mean	Factors	Overall mean
Teaching as a profession	3.97	Salary	1.99
Administrative support	3.76	Working environment	3.78
In-service training	3.81	Teaching load	3.51
Transfer & administrative problems	3.08	Facilities provided by the government	2.73
Promotion	1.95	Social status	3.51

Based on five point rating scale with responses ranging from strongly agree (5) to strongly disagree (1), teachers showed moderate satisfaction with teaching as a profession, administrative support, in-service training, working environment, teaching load, motivation and honor and social status, where the mean scores of their opinion were between 3.50 to 4.49. They were undecided on the factors like transfer and administrative problems and facilities provided by the government. With the factors such as promotion and salary they exhibited very low satisfaction with a mean score of only 1.95 and 1.99 respectively. Also their opinion on teaching load implies marginally moderate satisfaction.

The teachers were asked to give their opinion on some statements based on which the overall means are calculated. The tabular representations of their responses are shown below.

Table 4: Opinion regarding teaching as a profession

Statement↓	Category →	SA	A	U	D	SD	WA
1. It was your aim to join teaching Profession.		55 39%	57 40%	20 14%	9 6%	1 1%	4.10
2. Your family members also like this profession.		45 32%	72 51%	15 10%	8 6%	2 1%	4.06
3. You have got proper honor after entering this profession.		35 25%	68 48%	15 10%	18 13%	6 4%	3.76

Table 4 shows that teaching profession is a favorite profession of the teachers and they considered it as an honorable profession. Also it is the aim of the teachers to join teaching profession and their family members also like the profession.

Table 5: Opinion regarding administrative support

Statement↓	Category →	SA	A	U	D	SD	WA
4. The authority takes attempt to punish the teachers for their irresponsible & illegal deeds.		36 25%	82 58%	15 10%	8 6%	1 1%	4.01
5. The authority is conscious cordially to solve the problems of the teachers.		24 17%	63 44%	20 14%	31 22%	4 3%	3.51

Table 5 indicates that the majority of the teachers of the T.T.Cs. are satisfied on the attitude of the respective institute administration and the authority takes attempts to punish the teachers for the irresponsible and illegal deeds and the authority is conscious to solve the problems of the teachers.

Table 6: Opinion regarding transfer and administrative problems

Statement↓	Category →	SA	A	U	D	SD	WA
6. You will get transferred to any other institution if you are given chance to that.		12 8%	48 34%	30 21%	35 25%	17 12%	3.02
7. Most of the time you face problems with administration.		20 14%	45 32%	22 15%	47 33%	8 6%	3.15

Table 6 implies that problems with administration are undecided as teachers don't have extreme problems with administration so they didn't show their strong will to get transferred from the institutions. The teachers are not sure whether they will get transferred or not if they are given chance for it. In fact, the teachers are undecided about administrative problems and transfer.

Table 7: Opinion regarding in-service training

Statement↓	Category →	SA	A	U	D	SD	WA
8. The authority does not arrange in-service professional training.		36 25%	72 51%	10 7%	20 14%	4 3%	3.81

Table 7 exhibits that the authorities of the T.T.Cs. do arrange in-service professional training to increase the teachers' professional skills in the moderate level of satisfaction.

Table 8: Opinion regarding promotion

Statement↓	Category →	SA	A	U	D	SD	WA
9. You are satisfied with the promotion criteria of the government.		3 2%	14 10%	10 7%	65 46%	50 35%	1.98
10. You have been promoted after you join this profession.		2 1%	17 12%	5 4%	61 43%	57 40%	1.92

It is found from the table 8 that most of the teachers are very much dissatisfied with promotion criteria of the government and they are not promoted after join this profession even they fulfilled the criteria.

Table 9: Opinion regarding salary

Statement↓	Category →	SA	A	U	D	SD	WA
11. You are happy with your current salary.		1 1%	16 11%	7 5%	75 53%	43 30%	1.99

It is found from the table 9 that majority of the teachers are not happy with their current salary because the earning of this profession is not enough to maintain the family, payments and increments are not enough compare with hardship, teachers are bound to do part time jobs since the salary is too less to live comfortably. However, if the salary is increased, they will not think of doing extra jobs.

Table 10: Opinion regarding working environment

Statement↓	Category →	SA	A	U	D	SD	WA
12. Working environment of the institute is suitable for teaching.		35 25%	79 56%	11 8%	15 10%	2 1%	3.91
13. Physical facilities and surroundings of the institute are satisfactory.		20 14%	82 58%	14 10%	22 15%	4 3%	3.65

Working environment has a positive relationship with a teacher's job satisfaction. It is observed from table 10 that most of the teachers are satisfied with working environment and its physical facilities.

Table 11: Opinion regarding teaching load

Statement↓	Category →	SA	A	U	D	SD	WA
14. The working load of the institute is too much.		28 20%	59 41%	13 9%	41 29%	1 1%	3.51

Table 11 indicates that teaching load is not a problematic issue if salary, promotion criteria are well set. The teachers are eager to do hardwork if they are paid for it.

Table 12: Opinion regarding facilities provided by the government

Statement↓	Category →	SA	A	U	D	SD	WA
17. You are very much satisfied with the facilities provided by the government.		7 5%	17 12%	10 7%	78 55%	30 21%	2.25
18. You are happy with the residential facilities within the campus.		16 11%	61 43%	13 9%	41 29%	11 8%	3.21

Majority of the teachers are not satisfied with the facilities provided by the government. However, they are somehow happy with the residential facilities of the institute.

Table 13: Opinion regarding social status

Statement↓	Category →	SA	A	U	D	SD	WA
19. As a teacher you and your family get more social dignity.		17 12%	77 54%	20 14%	23 16%	5 4%	3.55
20. You are given the same status in social functions as it is given to the staff of general school.		17 12%	66 46%	31 22%	23 16%	5 4%	3.47

It is found that the teachers get social respect and their family members also get such type of honor. In the social functions they are treated same like the staff of the general school.

RECOMMENDATIONS

The study reveals that the overall job satisfaction of the teachers of T.T.Cs. in Bangladesh is moderate and which may affect the quality of education. Therefore the study suggests number of points for improving the level of job satisfaction of the teachers. The recommendations are as follows:

- Information should be made available to the government and his associates so that attention can be given to eliminate specific problem areas causing dissatisfaction and to expand conditions leading to satisfaction.
- Salary structure should be reviewed time to time in such a manner that teachers' basic needs are fulfilled.
- The promotion system of the T.T.Cs. should be improved by promoting the teachers in time. This will motivate them towards the job.
- To improve the quality of education, teaching load should be managed in such a way that teachers can feel at ease and work smoothly along with other tasks of their life.
- The policy for higher education should be revised. The teachers should be given chance to improve their knowledge and skills through high level training and degrees.
- To motivate the teachers and to bring attitudinal change among the teachers 'Best Teacher' award should be introduced.
- Teachers should be given the opportunity to represent themselves in policy-making bodies especially in making higher decisions affecting their state.
- There should be mutual cooperation between general schools and T.T.Cs. in organizing social activities. It will cause motivation as well as some sort of honor for the teachers of the Technical Training Centers (T.T.Cs.).

CONCLUSION

From the findings of the study it can be concluded that level of overall job satisfaction among teachers of T.T.Cs. in Bangladesh is moderate. Most of the teachers and their family members like the teaching profession and is considered as an honorable profession. Teachers have certain basic needs and desires which must be fulfilled before they can be happy and satisfied in their jobs. Satisfaction of the teachers is influenced by a number of factors. They are satisfied on the attitude of the respective institution administration, working environment, residence facilities, social status and the authority is conscious to solve the problems of the teachers. The teachers are not happy with their current salary as the earning of this profession is not enough to maintain their family. That's why most of the teachers are bound to do extra jobs and they are agreeing to leave extra jobs if their salary is increased. Most of the teachers are not happy with the promotion criteria set by the government and

there are many teachers who haven't got promotion after joining this profession even after fulfilling the requirements. In order to supply skilled manpower abroad which is the main source of income for Bangladesh, there is no other alternative except giving priority to the Technical Training Centers (T.T.Cs.) all over the country responsible for producing low and middle level technicians. The overall job satisfaction of the teachers may play an important role in this direction.

REFERENCES

- Argyle, M. (1989), *The Psychology of Happiness*, Routledge, London.
- Bellingham, J. (2002), *Dictionary of Education*, Academic (India) Publisher, Delhi, p – 166.
- Brief, 1998 cited in Weiss, H. M. (2002). Deconstructing job satisfaction: separating evaluations, beliefs and affective experiences, *Human Resource Management Review*, 12, 173 – 194, p. 174
- Cranny, Smith & Stone, 1992 cited in Weiss, H. M. (2002). Deconstructing job satisfaction: separating evaluations, beliefs and affective experiences. *Human Resource Management Review*, 12, 173 – 194, p. 174.
- Locke, 1976 cited in Brief, A. P., & Weiss, H. M. (2001). Organizational behavior: affect in the workplace. *Annual Review of Psychology*, 53, 279 – 307, p. 282
- Herzberg, F. 2 *Factor Hygiene and Motivation Theory*. Source: http://www.accel-team.com/human_relations/hrels_05_herzberg.html (11 November 2007)
- Michaelowa, K. (2002). *Teacher Job Satisfaction, Student Achievement, and the Cost of Primary Education in Francophone Sub-Saharan Africa*. Hamburg Institute of International Economics
- Peck, R. F., R. B. Fox, and P. T. Morston. 1977. *Teacher Effects on Students' Achievement and Self-Esteem* (Washington, DC: National Institute of Education).
- Rothman, E. P. 1981. Troubled Teachers (New York: D. McKay). Schonfeld, I. S. 1990. "Psychological distress in a sample of teachers." *The Journal of Psychology*. 124: 321-38.
- Tasnim, S. (2006), "*Job Satisfaction among Female Teachers: A study on primary schools in Bangladesh*", Thesis, M.Phil., Department of Administration and Organization Theory, University of Bergen, Norway.

Mini-Review**STAGES, ALCOHOLISM AND GENETIC BASIS
OF BREAST CANCER**

Khalid Hussain Janbaz
Department of Pharmacy,
B. Z. University, Multan,
PAKISTAN
khjanbaz@hotmail.com

M. Imran Qadir
College of Pharmacy,
G.C. University, Faisalabad,
PAKISTAN
mrimranqadir@hotmail.com

Zeeshan Siddiq
College of Pharmacy,
G.C. University, Faisalabad,
PAKISTAN
sweetzeeshan92@yahoo.com

ABSTRACT

Breast cancer (malignant breast neoplasm) initiate from breast tissue, mostly from the inner lining of milk ducts or the lobules that supply the ducts with milk. Two abnormal genes that involve are: BRCA1 (breast cancer gene one) and BRCA2 (breast cancer gene two). The occupation of the BRCA genes is to renovate cell damage and keep breast cells growing normally. But breast cancer risk increases when abnormal or mutated genes pass from generation to generation.

Keywords: Breast cancer, Stages, genes, BRCA1, BRCA2

INTRODUCTION

A form of cancer discovered in Egypt. Breast It is a major public health issue in less developed countries that leads to death in women. Breast cancers are responsive to hormones such as estrogen and progesterone, so it is feasible to treat it by blocking the effects of these hormones in the objective tissues (Zhu et al., 2011; Dowlatshahi et al., 1997). The prognosis of estrogen and progesterone positive tumor are much better and less forceful treated as compare to hormone negative cancer. It is the number one cause of cancer deaths in female (DeBoer et al., 2010; Weaver, 2003; Krag et al., 2007).

STAGES OF BREAST CANCER

Different phases are described as under

Phase 0

It is non-insidious breast cancers, in it no indication of cancer occurs but Paget's disease of nipple can be observed (Weaver et al., 2000; Weaver et al., 2009).

Phase 1

It is unrelenting (breaking of cancer cells that invade to the neighbouring cells) in which cancer capable to extend 2 centimeter in surrounding tissue (Weaver, 2009).

Phase 2

Cancer in this phase swells up not above 4 cm in greatest span (Greene et al., 2002).

Phase 3

It is further divided in two sub phases (Faderl et al., 1999).

Phase 3A

In this sub phase the greatest dimension of cancer not more than 5 cm and not less than 2 cm (Lugo et al., 1990).

- with homolateral region but some time lacking.

Phase 3B

Describes invasive breast cancer in which

- cancer size of up to and more than 5 cm in diameter
- cancer may have broaden to lymph nodes near the breastbone
- this stage is considered as inflammatory breast cancer

Phase 4

It is also invasive in which

Cancer of any size may spread to any organ of body. This stage is considered as metastatic cancer (Baccarani et al., 2006; Baccarani et al., 2009).

ALCOHOLISM AND BREAST CANCER

Alcohol enhances the level of hormones such as estrogen in our body. A high level of estrogen causes breast cancer. In our body, acetaldehyde is formed by the conversion of alcohol. Acetaldehyde is a toxin that causes cancer by damaging DNA and averting it from being mended. Acetaldehyde is found in large amount in the saliva of people who drink heavily and smoke. It is found by various observations that every alcohol unit drunk a day enhances the possibility of breast cancer about 7-11%. The chances of breast cancer in teenage girls is 25% elevated than as compare to women because of early menarche (Hochhaus et al., 2008; Shah et al., 2008).

GENES INVOLVED**Breast cancer genes (BRCA)**

BRCA1 and BRCA2 genes are found in human chromosomes. Breast cancer is developed by its altered form. But several studies have shown that breast cancer is not developed by only an altered form BRCA-1 gene. It is also observed that 10% of such cancer originated by abnormal form of these genes (Shah et al., 2010).

p53

The p53 involves in protein construction which use in the growth of cell. Abnormal p53 gene causes Li-Fraumeni syndrome (soft tissue cancer), it enhances the threat feature of breast cancer (Druker et al., 2006; de Lavallade et al., 2008).

Other genes

ATM: Dented DNA are repaired by the ATM gene But brain development is affected by inherit two abnormal copies of ATM gene. In some families, inherit abnormal ATM gene enhances the risk of breast cancer because it stops renovation of cells of breast tissue.

CONCLUSION

It is serious inflammatory disease which leads to death in women. Various risk factors are responsible for it. Different gene that control the breast tissue's cell cycle, when they are in abnormal form they may cause breast cancer.

REFERENCES

- Baccarani et al., (2006). Evolving concepts in the management of chronic myeloid leukemia: recommendations from an expert panel on behalf of the European LeukemiaNet. *Blood*, 108:1809-1820.
- Baccarani et al., (2009). Chronic myeloid leukemia: an update of concepts and management recommendations of European LeukemiaNet. *J Clin Oncol*, 27:6041-6051.
- de Lavallade et al., (2008). Imatinib for newly diagnosed patients with chronic myeloid leukemia: incidence of sustained responses in an intention-to-treat analysis. *J Clin Oncol*, 26:3358-3363.
- DeBoer et al., (2010). Breast cancer prognosis and occult lymph node metastases, isolated tumor cells, and micrometastases. *J Natl Cancer Inst*, 102:410-425.
- Dowlathshahi et al., (1997). Lymph node micrometastases from breast carcinoma: reviewing the dilemma. *Cancer*, 80:1188-1197.
- Druker et al., (2006). Five-year follow-up of patients receiving imatinib for chronic myeloid leukemia. *N Engl J Med*, 355:2408-2417.
- Faderl et al., (1999). The biology of chronic myeloid leukemia. *N Engl J Med*, 341:164-172.
- Greene et al., (2002). AJCC cancer staging manual. 6th ed. New York: Springer.
- Hochhaus et al., (2008). Dasatinib induces durable cytogenetic responses in patients with chronic myelogenous leukemia in chronic phase with resistance or intolerance to imatinib. *Leukemia*, 22:1200-1206.
- Krag et al., (2007). Technical outcomes of sentinel-lymph-node resection and conventional axillary-lymph-node dissection in patients with clinically node-negative breast cancer. *Lancet Oncol*, 8:881-888.
- Lugo et al., (1990). Tyrosine kinase activity and transformation potency of bcr-abl oncogene products. *Science*, 247:1079-1082.
- Shah et al., (2008). Intermittent target inhibition with dasatinib 100 mg once daily preserves efficacy and improves tolerability in imatinib-resistant and -intolerant chronic-phase chronic myeloid leukemia. *J Clin Oncol*, 26:3204-3212.
- Shah et al., (2010). Potent, transient inhibition of BCR-ABL with dasatinib 100 mg daily achieves rapid and durable cytogenetic responses and high transformation-free survival rates in chronic phase chronic myeloid leukemia patients with resistance, suboptimal response or intolerance to imatinib. *Haematologica*, 95:232-240.
- Weaver et al., (2000). Pathologic analysis of sentinel and nonsentinel lymph nodes in breast carcinoma: a multicenter study. *Cancer*, 88:1099-1107.
- Weaver et al., (2009). Metastasis detection in sentinel lymph nodes: comparison of a limited widely spaced (NSABP protocol B-32) and a comprehensive narrowly spaced paraffin block sectioning strategy. *Am J Surg Pathol*, 33:1583-1589.
- Weaver, D. L. (2003). Sentinel lymph nodes and breast carcinoma: which micrometastases are clinically significant. *Am J Surg Pathol*, 27:842-845.
- Zhu et al., (2011). Perspectives of breast cancer etiology: synergistic interaction between smoking and exogenous hormone use. *Chin J Cancer*, 30(7):433-41.

Book-Review**POLITICAL THOUGHT IN MEDIEVAL ISLAM: AN
INTRODUCTORY OUTLINE**

Erwin I.J. Rosenthal, 1958
University Press, England, UK;
Cambridge University Press, New York, USA

Reviewed by
Adil Khan
Department of Political Science
Hazara University, Mansehra,
PAKISTAN.
adil_seemab@yahoo.com

ABSTRACT

Rosenthal is a well known figure in academic circles. One of his famous works is Political Thought in the medieval Islam: An Introductory Outline. The key issues addressed in this book are the influence of Greek political thought on the Muslim thinkers as well as their own original contributions to the body of political thought. The author has also discussed, in detail, the influence of Sharia on Muslim Political Philosophy. Although it is a valuable piece of work yet it lacks objective judgments on a number of places while narrating the history of political thought in the Muslim world. Sometimes while going through the work one feels that it reflects the typical western perception of Islam and the Muslim world.

BOOK-REVIEW

Erwin I.J. Rosenthal is a well known name for the students of Muslim Political Thought. He was a professor at Cambridge University England. He was associated with Genizah Research Unit; an organization involved in the interpretation of Hebrew Bible. He wrote a number of articles on the Muslim medieval political thought including "The Place of Politics in the Philosophy of Ibn Rushd." He also translated Muqadima of Ibn Khaldun into English. The book under review was his first attempt to deal the subject comprehensively. He surveys the chief traditions of Muslim Political Thought from the eighth century to the end of fifteenth century.

In this book Mr. Rosenthal has tried to emphasize upon the two very important factors, Greek political thought and Sharia', which influenced and shaped the Muslim political thought during medieval Islam. Regarding the first factor two important points are worth noting; firstly the structure of book clearly supports our assumption, where the second part of the book exclusively addresses the influence of Plato's philosophy over the Muslim political thought; under the title "The Platonic Legacy", and secondly the author explicitly writes in the introductory (page 6), "Moreover, by confining myself to an investigation into the documentary evidence for Platonic ideas and arguments

in the political writings of the principal *Falasifa*, I hope to show the impact which Plato's political philosophy made on Islam". Thus, this statement clearly points towards the author's intent to trace out the influence of Plato's philosophy over the Muslim political thinkers. As for as the role of Sharia' is concerned, the author stated on a number of places in the book that this sharia' is the rock of Islam or it is like a foundation upon which all the theories are constructed (pp3-4). He explicitly admitted that Muslim political thinkers of medieval Isalm "were Muslim philosophers first and followers of their masters Plato and Aristotle second"(p4).

The author has limited his range of enquiry to Sunni Muslim thinkers only. In the introductory (page 5) he justifies it in this way, "Shia doctrine is mixed with a number of extra-Islamic ideas and notions and is too complicated to be treated in this first conspectus of political thought in Islam".

The expected readers of the book are Western students and scholars. We may deduce this from the fact that in the introductory (page8), he writes,

A final observation concerns the character of Islam in relation to politics as understood by Western students. Unless we grasp this character we cannot appreciate the significance of the caliphate as it is presented in the theory of the khilafa, which serves as introduction and background to this book.

By referring to Western students he has implied that his readers will by and large be these people. It may be extended beyond this to suggest that if a non-Western student is likely to study this book he/she is, probably, well versed in the Western tradition of knowledge or is trying somehow to be associated with it.

After the introduction, the book is divided into two parts. The first part, entitled "Constitutional Law and Muslim History", begins with a chapter on medieval ideas of happiness and the means to achieve it. This is followed by the accounts of the Classical theories of the caliphate; (Mawardi, Ghazali, Ibn Jama'a and Ibn Taymiya), some secular views on government; (Ibn at-Tiqqa, Ibn al-Muqafa', and authors of "Mirrors for princes'), and Ibn Khaldun.

The second part "The Platonic Legacy", consists of a general chapter on political philosophy in Islam and studies on the leading political philosophers (Farabi, Ibn Sina, Ibn Baja and Ibn Rushd), finally of Dawwani's collection of a work of Tusi, and three Ottoman writers of the Sixteenth century, including Haji Khalifa. The main thinkers are thus covered in 233 pages; detailed notes, a glossary and the index occupy the remaining third of the book.

Throughout the book the author has touched upon a number of controversial issues. While introducing his work, in the very first paragraph, he gave an implicit impression as Islam has inherited bulk of teachings from Judaism and Christianity. He pointed out towards the daily meeting of Muhammad (SAW) with Jews and Christians (p1). But he was unable to substantiate his claim through any evidence.

In the introductory (page 3) he writes, "The inclusion of Ibn Khaldun, the only political thinker in the strict sense of the term in Islam, requires no justification". Calling Ibn Khaldun the only political thinker, shows his intent of undermining the Muslim political thinkers against the Western political thinkers. He tries to justify his stand point on the subsequent page 4, by saying that the character,

quality and range of speculation of the Muslim political thinkers is limited by the overriding authority of the sharia’.

The term Saada I equated with happiness, which has totally different meanings. The author has wrongly attributed the attainment of happiness as the end of the Muslim society. Where as piety and obedience to God is the end of Muslim society and happiness and satisfaction are bestowed upon them as a reward for their obedience.

On page 21, he attributed the success of Islam in winning the allegiance of independent, proud, born warriors to the material inducements of booty and landed property as the result of the Holy War (Jihad). He is actually trying to interpret history through a materialist point of view. Through this attempt he is trying to undermine the ideological pull of Islam.

On a number of occasions in the book he has erroneously used the term Islam at the place of Muslims. For example on page 23 he writes, “...there were struggles for power in Islam”. On page sixteen he writes, “In Islam the problem of revelation and reason present itself chiefly as the contrast between the divine and human law”.

A considerable number of obscure statements are made by the author; a few may be mentioned here. It is not clear in what sense Ibn Tiqtaqa is a “utilitarian”; on pp.65-66 it is said that his advice to the ruler is directed towards the rulers’ own advantage and security of his throne; which is in no way a utilitarian view.

On page 118 ethics is correctly said to be a practical science according to Aristotle. Yet on the same page it is stated that in Farabi, Ibn Bajja and Ibn Rushd ethics is related to politics as theory to practice. Now this view is not Aristotelian; some explanation is thus needed which he ignores. On pages 166 and 167, Ibn Bajja’s opinion that philosophers in an imperfect state have the right to withdraw from political activity is asserted to be contrary to Plato. But Plato forbade withdrawal only to philosophers in the ideal state.

The book fails to present the leading ideas of Muslim political thought in the historical chronological order. The book out rightly ignored the time frame in which these Muslim political thinkers were living. It must be regarded rather as a collection of studies of individual thinkers. It can also be stated that this book will not be easily intelligible to readers without a previous knowledge of Islamic history and philosophy. The reviewer has found much to criticize in this book, but still it is a good book, which furnishes many an insight to scholars interested in this important subject.

GUIDELINES FOR AUTHORS

Academic Research International (ARInt.) is an international, professional, and peer reviewed journal. It is regularly published bimonthly in English by SAVAP International.

Authors are requested to observe the following before submission of manuscript:

1. The manuscript should be original, and has not been published previously. Do not submit material that is currently being considered by another journal.
2. The manuscript should be in MS Word format, submitted as an email attachment to our email box. The title of the paper should be on the cover sheet as well as the top of the first page of text. Author names and affiliations should be on the cover sheet only.
3. Manuscripts may be 3000-7000 words or longer if approved by the editor, including an abstract, texts, tables, footnotes, appendixes, and references. The title should be on page 1 and not exceed 15 words, and should be followed by an abstract of 250-300 words. 3-5 keywords or key phrases are required.
4. Submission of a paper to 'Academic Research International' implies that the manuscript has not been published in, or submitted to, any other journal and that the author(s) have obtained appropriate permission to use data obtained for and contained in the manuscript. Previous presentation at professional meetings should be mentioned in a footnote.
5. Authors of the articles being accepted with clear understanding that copyrights are transferred to 'Academic Research International (AR Int.), SAVAP International' as publisher.
6. Authors will download copies of the journal available online free of cost with open access to everyone. While the print version of journal will be available on payment of 30 USD Prices include airmail cost.
7. All content is freely available online without charge to the user or his/her institution. Users are allowed to read, download, copy, distribute, print, search, or link to the full texts of the articles in this journal without asking prior permission from the publisher or the author. The permission is only for personal purpose of researchers to promote and support research culture.
8. It is not our policy to pay authors.

All manuscripts submitted will be considered for publication. Manuscripts should be sent as an email attachment to editor.arint@gmail.com

The Editor

Academic Research International (AR Int.)

URL: <http://www.journals.savap.org.pk/>

Email: editor.arint@journals.savap.org.pk

editor.arint@gmail.com

[Authors Template]**TITLE OF SUBMISSION**

Author's Name(s)
Author Affiliation(s)
COUNTRY.
E-mail

Author's Name(s)
Author Affiliation(s)
COUNTRY.
E-mail

Author's Name(s)
Author Affiliation(s)
COUNTRY.
E-mail

ABSTRACT

The abstract is to be in fully-justified italicized text, at the top of column as it is here, below the author information. Use the word "Abstract" as the title, in 12-point Times, boldface type, centered relative to the column, capitalized. The abstract is to be in 10-point, single-spaced type, and up to 250-300 words in length. Leave two blank lines after the abstract, and then begin the main text.

Keywords: 4-5 key words or phrases should be included.

INTRODUCTION

These guidelines include complete descriptions of the fonts, spacing, and related information for producing your proceedings manuscripts. Please follow guidelines and email your paper to editor.arint@journals.savap.org.pk

The articles need to be not published elsewhere previously. If the article has been presented at any seminar or conference, the name of the conference, the institution where it has been presented and the date of the presentation needs to be mentioned. The Journal is written in English. Thus, the articles need to be written in this language.

The title of the article must be written in capital letters, using font size 14 and bold. One line space must be left after the title. The name and surname of the author(s), their title, and the institution they work for and its email or web site must be written font size 10 in upper or lower case as mentioned.

The number of the pages of the article must not exceed 20, including abstract and reference list. The whole work must be written in Times New Roman, font size 11. Subheading must be in bold, and the first letter of each word must be capital letters.

HEADING 1 – MAIN HEADING LEVEL**Heading 2 – Subheading*****Heading 3 – Subheading***

All the text must be written using single line spacing, including the reference list. The article should normally consist of the following parts: introduction, context and review of literature, method, findings, discussion and conclusion.

All inserts, figures, diagrams, photographs and tables must be centre-aligned, clear and appropriate for black/white, grayscale or colored reproduction.

In tables font size 10 must be used and vertical lines must be not be drawn. When the contents of the table cannot fit into the table, font size 9 might be used. Number of the table and the title must be written above the table. Tables (eg, Table 1) are also numbered consecutively, 1, 2, etc., from start to finish of the paper, ignoring sections and subsections, and independently from figures.

Table 1. XXXXX XX XXXXX XXXXXX

	XXX	XXX	XXX
XXXX Sxxx	xxx	xxx	xx.x %
XXXX Sxxx	xxx	xxx	xx.x %
XXXX Sxxx	xxx	xxx	xx.x %
XXXX Sxxx	xxx	xxx	xx.x %

The items on the reference list must be arranged according to APA Referencing. (Publication Manual of the American Psychological Association). Go to <http://owl.english.purdue.edu/owl/resource/560/01> for more information.

Figures (eg, Figure 1) must be numbered consecutively, 1, 2, etc., from start to finish of the paper, ignoring sections and subsections.

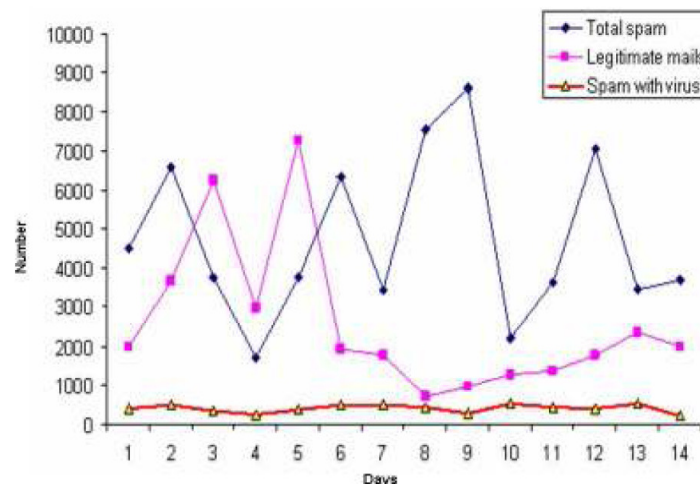


Figure 1. XXXX XXXX XXXX XXX XXXXXX

All figures, tables, etc. must have a caption, centre-justified in 11 pt. Times New Roman. Captions precede tables but follow figures. Tables and figures must appear as close to their point of reference as satisfactory formatting of the final document permits.

In-Text citations

Use the name of the author(s) followed by the year of publication when citing references within the text and page number. For example:

1 authors (Callan, 1998), **2 authors** (Eggen and Kauchak, 2001), **3 or more authors** (Levine et al., 2002)

ACKNOWLEDGEMENTS

An (unnumbered) acknowledgements section may be inserted if required.

REFERENCES

List and number all bibliographical references in 11-point Times, single-spaced, at the end of your paper in APA style. The references should be up to 25.

How to create a reference list?

Single author:

Feldman, R. S. (1996). *Understanding Psychology*. Newyork: McGraw-Hill,Inc.

2 authors:

Eggen, P. & Kauchak, D. (2001). *Educational Psychology: Windows on Classrooms*. New Jersey: Merrill.

Erden, M.& Akman, Y. (1996). *Egitim Psikolojisi (Educational Psychology)*. Ankara: Arkadas Yayınevi.

3 or more authors:

Levine et al., (2002). Signal Analysis of Behavioral and Molecular Cycles. *BMC Neuroscience*, 3: 1-25.

ACADEMIC RESEARCH INTERNATIONAL
ISSN-L: 2223-9553, ISSN: 2223-9944 Print, ISSN: 2223: 9952 CD

Academic Research International (ARInt.) is an international, professional, peer reviewed journal. It is regularly published bimonthly in English by SAVAP International (Society for the Advancement of Education through Visionary Academicians/Researchers for Peaceful Globe). It is a scholarly journal of opinion and research in academic research. Its mission is to provide an interdisciplinary forum for discussion and debate about academicians researches most vital issues.

It covers a wide range of topics of current concern in academicians' research in humanities, social sciences, management sciences, natural and applied sciences. Each issue of will contain a variety of articles, essays, and book reviews.

We are interested in receiving well-written and timely papers from individuals for possible publication. The focus of the publication is original completed research that has application to academicians, researchers, policymakers, administrators, and teachers within the broad areas of academic research. Academic Research International would welcome manuscripts on:

Social Sciences, and Humanities:

Education, Economics, Geography, History, Law, Languages and linguistics Literature, Performing arts, Philosophy, Religion, Visual arts, Political science Public Administration, Publishing and editing, Psychology, Gender studies, Cultural studies and ethnic studies, Social Work, Sociology, Anthropology, Archaeology, Area studies, Business, Divinity, Library and museum studies, Journalism, mass media and communication, and other studies.

Natural and Applied Sciences:

Astronomy, Biology, Zoology, Ecology, Botany, Chemistry, Earth science, Marine science, Physics, Space sciences, Life sciences, Applied Mathematics, Computer sciences, Logic, Mathematics, Architecture and design, Statistics, Systems science, Applied Physics, Health science, Artificial intelligence, Ceramic engineering, Computing technology, Electronics, Energy, Energy storage, Environmental Engineering Science, Engineering physics, Environmental technology, Fisheries science, Forestry science, Materials science and engineering, Micro technology, Nanotechnology, Nuclear technology, Optics, Zoography, Military sciences, Naval science, Transportation, and other sciences.

All manuscripts submitted to "Academic Research International" will be considered for publication. Manuscripts should be sent as an email attachment to the editor.

The Editor

Academic Research International (AR Int.)

URL: <http://www.journals.savap.org.pk/>

Email: editor.arint@journals.savap.org.pk

editor.arint@gmail.com

Academic Research International

ISSN: 2223-9553, ISSN: 2223-994 Print

Academic Research International (AR Int.) is a bimonthly peer reviewed journal published by SAVAP international. It is a scholarly journal of opinions and academic research. Its mission is to provide an interdisciplinary forum for discussion and debate about academicians research's most vital issues. It covers a wide range of topics of current concern in academicians research in humanities, social sciences, management sciences, natural and applied sciences. Each issue contains a variety of articles, essays, and book review. We are interested in receiving well-written and timely papers form individuals for possible publication. The focus of journal is on original completed research that has application to academicians, researchers, policymakers, administrators, and teachers within the broad areas of academic research.

On key request of researchers, SAVAP International is providing open and unrestricted access to its research publications across the world. It will also enhance indexing, retrieval power and eliminate the need for permissions to reproduce and distribute content. Academic Research International is abstracted/indexed by well reputed international indexing agencies/databases Ulrichs' Web, USA, Index Copernicus International, EBSCO Host Research Database/Electronic Journal Service, Re, Research Gate Germany, SCIRUS Elsevier, Directory of Open Access Journals (DOAJ) Sweden, ProQuest USA Die Eletronische Zeitschriftenbibliothek (ZDB) Germany,ourglocal Academic Resources Japan, Open J-Gate, Google Scholar, CrossRef etc. Some Others are in pipeline like Social Sciences Citation Index etc.



Inquiries, comments, and suggestions should be addressed to the Editor :
Academic Research international (ARInt.)

Published by:
SAVAP International,
Bright Home, Eidgah Colony, Lodhran City - 59320, PAKISTAN.
URL: <http://www.savap.org.pk>
Email: editor.arint@journals.savap.org.pk, mail@savap.org.pk
editor.arint@gmail.com
Telephone: +92 608 361176, Cell: +92 300 6826926