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MEASUREMENT OF SCIENTIFIC ATTITUDE OF SECONDARY SCHOOL STUDENTS IN PAKISTAN

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ABSTRACT

The aim of this paper was to measure the scientific attitude of secondary school students. The data were drawn from ten schools of District Rajanpur, Pakistan. Total samples of 100 students were drawn randomly. The instrument was consisted of student questionnaire. The questionnaire contains eight main elements of scientific attitude which are: curiosity, rationality, willingness to suspend judgment, open mindedness, critical mindedness, objectivity, honesty and humility. This study was being made to know the development of scientific attitude of Grade 10 students. Using statistical procedure, the empirical data was analyzed. The mean score for each items, eight parts and over all were calculated. The analysis shows that the attitude of the students is slightly scientific.

Keywords: attitude, heritage, achievement

INTRODUCTION

Science is not a new thing in this world. It is the intellectual heritage of man which has come down to us. Since man became aware of his surroundings and started pondering over the natural phenomena in which he found himself engulfed. This knowledge of physical world not only changed his environment but also his outlook and approach to the problems that he faced in his everyday life. Up to the middle ages, science was considered a part of philosophy and as such was called ''natural philosophy''. Since sixteenth century, science started taking quick strides, while it was mostly the product of the intellectual, interest of gifted individuals who worked almost independently in their fields. The importance of attitude may be inferred from the fact that attitudes determine behavior.

Scientific knowledge, in those days, exerted little influence on the common man. But since the turn of this century, even the man in the street becomes aware of the impact of science on the society and new age of science.

The development of any county is based on the scientific knowledge. Progress in science depends upon continuous scientific investigations. No doubt, well-organized and well-equipped laboratories are essential but probably the most important factor in this research is the attitude and character of persons working in the laboratories. These persons make plans, devise and conduct experiment and draw suitable inferences from experimental results. The attitude has an effect upon students' selections of different subjects and also on their interest and achievement in the scientific knowledge. Generally attitudes are considered as the degree of positive or negative effect. Positive or favorable attitude facilitates the learning of subjects while a negative attitude results in poor learning and achievement.

Pakistan is one of the developing countries. Science education is very important for her to face the challenges of the time. For such a revolution to take place, Pakistan needs a considerable number of scientists in agriculture, industry and research institutes.

To inculcate the scientific attitude in the students of secondary level for science subjects, (viz., physics, chemistry, biology and mathematics) are being taught. This study is being made to know the development of scientific attitude of Grade-10 students.

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OBJECTIVES OF THE STUDY

The main objectives of this study were as under:

i. To measure the scientific attitude in the students of Grade 10.
ii. To find out as to what extent the scientific attitude is being developed in the Grade 10 students.
iii. To make recommendations for the future researcher interested in this topic.

REVIEW OF THE RELATED LITERATURE

We got different experiences during our life on the basis of these experience, many beliefs, ideas and biases are developed. Some associations are so close to a person that he feels himself whenever he talks about them. For example a person becomes excited when socialism is discussed with him while other person shows no response on indication of excitement. Another person is excited over state's rights and another over human rights. There are many other examples where different individuals respond differently to the same topic.

Responses may be ideational, emotional and all of these may be termed as attitude. The difference between such responses is of degree and not of kind. Responses based on experience and skill involves very little emotion on the other hand emotions attack to all stimulation. Though are markedly different degrees. The situation of uncertainty or controversy gives rise to the emotions.

The term attitude not only includes the negative attitude such a prejudices biases and dislikes, but also positive attitudes. Some time called sentiment, which includes our attachment and loyalties to person, objects and ideas. Attitude thus seems like a system of ideas with an emotional core or content.

An individual possess his life, he acquires not only skills and knowledge, but also definite attitudes, point of views and feelings about his experiences. These definite attitudes, point of views and feelings are developed not only due to what kind of experiences. The individual passes though, but also how these experiences came across.

Definition of Attitude

According to the Encyclopedia of Educational Research, an attitude is a psychological construct, or latent variable, inferred from observable responses to stimuli which are assumed to mediate consistency and coherence among those responses [1].

Karlinger defined attitude as a pre disposes to think, feel, perceive and behave toward a cognitive object [2].

Anastasi while defining it is "A tendency to react favorably or unfavorably towards a designated class of stimuli" remarked that it was synonymous with opinion. The attempted differentiation between attitude and opinion was, according to her, "Neither Consistent, nor logically definable [3].

Thurston, who was the first to undertake measurement of attitude, defined it as, "The degree of positive or negative affect associated with some psychological object".

These definitions generally attribute four basic characteristics to attitudes which according to Encyclopedia of Educational Research are:

a. Approach avoidance
b. Direction of affect
c. Intensity, and
d. Generality

But from the stand point of these characteristics, attitude becomes psychologically inseparable from a number of other concepts which can be subsumed under the some construct. These include interests, appreciation, likes and dislikes, opinions, values, ideals, social distance, character traits, loyalties etc

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according to EER the attempted distinctions between these concepts are primarily dependent on customary language usage rather than intrinsic psychological process [4]. Therefore, for the purpose of this research attitude is operationally defined as verbalized opinion about liking or disliking, with varying degree of intensity, of some psychological object.

Nature of Attitude

Attitude is a complex phenomenon. Its characteristics discussed below help in unfolding its nature:

a) Attitude are Learned

Psychologists generally agree that the attitudes are not innate; rather they are learnt and are enduring like all other learning. Freeman remarked that attitudes may be said to have been learned and become one's typical mode of response [5].

The same point of view was expressed by Travers who noted that attitudes are selectively acquired and integrated through learning and experience and they are enduring depositions indication response consistency [6].

b) Attitude are learnt in a Society

Learning of attitudes occurs in a society, both formally and informally, therefore, attitudes are culture oriented.

Lasley expressed his viewpoint in detail. He pointed out that beliefs evolve as individuals are exposed to the ideas and more of their parent, peers, teachers, neighbors and various significant others, and through the folklore of a culture, and they usually persist unmodified, unless intentionally or explicitly challenged [7].

c) Attitudes are Affected by Group Norms:

One of the most important classes of factors, constituting, a pressure toward conformity of attitudes and behaviour is group norms.

Karlinger summarizing the experiments on this phenomenon has noted that when an individual was put into a group situation with others whose norms were different from his own, the different norms tended to coverage on the new group norms. When individuals now to the situation were put into it in groups they tended rather quickly establish a group norm that was peculiar to the group [8].

The above conclusion support the social phenomenon of learning and modification of attitudes with reference to the norms of the group in which an individual happen to be placed.

d) Attitude are Interlinked:

An important aspect of attitudes is their hierarchical and collateral nature within the frame of work of an organized and unified mental state designated as mental set.

The quality of goal seeking drive of attitude was emphasized by Rozenberg who, according to Krathwohl argued that a tendency to respond to an object with positive or negative affect is accompanied by cognitive structure for attaining or blocking the realization of valued states. He continued that both the direction of effect whether it is positive or negative with reference to the object and the strength of the effect are co-related with the content of the associated cognitive structure [9].

Thus, a unified and organized mental state, called mental set, composed of beliefs, values, likes and dislikes etc., influence learning and modification of attitudes.

e) Attitudes Determine Behaviour:

The importance of attitude may be inferred from he fact that attitudes determine behaviour.

Murphy summarizing the work of Razern has concluded that the attitudes of the subject make a profound difference in determining which of the several possible conditioned responses will be manifested at a given time [10].

This leads to the conclusion that attitudes control behaviour through a process of selection in the repertoire of available responses.

In summary, attitude may be deified as a mental state, more or less enduring, representing a tendency to react favorably or unfavorably or unfavorably towards a designated class of stimuli.

Research Evidence Related to Attitudes

Numerous studies have been conducted particularly in the field of education to explore the effects of different variables on the learning and modification of attitudes. The findings of such studies are summarized below:

a) Effects of Attitudes on Perception:

Craft noted that experiments provide evidence that perception is influenced by individual's attitude toward his own place in the social environment; by ideas if prestige; and by intensity of need toward the object perceived.

The obvious conclusion is that attitude about an object is influenced by the perception of the individual toward self, social environment and idea of prestige. Perception is likewise influenced by attitude [11].

b) Education Involves Attitude Change:

The process of education involves change in attitude. EER remarked that attitude change is constantly occurring as a result of learning and situational influences. The EER further reported that the important way of altering attitude is to alter the individual's concept of the object toward which the attitude is expressed [12].

The above research evidence shows the education involves modification of attitude, brought about by providing information, formation or change of concepts and other variegated techniques.

c) Teacher Education and Attitude

One of the concerns of teacher education is to bring about changes in attitude. Loree remarked that in the realm of attitude change, teaches training is concerned with desirable change in a student – teachers attitude toward himself and his pupils [13].

d) Attitude toward Teaching:

Morrsion has reported that, when students enter training institutions, student teachers do not differ from others in their educational attitudes, but that they may tend to be more religious and more conservative in their political attitudes and allegiance. He has also noted that with a fair degree of consistency, those choosing teaching as career have been found to be more people oriented in their values than most other occupational groups, placing emphasis on personal relationships, helping other people and working with people [14].

Grambs has noted that one study reported that tow of the major factors contributing to personal satisfactions in teaching are the independence that teachers have planning their work and the stimulating, Varity of their work. The chief dissatisfactions were with conditions, salaries and lack of recognition from others [15].

The research evidence suggests that teaching as a profession is rather low in the estimation of the feeding population as well as in the university students. The entrants to teacher training generally hold educational studies similar to others but tend to be more religious and more conservative and have lower needs or desires for prestige, income and recognition. Working teachers are generally dissatisfied with working conditions, salaries and states.

Institution and Attitudes

EER explained that the environmental situation may influence behaviour in two related ways. First, the individual is stimulated by various factors to which he responds with approach with or avoidance reactions of varying intensity and affect; second, the situation may limit the degrees of freedom of

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behavior in terms of possible alternative responses. The influences are learned to a considerable extent, and they depend on the selective perception of the individual and his existence of social and cultural restraints [16].

People tend to take on the characteristic required by the settings in which they participate. The institutional environment influence attitudes in the form of situational adjustments of participants by providing variegated stimuli as well as limiting available stimuli.

Scientific Attitude

The metal state, more or less enduring, representing a tendency to react favorably or unfavorable toward designated class of stimuli is attitude. If this reaction is according to the ethics of science, then it is scientific attitude. The scientific attitude investigates for a certain scientific act or thought.

The habit of thought associated with scientific thinking deserved more careful consideration. To be scientific mean that one has such attitudes as curiosity, rationality, willingness to suspend judgment, open mindedness, critical mindedness, objectivity, honesty and humility etc. attitude regulate behavior that is directed towards or away from some object or situation group of objects or situations.

Attitudes have emotional content and vary in intensity and generality according to the range of objects or situations over which they apply. Mostly attitude learnt are difficult to distinguish from such affective attributes of personality as interest, appreciation, likes, opinion values, ideals and character traits [17].

Various Elements of Scientific Attitudes

A recent attempt t analyze the process through which attitudes are acquired appears in the "Taxonomy of Educational Objectives. – Affective Domain", attitude are send to emerge first at the level of willingness to respond and become increasingly internalized in the learner through the stage of "Satisfaction is response", "acceptance of a value", "performance of value", "commitment and conceptualization of a value" At the last stage, the learner is able to see how the value relates to those that he already holds or to new ones the he is coming holds [18].

Development a scientific attitude is an important goal of science education. Instruction leading to the attainment of this goal cannot proceed until the components of scientific attitude are will defined.

a) Curiosity

Maslow had postulated that curiosity could be equated with basic desire to know. Two active investigations in the field, Wallace and Ethel Vaw, gave the following definition of, based upon informal surveys with college students and teachers that a curious perform:

i. Reach positively to new, strange, incongruous, or mysterious elements in the environment by moving towards them, by exploring them, or by manipulation them;
ii. Exhibits a need or desire to know about himself or his environment or both;
iii. Scans his surroundings seeking new experiences; and
iv. Persists in examining and exploring stimuli in order to know more about them.

Curiosity is then considered to be the energizing factor that arouses exploratory behaviour. Curiosity can be induced in children and that once induced, it can increase the input of information of value in interpreting observations. Curiosity leads to an increase in sensory data input; the curious person not only sees and hears but looks for and listens for. In this explorations, the individual is probably partially oriented toward stimulus change and partly towards Novelty [19].

A curios person asks questions, read to find information and readily initiates and carries out investigation. Curiosity is a stimulus to inquiry and it is desirable outcome of instruction as well. Each discovery raises new questions and suggests new undertakings. Pupils should show great curiosity for the science courses. But who are most curious? They are the younger children.

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Curiosity is learned. It can be learnt in the classroom. Problematic situation in which answers and explanations are not immediately available to help in stimulate curiosity. The solution of problems should raise new problems [20].

b) Rationality

While curiosity stimulates inquiry, the attitude of rationality guides the scientists' behaviour throughout the investigation. This is the habit of looking for natural causes and for natural events the rational person is not superstitious. The pre-scientific periods in our history was marked by numerous examples of mythological explanations. The tradition still abounds in our folklore and in the every day thinking of many persons. To help them develop the attitude of rationality, pupils can be confronted with situations in which careful reasoning proves superior to explanations of a superstitious nature [21].

c) Willingness to Suspend Judgment:

A scientist tries hard not to from an opinion on a given issue until he has investigated it, because it is so hard to give up opinions already formed, and they tend to make us find the facts that support the opinions. This is closely related to a desire to investigate before acting to act all the relevant facts if immediate action is necessary. There must be, however, a wiliness to act on the best hypothesis that one has time or opportunity to from [22].

Persons with this scientific attitude accumulate sufficient evidence before making judgment or drawing conclusion. To learn this attitude, our students should be confronted with situations in which the behavior is rewarded or in some way leads to success, while formation of conclusions without evidence lead to failure. Pupils should examine closely the common practice of asking students to formulate a conclusion at the every experiment. At the end of these experiences, students should have the opportunities to choose among formulating a generalization with various qualifications, stating that they have only learned something about the particular operation at hand, or stating that they could make new sense of the data [23].

d) Open-Mindedness:

A scientist is open minded willing to change his mind in the face of reliable evidence and the respects another's point of view.

People hate to give up an idea especially are they thought clever, or sacred, or a part of the general structure of ideas on which their security depends. A scientist feels these pangs also, but is more willing than most to alter an opinion, once he sees reliable evidence to the contrary, because he knows that, every time he does so, he has learned something. Retaining the old opinions intact is satisfying to the ego, but a sure indication that one has learned nothing [24].

Experience that Foster open-mindedness includes those in which pupils are confronted with the needs to revise a belief the result of having acquired new information on the subject. The scientific method is not simply the application of routine and predetermined procedure to new problems.

The study of new areas of knowledge often requires the invention of new methods of inquiry. Popular conceptions and explanations may fail to fit new bits of evidence. The history of science contains the stories of men who broke with traditions and saw nature in new light. The foster this creative spirit in the classroom, teachers can provide experiences in which pupil have the opportunity to design their own investigations and evaluate their explanations for natural phenomena [25].

e) Critical Mindedness:

New ideas are not accepted in science simply because they are new or different. To be a scientific means to be critical minded also. A person with this attitude looks for evidence and arguments that support other persons assertion. He challenges authority with the question, "How do you know?": "Why do you believe?" He is concerned about the sources of his knowledge. One of the greatest temptations confronting the science teacher is that of giving direct answer to the children's question

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and of offering full explanation. Teacher need to be careful of answers that include the word "because". Most explanations are not as simple as they might possibly appear at first.

How many teachers behave so that their students learn the attitude of critical mindedness? How often do they encourage their students to ask in class? Now do you know? To foster the learning of this attitude, teacher should provide evidence to support generalization in the lesson. Pupils should be taught to look for arguments and evidence supporting important propositions, and they should be taught to provide these in their own communication. The reading of historical and biographical accounts of investigations is also valuable experiences from which pupils can learn of the sources of our current knowledge.

f) Objectivity:

A scientist has a high regard for facts and tries to behave in accordance with them, while an unscientific person tend to see only the facts he whishes to see and to react emotionally against others. Leo Szilard (one of the top men working on bomb) said just before the last war, intelligent Englishmen were convinced that war was about to break out, but they behaved as though this possibility had nothing to do with their everyday conduct. One much person was showing Szilard his new apartment, very luxuriously furnished. What do you think of it? He asked that it is combustible [26].

A scientist is objective in gathering and interpreting his ideas and is fair in communication his findings. To learn the attitude of objectivity, student may be confronted, by situations which the temptation to permit personal feelings to interfere with the recording of an observation or the interpretation of data must be successfully resisted in order to achieve a correct or accurate solution of a problem. Complete objectivity is difficult to achieve because an observer's perceptions are governed by his previous experiences and his expectations [27].

g) Intellectual Honesty:

A scientist is sometimes subjected to humiliation as his findings shift and invalidates some conclusion to which he has previously committed himself, but his loyalty to truth is such that he would rather cut off his right arm then suppresses the new data. The general picture is o lefty and even devotion to the facts; however, they may affect one "personality" [28].

This attitude is concerned with the conscious act of truthfully reporting observations. Teachers have to ask themselves how the reward honesty in their classroom. In the laboratory, for instance, do the pupils know the right answers report, regardless of their actual sense data? Science could not be the cumulative enterprise, if it were not the objectivity and honesty of its practitioners [29].

h) Humility:

Most people are extremely arrogant in their opinions. In any tavern and even on a good many lecture platforms one will hear opinions expressed with supreme confidence that could not be tested or proved. A scientist realizes how little is known with any certainty; the commonly looks for little truths that the unscientific would consider not worth the trouble [30].

Humility is desirable ingredient of the nature personality. It can be learned, at least in part, as a result of science instruction. Science can teach children to recognize their own limitations as well as the limitations of science itself. This is the attitude that underlies the conservation movement. It is the humble person who used natural resources wisely, for the common good, even though he might have to forego immediate gains that could occur from their exploitation [31].

These attitudes directly govern the intellectual behaviour of scientist and science students. To be 'scientific' mean to have these personality traits. In our classroom, however, children learn more then the content and processes of science. They incorporate these bits of knowledge and skills along with those gained in other subjects and extra curricular experiences into their personal views of the world and their places in it. Each student gradually built his own philosophy of life.

METHODOLOGY

The following methodology was used for this study.

Population

The population taken for this study was the Grade 10 students of District Rajanpur, Pakistan. The total number of schools in District Rajanpur was 67. The study was delimited to 10 different schools. The ten schools have total numbers of students were 505. Ten students were selected randomly from each schools, so total sample of hundred students were drawn. The data was collected from hundred students.

Instrumentation

The questionnaire for students was designed and administered. The questionnaire consists of eight parts curiosity, rationality, willingness to suspend judgment, open mindedness, critical mindedness, objectivity, honesty and humility. Each part contains five items. All part included 40 items.

Data Collection

The questionnaire was administered to the sample by researchers personally in a classroom situation.

Analysis Procedure

The collected information was analyzed with the help of computer software package SPSS (version 15). All the results were reflected in the form of tables.

The mean score for each item was calculated and the items were arranged in the descending order of the mean scores value. The mean score for each eight part (curiosity, rationality, and willingness to suspend judgment, open mindedness, critical mindedness, objectivity, honesty and humility) and over all mean score of the total eight parts were also calculated.

In the analysis of different parts, if the part contains, five items, the highest limit of scientific attitude is 25.0 and the lowest limit is 15.0 below 15.0 the attitude will be negative, at 15.0 neutral from the 15.6 to 20.5 slightly positive, 20.6 to 22.5 moderately positive and from 22.6 to 25.0 taken highly positive.

The analysis of items of different parts, the attitude will be negative below 3.0, neutral at 3.0, slightly positive from 3.1 to 3.5, moderately positive from 3.6 to 4.5 and highly positive from 4.6 to 5.0.

RESULTS

The scientific attitude of 100 students was measured by calculating mean score of each item and parts separately.

The mean score of the items of part one is given in table 1. This part is related to the “curiosity” which is the main element of scientific attitude. The total number of items in this part is five.

Table 1: Mean Scores of Items of Part One Curiosity

Item No.	Item	Mean Scores
2	Are you like learn computer as a modern technology?	4.60
5	Would you like to get books and journals about the latest space research in the America?	4.40
3	Would you get detail information if you read in a news paper that atomic reactor of a country is blasted?	4.15
1	Would you like to run the circuit again by melting a fuse in your home?	4.10
4	Would you like to know why it happened if a red rose flower dips in water and then put it in cylinder of supper dioxide gas its colour changed?	3.98

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In this part at item No.2 the trend of the students to learn about computer as a modern technology is maximum i.e. 4.60, and at item No.4 the trend of the students about the colour bleaching of rose by sulpher dioxide is minimum i.e. 3.98.

All the values of this table are positive and value of item No.2 shows highly scientific attitude of the students. The item nos. 1, 3, 4 and 5 shows moderately scientific attitude of the students.

The means scores of items of part two are given below in table 2, this part is related to "rationality".

Table 2: Mean Scores of Items of Part Two Rationality

Item No.	Item	Mean Scores
1	Would you believe on it if many observation and experiment verify that smoking is injurious to health?	4.64
5	A black cat came across motor cycle rider and then accident occurred is its reason the coming black cat?	3.29
4	Would you leave to go under that tree if your friend tells you that to avoid from going under tree because there is living a Jaint?	3.21
3	Shooting star is the sign of war, do you agree?	3.19
2	Would you believe on it if your's elder told you that if a crying crow sitting on ridge of a wall is a sign of guest coming?	2.69

In this part at item No.1 the response of students that smoking is injurious to health is maximum i.e. 4.64, and at item No.2 the response of the students about the superstition that guest is not due on the crowing of the crow is minimum i.e. 2.69.

All these values of this table are positive except value of item No.2 which is negative. The value of item No. 1(4.64) shows highly scientific attitude of the students. The values of item nos. 3, 4 and 5 shows slightly scientific attitude of the students and item No.2 shows negative attitude of the students.

The means scores of items of part three are given below in table 3, this part is related to "willingness to suspend judgment".

Table 3: Mean Scores of Items of Part Three Willingness to Suspend Judgment

Item No.	Item	Mean Scores
3	Would you like to declare the name of person without any evidence on missing your bicycle?	4.08
4	Will you express about the goodness or badness of person after first meeting with him?	3.78
5	Would you agree that deduced quick result about any matter might be correct?	3.59
1	Would you reject your friend opinions without giving proofs?	3.58
2	Every person seen coughing, can you tell that he is a smoker?	3.53

In this part at item No.3 the respondent denies to declare a person without any evidence. The score obtained highest i.e. 4.08. At item No.2 the response of the students about every person seen coughing is not a smoker, is minimum i.e. 3.53.

All the values of these items are positive. The value of item Nos. 1, 3, 4, and 5 shows moderately scientific attitude of the students. The value of item No.2 shows slightly scientific attitude of the students.

The means scores of items of part four are given below in table 4, this part is related to "open mindedness".

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Table 4: Mean Scores of Items of Part Four Open Mindedness

Item No.	Item	Mean Scores
2	Would you ready to provide first aid to an opponent person who is injured in a car accident?	4.41
5	Are you believed on the space research in America?	4.12
1	Would you stand your brother in case of any occasion if in your home your servant is telling truth and your brother telling a lie?	3.91
3	In international competition, would you encourage a good player even he is Jews or Indian?	3.80
4	Would you accept research of a Jew based upon the observations and experiments?	3.60

In this part at item No.2 the response of the students against the provision of first aid to an opponent injured person is maximum i.e. 4.41 and at item No.4 the response of the students about against the acceptance of a research of a Jew based upon the observations and experiment is minimum i.e. 3.60.

All the values of these items are positive. All the values shows moderately scientific attitude of the students.

The means scores of items of part five are given below in table 5, this part is related to "critical mindedness".

Table 5: Mean Scores of Items of Part Five Critical Mindedness

Item No.	Item	Mean Scores
2	A doctor operated your father of a friend kidney to remove stone, would you ask question from doctor that how and why stone is made?	4.61
3	God forbad! In case of illness except doctor's advised medicine, would you like to ask question from doctor about the causes of illness?	4.56
5	Does a question arise in your mind, during study of a topic in a book or journal?	4.42
4	Do you believe on every listening talk without any thinking?	3.87
1	If some one tells you that feeling of irritation in the palm is a sign of getting money, would you demand proofs from that person?	2.94

In this part at item No.2 the response of the students about the nature of the kidney stone of operated father of their friend is maximum i.e. 4.61 and at item No.1 the response of the students about the superstitious feeling of irritation in the palm is not a sign of getting money is minimum i.e. 2.94.

All the values except of item No. 1 are positive. The value of item Nos. 2 and 3 shows highly scientific attitude of the students. The value of item No's 4 and 5 shows moderately scientific attitude of the students and item No.1 shows negative scientific attitude of the students.

The means scores of items of part four are given below in table 4, this part is related to "open mindedness".

In this part at item No.1 the response of the students about the likeness of thing for other is maximum i.e. 4.57 and item No.2 the response of the students not to get more money from father than our brothers and sisters is minimum i.e. 2.74.

All the values of this part except the value of item No.2 are positive. The value of item No.1 shows highly scientific attitude of the students. The value of item No. 3, 4 and 5 shows moderately scientific attitude and item No.2 shows negative scientific attitude of the students.

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Table 6: Mean Scores of Items of Part Six Objectivity

Item No.	Item	Mean Scores
1	Would you like such things for your friends whom you like for your self?	4.57
4	Would you like to use such apparatus for the sack of truthfulness of your experiment which is used by its founder scientist?	3.93
3	Do you like such supervisor who is stricter for others but will provide you a chance of cheating?	3.88
5	Would you like to give preference your own well for the selection of team than considering the playing ability of players?	3.77
2	Would you like get more pocket money from father than your brothers and sisters?	2.74

The mean scores of items of part seven are given below in table 7. This part is related to "honesty"

Table 7: Mean Scores of Items of Part Seven Honesty

Item No.	Item	Mean Scores
1	Would you like such empire which is given illegal decision in the favor of that cricket team even you are also a member of that team?	3.90
4	Would you like to cheat during examination?	3.77
5	Would you like to draw that picture by some body else which is provided by your teacher for the drawing?	3.77
2	Would you like such teacher which provides helps to you in physics practical during examination?	3.62
3	Would you like to take that cash money found by chance on the way accidentally no body looking you?	3.61

In this part at item No.1 the response of the students about illegal favor of your team is not acceptable is maximum i.e. 3.90. At item No. 3 the response of the students not left the money which they found by chance on the way is minimum i.e. 3.61.

All the values of this part positive. All the values of these item shows moderately scientific attitude of the students.

The mean scores of items of part eight are given below in table 8. This part is related to "humility"

Table 8: Mean Scores of Items of Part Eight Humility

Item No.	Item	Mean Scores
5	Would you like to convince others that it is better to treat others softly and tenderly rather than harshly in favor of your good talk?	4.29
2	Would you like to accept from the core of you heart that new idea which is put forwarded by some one to prove false your evidence during a conversation?	3.97
3	Would you like to behave strictly with your class fellow if you are selected as a monitor of the class?	3.64
1	Do you consider better yourself than those whose studying arts subjects?	3.46
4	Would you like gain more respect in the class even you have obtained lowest score?	3.41

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In this part at item No.5 the response of the students to convince others that it is better to treat others softly and tenderly rather than harshly is maximum i.e. 4.29. At item No.4 the responses of the students not to be respect most in the class even obtaining lowest score is minimum i.e. 3.41.

All the values of this part are positive. The values of item nos. 2, 3 and 5 show moderately scientific attitude of the students and item Nos. 1 and 4 show slightly scientific attitude of the students.

The highest limit of scientific limit of scientific attitude is 25.0, where the attitude will be strongly scientific. The lower limit of scientific attitude is 15.0. Below 15.0 the attitude will be negative from 15.6 to 20.5 the attitude will be slightly positive, from 20.6 to 22.5 moderately positive and from 22.6 to 25.0 highly positive.

Table 9: Comparison of Mean Score of Different Parts of Attitude Scale

Part No.	Name of Parts	Mean Scores
One	Curiosity	21.23
Two	Rationality	17.02
Three	willingness to suspend judgment	18.56
Four	open mindedness	19.84
Five	critical mindedness	20.40
Six	Objectivity	18.89
seven	Honesty	18.67
Eight	Humility	18.77

Mean of Mean Score = $\frac{153.38}{8} = 19.17$

1. The attitude of part one is moderately scientific and its value is 21.23
2. The attitudes of part two, three, four, five, six, seven and eight are slightly scientific and their respective values are 17.02, 18.56, 19.84 20.40, 18.89, 18.67 and 18.77.
3. The mean score of part one (21.23) is maximum in the mean score of eight parts, while the mean score of part two (17.02) is minimum from the mean score of eight parts.
4. As a whole, the analysis shows that the attitude of the students is slightly scientific as the total mean score is 153.38.

CONCULSION

Following conclusions are drawn from the findings of this study:

1. The attitude of secondary school students was moderately scientific about the element "curiosity".
2. The attitude of secondary school students was slightly scientific about the element rationality, willingness to suspend judgment, open mindedness, critical mindedness, objectivity, honesty and humility.

In the light of the findings and conclusions of this study, the following recommendations seem reasonable and fitting. The attitude to be taught must be identified and planned. The meaning of vocabulary used to describe attitudes or the behaviour related to them must clarify for the learner. Pleasant emotional experience should accompany the learning of attitudes. Pupils should be free to attempt their own patterns of exportation. Learning experiences must be selected on the basis of knowledge, skills and attitudes to be learned. Emphasis should be laid upon the teaching of science along with homemade cheep material for different experiments. The students should be encouraged to construct new equipment for the experiments. Interest should be created in science teaching by

organizing science exhibitions and science fairs. The modern scientific magazines, journals, films, video films, should be provided to the school for students use. Science classes should not consist of more than thirty five students. Discovery approach should replace the conventional method in science teaching.

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