Emerging Communication Technologies in Science Education and Existing Issues of E-Compliance among Teachers

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ABSTRACT

ABSTRACT: Communication technology in this paper refers to the computer and internet facilities used to handle and communicate information for teaching and learning purposes. The world is growing at a very fast rate with regard to communication technology. As a result, teaching and learning have become digitalized, in order to make the art easier. Hence, the teacher could teach even when he/she has travelled out of station. This paper examined issues relating to emerging communication technologies in science education, e-compliance among science teachers, importance of ICTs, challenges and use of communication technologies in teaching. The study utilized the descriptive survey design. The participants were from higher institutions of learning {university} in Nigeria and were 204 in number. Purposive random sampling was used and a 16-point item questionnaire of yes/no was used. The reliability was established using Pearson product moment correlation coefficient and the index was 0.81 and simple percentage was used to analyze the data. Results show that significant number of respondents 88.7% are aware of ICT but only few accessed ICT 37.3%. some recommendations were made: ICT should be made compulsory for teaching staff in higher institutions, also an ICT policy commission should be set up to provide facilities and monitoring the proper usage,

KEY WORDS: Emerging Communication Technologies, E-compliance, Scie and science Education.

I. BACKGROUND

The quest for effective science education requires effective communication technologies. Many countries and education systems have tried to improve science education through reviewing educational policies and programs, infrastructure and teacher training. However, it is the teacher who decides when and what technologies to use or not in the classroom. Emerging technologies are technologies that are likely to have a large role on teaching, learning, or creative inquiry in learners and those technologies which are new and on the rise, Bolalek (2011). Sloan (2006) opined that emerging technologies represent a paradigm that at first grows on the edge in relative obscurity and often seems to be of no threat or even of little value to users of the sustaining technology. Developments in digital technologies especially web 2.0 tools such as blogs, wikis and several social media, and mobile devices such as phones and tablets, have given the end user, much more control over access to and the creation and sharing of information and knowledge. Emerging Communication technologies are useful in enhancing learning such as; presentation of slides reduce the time taken to explain a teaching material, it enables teachers to show fragments of educational and scientific films, tables, graphs, diagrams, animation of physical processes and experimental setups etc. The Federal Ministry of education has identifiedandemphasizedthe use of Information and Communications Technologies (ICT) asan import ant instructional tool with in schools across the country (F.R.N 2004),

In line with the significant educational reform efforts are being made to meet up with global trends. We can identify a number of advantages of using computer models. Projecting onto a large screen enables one to see a fine detail of elements of the devices. Due to the presence of the video you can "manage" time, stretching rapid processes or reducing stretched ones in time. For example, the study on diffusion of the molecules, warming or crystallization bodies and many other phenomena and processes.

The use of communication technology enables one to make any activity more visible, work with various information, such as sound, text, photos and video. However, some teachers overuse these opportunities, justifying it by the fact that a modern student is not inspired by narration and lectures alone. It is important to remember that information technologies should complement the material rather than replace it. Technology has changed beyond recognition, but the core values remain the same in education. Sometimes it seems that information technology brings to the educational process only positive things. Of course, in most cases it is true, but there are two sides of every coin. Every teacher should know and consider both sides. Unfortunately, some schools made up the practice of replacing a real physical experiment on virtual experiment. We should not forget that video demonstration should not be a substitute for the real experiment. Using a computer is permissible only in cases when it is in addition to experiments. Colorful illustrations and models should not overshadow experiments in physical science. After all, only work with devices give students necessary practice skills. Probably there is no such a teacher who does not understand that the use of the computer in a classroom is not just a fad. Obviously, the use of modern equipment, software, electronic educational resources helps one to conduct lessons more easily and make them more interesting. But one should not forget that the information technology is not a cure-all, but a good learning tool in the hands of a wise teacher. Their user should be thoughtful, reasonable and competent. Only the talent and skill of a teacher will find a middle ground in the use of information technology.

Emerging technologies refer to resources, artifacts, tools, concepts and innovations associated with digital, that have a disruptive potential to transform or generate changes in the processes where they are used, regardless of whether these are new or old technologies"(Sosa, Salinas, & De Benito, 2017). This definition implies two aspects, the first one, is that emerging technologies are contextualized; for example, from the perspective of those schools that have never used technology such as video, mobile applications, augmented reality, this type of technology is considered to be still emergent. On the contrary, it is not emergent for those schools that normally use these resources because students have already been in touch with them. The second aspect is that emerging technologies have a very general definition not only because they involve technological tools but also because they refer to innovations that can be made with the use of technology as an inverted classroom or gamification aiming to produce a radical change in the teaching and learning processes, Day and Schoemarker, (2000).

SOME EXAMPLES OF EMERGING COMMUNICATION TECHNOLOGIES IN THE CLASSROOM
Computerized Grading: Computerized grading is not new; indeed, educators have relied on computerized grading for years, beginning with the Scantron "bubble sheet" solution for multiple choice questions (Mark off 2013; Strauss 2013). Computerized grading of written, free-form short answers or essays has not yet been fully realized but is rapidly gaining attention as a new technology for education. Computerized grading applies the techniques of machine learning and artificial intelligence to determine statistically the probability that a human grader would give a particular grade to an essay (Mark off, 2013; Strauss 2013; winter halter, 2013; Cody, 2014). A software program does this by searching for aspects of writing such as the number of words, spelling, sentence structure, use of punctuation, average length of a word, average length of a sentence, accuracy of quotes against source material, etc. Computerized grading has received mixed reviews among educators, with headlines claiming that "Computer grading will destroy our schools" (Winter halter, 2013). The National Council of Teachers of English (NCTE) has released a position statement in strong opposition to computerized grading (NCTE 2013). An MIT researcher has even developed a software program, titled "Basic Automatic BS Essay Language Generator (BABEL)," that generates "babel" essays designed to intentionally "trick" grading programs (Cody, 2014). Proponents, however, argue that computerized grading will cut costs, provide faster student feedback, and standardize the grading process (Markoff 2013; Strauss 2013; Winter halter 2013; Cody, 2014).

E-Textbooks: E-textbooks offer the opportunity to enhance written text with hyperlinks to additional resources, including other textbooks or readings, videos, audio feeds, and slide presentations (Murray and Pérez 2011; Talancon and Lieu 2012; Greenfield 2013; PR Newswire 2014). Theoretically, e-textbooks could link students to real-world data sets or streaming sensor data and thereby empower students with data to explore graphical software packages, statistical tests, and other forms of data analysis. The goal of e-textbooks is to create a truly dynamic, interactive learning experience, in which students and teachers can simultaneously immerse themselves in the learning experience. E-textbooks provide greater portability at a reduced cost when compared to traditional paper textbooks, and their popularity has been growing, albeit somewhat slowly (Murray and Pérez 2011; Greenfield 2013; Jabr, 2013). In fact, students continue to prefer traditional paper textbooks over e-textbooks, even though they have adopted other forms of digital learning, such as online course materials and discussion forums. A significant drawback regarding e-textbooks is that publishers have not adopted a common

platform or standardized approaches to the creation of e-textbook material (Murray and Pérez, 2011). However, IBM is working with a Polish company, Wydawnictwa Cyfrowe LLC, to create a cloud-based solution to this challenge (PR Newswire, 2014), and other solutions are likely to emerge. In terms of effectiveness, early research found that paper textbooks are associated with significant learning advantages over e-textbooks, but recent research suggests that there is less of a difference in learning outcomes between the two types of textbooks. Clearly, additional research is required to fully compare electronic versus paper textbooks.

Simulation Technology : The use of simulation technology as a learning tool traces its roots to the urgent need to improve safety in the aviation industry (Sexton, et al. 2000). The premise underlying flight simulation is to create a realistic (but simulated) flying environment in order to safely train pilots. The idea dates back to the origins of modern airplanes, when pilots would be trained by sitting in the glider of a plane while facing strong winds, thus allowing the pilot to get a feel for the plane in a realistic setting. Modern flight simulation typically incorporates advanced technologies such as sensors and virtual reality displays to better simulate the "real" experience of flying, including any emergency situations that may arise. Simulation technology has since been adopted as an established training tool by the military and certain high-risk industries such as nuclear energy (Passiment, et al. 2011). Simulation technology is becoming more widely recognized as an important learning tool for several reasons (Damassa&Stiko 2010): It actively engages students in the learning processes and allows students to practice skills and apply knowledge; It provides flexibility in learning, with the option of slowing down (or speeding up) the learning process and/ or repeating lessons; It provides a "safe" environment for making mistakes, and: It allows students to engage in virtual situations that would otherwise be difficult, dangerous, or impossible to engage with.

Gamification: Game-based learning is not a new concept, and many educators routinely incorporate games into their lesson plans, particularly at the preschool and early elementary school levels. "Gamification" is a relatively new concept that was coined in the early 2000s by British IT expert Nick Pelling, but only recently has it become widely used (Smith, 2014). Gamification can be considered as a very specific type of simulation technology; it refers to the use of game theory and practices in the development of digital simulations for e-learning (i.e., game-informed learning) (Begg, et al. 2005; McClarty, et al. 2012; Buck 2013; Smith 2014). Gamification is based on the theory that students will be more engaged with the learning process and will ultimately achieve greater academic success if learning is based on gaming concepts such as competition, incentives, and goal attainment. Many e-learning games are available today; some of these are targeted for individual learners, but many are intended for teams, and some have options for either individuals or teams

Flipped Classrooms: The concepts of "flipped learning" and "Flipped Classrooms" arose circa 2007, when two high school teachers in Colorado, Jonathan Bergmann and Aaron Sams, realized that, for a very small investment in software ($50), they could record their classroom Microsoft® PowerPoint lectures and post them online for students who were absent the day they were taught (Tucker, 2012; Knewton, 2014). Much to their surprise, the online, freely available lectures became popular among both students who missed the lectures and those who wanted to refresh and reinforce the lesson plan. Thus, was born the concept of the Flipped Classroom, in which educators prepare online lectures and interactive lessons that students are required to review before coming to class, and class time is spent engaging in hands-on "homework," discussion, and other classroom activities. The model is such that the educator moves from "on-stage" lecturer to "on-the-side" tutor, thereby providing more personalized instruction; in this regard, flipped learning embraces several of the principles of "active learning. Educators, including those in higher education, are embracing the Flipped Classroom (Bogost 2013; Educause 2014; Yarbro 2014). This approach has even been implemented for large courses of more than 1,000 students. The Flipped Classroom faces several challenges, however. One such challenge is the development of short, but high-quality, online video content that is simultaneously engaging and informative—a challenge that, admittedly, is not new to educators but may be harder for them to achieve without sufficient training and time . Another challenge is that educators need training in how to best integrate the online and in-class instruction into their course curriculum. Critics argue that Flipped Classrooms are simply "condensed classrooms," which compress learning material into short pieces of summarized information that can be understood with little or no synthesis or critical thinking on the part of the student (Bogost 2013). Ironically, students also may rely strictly on the online preparatory lecture and skip the in-class activities (Educause 2014).

LEARNING MOBILE SYSTEMS (LMSs) :A variety of open source and commercial LMSs are available and designed to support all aspects of e-learning and the needs of all stakeholders, including students, educators/employers, administrators, and IT staff (Docebo 2014; Mindflash 2014; TrainingForce 2014). A typical LMS provides automated administration (including integration with human resource systems), calendar support, course design, document and curriculum management, student registration support, tracking of student

and organization progress, basic assessment and testing tools, synchronous collaboration tools such as webcasts, and a variety of other features, including training.Many LMSs are based on the Software-as-a-Service (SaaS) "cloud" model (Docebo 2014; Pappas 2014). The popularity of the SAAS LMS model is driven by three factors that have proven to be critical to educators and employers: 1. speed to implementation; 2. direct cost and resource savings; and 3. outsourced technical expertise. While more popular among industry learners than academics, SaaS LMSs currently account for more than 60% of the e-learning total market revenue (skill spark). A major drawback to LMSs is their high upfront costs, although those costs are decreasing (Docebo 2014; Training Force 2014). In addition, the LMS model tends to cater to industry and continuing education in the workplace rather than traditional higher education (Docebo 2014; mind flash 2014).

ELECTRONIC WHITEBOARD: Electronic white boards are very effective for group instructions. They are used for group presentations which enhance learning, and also students find it more compelling. Educators can use whiteboards to teach languages, social studies, science and mathematics. Electronic whiteboards are interactive such that a teacher can project a diagram from a laptop onto to the board and draw on it to help students understand quickly.

VIDOE CONFERENCING CLASSROOM TECHNOLOGIES: Through video conferencing, students on different geographical locations can attend to a lecture through online streaming. Video conferencing can be set up on Skype or google, and guest speaker can easily address the students. It can help reduce travel costs and time required to give speeches at different places.

CHALLENGES FACING THE USE OF EMERGING COMMUNICATION TECHNOLOGIES IN TEACHING IN NIGERIA
- Lack of adequate knowledge on emerging communication technologies by the teachers
- There are more students willing to be taught using emerging communication technology based approach than there are teachers to use it effectively.
- Lack of constant electricity
- Many schools are still not yet connected to electricity; Nigeria being a developing country, the government has not been able to connect all parts of the country to the national electricity grid.
- Fund: It is too expensive for teachers to afford and use emerging communication technologies in their day to day lessons.
- Lack of internet accessibility
- Not all schools in Nigeria has access to internet services as it requires subscription which is also very expensive.
- Inadequate infrastructure
- Many schools in Nigeria are having infrastructural problem, that is even if they have computers and other technology equipment that will support the use of emerging communication technologies where to keep it is a problem.

II.   PURPOSE OF THE STUDY
- The purpose of the study is to investigate the issues of teacher E-compliance to emerging technology

III.   RESEARCH QUESTIONS
The following research questions guided the study:
- What are the E-compliance level of teachers in science Education
- To what extent can teachers of science Education utilize available communication technologies
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IV.   METHODOLOGY
The study utilized the descriptive survey design. The participants were from higher institution (university) of learning particularly science Education department. The sample of the study was 204 teachers who were purposive randomly drawn. The instrument for data collection is a 16-item questionnaire of yes/No type. The instrument is called Teacher E-compliance and utilization assessment questionnaire (TECUAC) which was designed by the researchers and validated by three experts in science Education. The reliability was established using Pearson product moment correlation coefficient giving an index of 0.81. The statistics used to analyse the data was the simple percentage.

V. RESULTS
Table 1: Results from the questionnaire

S/NO	Statement	Responses	
		Yes	**No**
1.	I use communication technology to get information	28(13.7%)	176(86.27%)
2.	I use CT to enhance students' class	32(15.68%)	172(84.30%)
3.	I use CT to present lesson	18(8.82%)	186(91.15%)
4.	I use to enhance students' interest	15(7.35%)	189(92.64%)
5.	I CT to develop team-work among student	10(4.90%)	194((95%)
6.	I use CT to develop collaborative skills	10(4.90%)	194(95%)
7.	I have a computer	26(7.94%)	178(87.25%)
8.	I lack CT skills in wide range area	184(90.19%)	20(9.8%)
9.	Communication technology is intergraded in my teaching	08(3.92%)	196(96.09%)
10.	I have a laptop	39(19.11%)	165(80.88%)
11.	My institutions has projectors	101(49.51%)	103(50.50%)
12.	I understand the legal, ethical, cultural, issues related to CT	64(31.37%)	140(68.63%)
13.	I can use CT to process data and report results	40(19.6%)	164(80.39%)
14.	I can use a variety of media and formats to interact	34(16.67%)	170(83.33%)
15.	I am competent in trouble shooting common computer problems	60(29.41%)	144(70.59%)
16.	I can operate projectors	40(19.60%)	164(80.39%)

VI. DISCUSSION

- From the table, 181(88.7%) are aware of ICT while 23(11%) are not. 68(37.3%)lecturers accessed ICT while 136(66.7%) do not. Regarding the access: personal computer is 46(22.55%) while the ones provided by the school is 22(10.78%)and those who use ICT in teaching are 53(26%) while 151(74%) do not use ICT in teaching.
- The results revealed that significant number of respondants is fully aware of ICT but only insignificant number has accessed ICT in lesson delivery. ICT was found to be higher of personal capacity than provided by school.
- These results confirm the assertions by Singh and Chan (2014) and Zubairu and Olatoye (2015) and Ukpong (2016), that despite the good effects of computer on learning, most teachers are not putting it to use.

VII. CONCLUSION

The results shown from the study speaks volume that the objectives of ICT in Nigeria education system have not been achieved. It is not sufficient to put up policies but to implement them to the later.

VIII. RECOMMENDATION

Outlined below is some recommendation on the way emerging communication technology can be used to enhance science education.

- Serving science education teachers should be given the opportunity to be information communication literate through in-service education
- Government should ensure provision of ICT facilities in schools.

- Every school should have education technology center.
- ICT education should be compulsory in all schools
- Government ICT policy should be translated into reality.
- An ICT policy commission should be created that will be responsible for providing ICT facilities and monitor the use in the schools

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