CHANGING LITERACIES, TRANSFORMATIVE PEDAGOGIES: IMPLICATIONS FOR KNOWLEDGE GENERATION, TRANSMISSION THROUGH SOFT SKILLS DEVELOPMENT

Clara N. Olele & Arokoyu, A. A.

Department of Curriculum Studies & Educational Technology
University of Port-Harcourt, NIGERIA.

clara.olele@uniport.edu,ng; abosede.arokoyu@uniport.edu.ng

ABSTRACT

Information and Communication Technologies (ICTs) have brought so many changes in the way society conduct affairs. In the field of education, the changes associated with the use of ICTs are enormous. The pendulum swung from traditional to modern practices which ushered in newer approaches to knowledge generation, transmission, and sharing. Teachers' roles, students' roles, pedagogical approaches, and the tools for teaching and learning have changed tremendously, and will continue to change with the evolution of digital tools. All these changes demand for additional literacy skills referred to as the 7Cs. This paper begins by addressing six fundamental issues in 21st century education in relation to the 7Cs, which are mainly soft skills oriented. The issues are as follow: a discussion on the trend towards lifelong learning; the three global perspectives and roadmaps to 21st century education are recognized in identifying the clusters of skills that students need to live and work in the 21st century; using the 7Cs to engage students is imperative, hence, the detailed elaboration of the 7Cs with the activities associated with each component; it goes on to discuss 21st century pedagogies which can lead to the development of hard and soft skills simultaneously, moving students from lower-order-skills to higher-order-skills. It explores inquiry-based learning as a platform for developing 21st century skills for knowledge generation, sharing, and how ICT can enhance transformative pedagogical practices. The conclusion is that students should be exposed to 21st century skills development through inquiry-based learning in which research is embedded, as a way of infuses hard and soft skills, using real task in real time to solve real life problems in technology-rich learning environment.

Keywords: Literacies; transformative pedagogies; inquiry-based learning; soft skill; and knowledge generation.

Introduction

The ways in which the society make meaning and engage with each other are changing with the use of computer, the Internet, and social media. Students and teachers are now learning in different ways with Information Communication Technology (ICT) tools and processes. This implies that, the approaches to teaching have changed from teacher controlled 'transmission' model, through which teachers teach using lectures and textbooks, while students watch and listen passively; to 'constructivist' model, where students are actively engaged in the process of learning. To be able to effectively use digital tools and processes, students and teachers must possess 21st century digital literacies of technology, information and media. To be literate today requires the ability to use digital tools and interpret languages using various codes such as, 'icons, symbols, visuals, graphics, animation; be able to record audio and video messages' (Nallaya, 2010:48). Some users, for example, add emoticons to a message to communicate intended emotion by adding a smiley face to a funny comment. These literacy skills can enhance the integration of hard and soft skills simultaneously towards progressive knowledge creation (edorigami.wikispace.com>21st+century).

A combination of hard and soft skills drives the world. Hard skills are derived from various disciplines in form of academic content, technical and vocational skills; these skills enable one to secure employment and with experience, the skills mature over a period of time. Soft skills are intangible non-academic skills, such as ethics and moral, critical thinking and problem-solving, communication, intra-personal and inter-personal, team work, and leadership skills. These skills can be categorized into three major groups: intra-personal skills, inter-personal skills, and problem solving and decision making skills. Armed with these skills students' can interact harmoniously with other people in any given situation and context; hence it is said that hard and soft skills are tools for successful work and personal lives. Acquisition of these skills has implication for the approaches to teaching/ learning, and in the various ways teachers and students relate to others. It suggests teaching beyond the traditional practice which focuses on content and assessment, to learning how to use digital tools, skills; and life and career skills to transform contents as new knowledge to solve real life problems. The peak of this understanding is using inquiry-based activities which encompass research. Research is embedded in inquiry and the '7Cs super extra skills,' are embodied in this approach (Trilling and Fadel, 2009:176 - 177). The authors rearranged and condensed the key components of the 21st century skills, all beginning with letter 'C' representing:

The Seven Cs – 21st Century Lifelong learning Skills

   i.   Critical thinking and problem solving
   ii.   Creativity and innovation
   iii.   Collaboration, teamwork, and leadership
   iv.   Communications, information, and media literacy
   v.   Cross-cultural understanding
   vi.   Computing and ICT literacy
   vii.   Career and learning self-reliance.

These skills promote lifelong learning through active, exploratory, participatory, inquiry-based constructivist learning; which are mostly soft skills oriented. Table 1 shows a detailed analysis of the 7Cs the major skills required and the implications to students and teachers:

Table 1. Components of the 7Cs Lifelong Learning Skills

Seven Cs	Component Skills	Comments
Critical Thinking and Problem Solving	- Knowledge Acquisition - Knowledge Deepening - Knowledge Creation; - Identify and solve problems.	Using Bloom's instructional model to plan instruction to promote higher levels of thinking.
Creativity and innovation	- Think Creatively - Generate new knowledge - Use the knowledge generated to create products or services worth sharing.	Create a learning culture that values and promotes creative behaviours: risk-taking by trying new things.
Collaboration and teamwork	- Working in teams - Supporting each other - Heterogeneous group.	Intra-personal, inter-personal skills and social graces are key elements.
Communication	- Speaking clearly and directly, - listening attentively to	Communicate effectively in diverse environment

	understand, • Use verbal and non- verbal techniques, • Use technological devices to communicate.	
Cross-cultural understanding	• Work with people of different ages, gender, race, religion and political;	Accommodate people from diverse cultural, political, and religious background.
Information, media, and technology literacy	• Use computer, • The Internet, • Social media • Use other digital devices	Evaluate information; use and manage information.
Career and learning self-reliance.	Embrace lifelong learning culture, • Redefine career • Online etiquette must be observed.	Flexibility and adaptation are essential skills for learning, and learning-how –to- learn is key.

Educators of the 21st century are saying that students should construct knowledge through research- driven discovery learning using a combination of hard and soft skills. That teachers' should design learning experiences using approaches that can simultaneously embed hard and soft skills through the expanded super skills (3Rs, 4Cs and 3Cs). A breakdown of the 7Cs to get the 21st century skills gives the following formula in Table 2:

Table 2. Expanded Super Skills

3Rs x	4Cs Super Skills +	3Cs Super Extra Skills
Reading Writing Arithmetic (3Rs)	Critical thinking and problem solving Creativity and innovation Collaboration, teamwork, and leadership Communications, information, and media literacy	Cross-cultural understanding Computing and ICT literacy Career and learning self-reliance.

$$3Rs \; x \; (4Cs +3Cs) = 3Rs \; x \; 7Cs = 21^{st} \text{ Century Learning}$$

Source: Adapted from Trilling and Fadel (2009: 176).

Anderson (2010) presents all these skills as a paradigm shift from teaching and learning just content knowledge to embedding soft skills in teaching content knowledge through disciplines. Inquiry-based approaches to learning can serve the purpose of integrating soft skills into disciplines. It exposes students to 'learning-how-to-learn'. Students should be able to establish what is to be learnt, how learning will occur, which tools and resources will be required and in what ways, and how the learning will be assessed. This process will inevitably help students to understand and appreciate how to solve problems by browsing broadly to: search, identify, gather, evaluate, analyze, interpret, and finally reflecting on what they find to solve the problem. In doing this, they filter biases and compare with other works to differentiate between facts and opinion.

Transformative Pedagogies - Embedding Soft Skills in Teaching and Learning

There are three global frameworks for 21st century learning which show different roadmaps to education in information-knowledge-rich society:

The Organization for Economic Cooperation and Development (OECD) framework with three dimensions of the roadmap to education in the 21st century: Communication, Information, Ethics and Social impact (Eastern Europe Perspective) (Ananiadou & Claro, 2009).

Assessment and Teaching of 21st century skills (ATCS) with four dimensions of the roadmap to education in the 21st century: Ways of thinking, ways of working, tools for working, living in the world (British Perspective) (Griffin, McGraw & Care, 2012).

The Partnership for 21st century skills with four dimensions of the roadmap to education in the 21st century: Learning and innovation skills, Information media and technology skills, Life and career skills, 21st century themes (American Perspective) (http://www.p21.org).

The three frameworks established the contemporary guiding educational tenets showing the intersections among the frameworks, and how they align in different national contexts. The tenets are all soft skills oriented roadmaps on the direction of education in the 21st century. However, the frameworks did not suggest the possible pedagogies that can simultaneously infuse hard and soft skills at a go in any discipline. National Educational Technology Standards (NETS) framework, developed by the International Society for Technology in Education (ISTE) indicated what students, teachers, and administrators should know and be able to do with technology in education (International Society for Technology in Education (ISTE, 2009), but did not indicate the pedagogies for integration. A look at NETS-S gives an overview of the expectations of students in 21st century teaching and learning:

Table 3. National Educational Technology Standards for Teachers (NETS-S)

Standard	Description
Creativity and innovation	Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
Communication and collaboratio	Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of other.
Research and information fluenc	Students apply digital tools to gather, evaluate, and use information.
Critical thinking, and proble solving, and decision making.	Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
Digital citizenship	Students understand human, culture, and social issues related to technology and practice legal and ethical behavior.
Technology operation an concepts	Students demonstrate a sound understanding of technology concepts, systems, and operations.

Table 3 shows that the NETS-S closely aligns with the 4Cs and 7Cs of Tables 1and 2. This point to the critical skills or competences required for 21st century education; and the need to use strategies that could integration hard and soft skills in a single lesson, thus developing Lower-Order Thinking Skills (LOTS) and Higher-Order-Thinking Skills (HOTS) in stages – from simple to complex knowledge (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths, and Wittrock, 2001)

Simultaneously developing LOTS and HOTS would involve active engagement, exploration, and explanation, elaboration, and evaluation activities. This strategy exposes students to the science of learning-how-to-learn through research (Bransford, Brown, & Cocking, 2000; Donovan & Bransford, 2005). In line with these thoughts, Kivunja (2014) posited that many instructional models have been developed to scaffold constructivism whereby students use

problem-solving approaches to acquire new knowledge. Such inquiry-based activities can be run through case studies, group project, problem-based learning, and challenge-based learning. During such problem-solving process, the students work collaboratively; and for the students to solve the problem, they need to use the techniques of researchers or scientific method. These are open-ended learning environments   which require students to solve problems, which expose them to new information. In doing this, students:

i.   Identify the problem,
ii.   Ask significant questions
iii.   Gather information to find out what is already known and recorded on the problem, to establish the gap
iv.   Develop method for finding out more,
v.   Develop instrument for data collection,
vi.   Validate the instrument,
vii.   Establish the extent to which the instrument reliability,
viii.   Collect, analyze, and interpret data,
ix.   Draw conclusions or outline possible explanation,
x.   Create prediction for future studies.

This procedure is process-oriented and it involves active learning. Active learning engages students in two ways: doing something; and thinking about the thing they are doing. Examples of active learning are: experiential learning, discovery learning, and scientific inquiry. These are action-oriented processes. A good example of such a process is the 5E instructional model that was developed by Bybee, Taylor, Gardner, Scotter, Powell, Westbrook and Landes (2006). These authors postulate that to expose students to active learning and construction of knowledge, teachers should teach through the disciplines by giving students opportunities of generating new knowledge through exploration, engagement, elaboration, explanation, and evaluation (5Es) as means of discovering new information. These are pedagogies that will enable learners to develop 21st century skills through inquiry-based learning, a shift from traditional content learning, basic literacy skills, and regurgitation of factual knowledge to include the infusion of the 7Cs. However, these approaches require a high level of technology, information, and media literacies (Chu, Reynolds, Tavares, Notari, and Lee, 2017).

Incorporating ICT into Problem Solving

Problem solving encourages students to ask questions to investigate, discover, and create answers for themselves, rather than waiting for someone else to provide the answers for them. It helps the students to be more independent learners who believe they are capable of understanding quite complex issues and of discovering important new knowledge themselves. Problem solving is a teaching strategy that readily enables teachers to use computers as teaching tool in any subject. The Internet is particularly a valuable resource that can engage students actively in the process of gathering information; but the teacher should also expose students to how to evaluate such information. Students can use ICTs either as means of obtaining information relevant to the problem they are investigating or for processing and reporting the information that they generated. According to Killen (2010: 276), the highlights in the use of ICT for solving problems are as follows:

i.   Use Internet to locate information. Teach the students how to evaluate the information gathered;
ii.   Use word processors, databases and spreadsheets to store and manipulate data that were collected;
iii.   Use drawing presentation programmes, to present the results of investigations;
iv.   Work co-operatively with students from other schools or country, via the Internet;

    v.   Pose problems to real expert who can be contacted on the Internet. There are numerous 'Ask an Expert' sites available.

    vi.   Give guidance and assistance to students on how to use other people's works from the Internet.

    vii.   Encourage students to share the information they find and discuss the differences.

Social constructivism is grounded on the belief that students learn very well when given the opportunities to engage in authentic problem solving. This is process-oriented as students are active participants in knowledge construction in stages; which moves gradually from LOTS to HOTS. It also involves interactions with peers, experts, and teachers in social context which are all embedded in soft skill. Social interaction in all dimensions is the key element here. Such interactions could be individual or group-based upholding different dimensions of co-operations and collaborations. The 21st century is an age of collaboration and with the advent of collaboration tools such as wikis, social networking, classroom blogs, collaborative document tools, and learning management system, students and teachers can collaborate in the classroom and beyond.

Embracing Inquiry-Based Pedagogical Approach

Inquiry-based learning requires the teacher to adopt new approaches; which are student-centered approaches to teaching that have been advocated for in the sciences. The epitome of student-centered philosophy is that the teacher serves as a 'guide on the side' not a 'Sage on the stage'. It emphasizes self-regulated learning in that the responsibility for meaningful learning is on the student. The primary mode of teaching switches from lecturing to one of facilitator and co-learner. The roles of students also change from being passive recipient of information, reproducing knowledge, and learning in solitary activity to being active participant in the learning process, producing knowledge, and learning collaboratively with others. In addition, the tools for teaching and learning have also changed from text-based to ICT-based. With digital tools, students are active researchers, searching the web for information, communicating with e-mails, blogs, and social networking with teachers, peers, and experts in other places (Anderson, 2010; Morrison & Lowther, 2010; Global Cities Education Network, April 2012).

Initiating students into the use of inquiry-based learning activities which encourages scientific thinking comes in four (4) progressive levels from confirmation/verification, through structured inquiry, through guided inquiry learning to open inquiry-based learning (Banchi & Bell, 2008):

    i.   Confirmation/Verification – Give students a question, its answer and the method of reaching the answer. The goal is to build investigation and critical-thinking skills, learning how the specific method works.

    ii.   Structured Inquiry – Give students an open question and an investigation method. They must use the method and show evidence to back the conclusion.

    iii.   Guided Inquiry – Give students an open question. Typically in groups, in order to design investigation methods to reach a conclusion.

    iv.   Open Inquiry – Give students time frame and support. They choose their topic, set aim and objectives, pose the original questions, formulate hypothesis; review what had been done in that area to establish the gap that need to be filled; and then using their own design and procedure to find the solutions to the problem, and eventually present their results to discuss and expand.

This process is in stages with the aim of developing students' knowledge base through research in compliance to knowledge ladder based on Bloom's Taxonomy (Kozma, 2008).

The onus lies on the teacher to facilitate this growth by providing students' with appropriate knowledge and guidance required at every stage of inquiry process using ICT tools and processes to source for information, collaborate, and communicate with others independently.

Consuming and Producing Knowledge within Disciplines

Scholars consume knowledge in order to produce knowledge; hence the need to search for information from different sources. Information literacy is the ability to access information efficiently, effectively, and evaluate information critically and competently, to gain new knowledge, which can be used to produce creative and innovative products or services. This process becomes very important for students and teachers with the abundant information on the web. Through inquiry-based activities, student gain new knowledge which leads to development; and each discipline in every human endeavour is knowledge-based. Through disciplinary curriculum and instruction, students can learn how experts in different discipline articulate a problem, creatively address the problem, and communicate findings. To achieve these involves using many of the 21st century skills simultaneously with contents, to create new knowledge, and then communicate and distribute such knowledge. In inquiry-based learning students teach fellow students and teachers teach students how-to-learn on their own through activities that span through consuming and producing new knowledge via investigation within each discipline.

CONCLUSION

An attempt has been made in this paper to present the ways Information and Communication Technology (ICT) is transforming the world and education. This transformation is witnessing a number of tremendous changes taking place continuously. These changes manifest through a swing from traditional to modern innovative pedagogies to enhance knowledge generation, transmission, and sharing. This paradigm shift gives the students and teachers new roles; which embrace a shift away from teacher-centered, lecture oriented learning to student-centered, interactive and constructive learning environment. This makes it possible for students to become active researchers, browsing broadly for information to complete individual or group assignment and, communicating via e-mail, blogs, and social networking with peers, teachers, and experts across the globe. These changes are demanding for literacy skills (7Cs) which are soft skills oriented, in addition to the traditional literacy skills of 3Rs. This paper addressed compelling issues in 21st century education, mainly: 21st century skills development through inquiry-based learning towards lifelong learning. This represents a shift from traditional content and assessment learning to encompassing cross-cutting skills that span across disciplines, to include the 7Cs in technology-rich inquiry learning environment. In addition, the paper stresses the importance of developing hard and soft skills simultaneously as a way of moving students through knowledge ladder model, using inquiry-based strategies, to teach students the skills associated with knowledge generation, transmission, and sharing.

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