Use of ICTs as Pre-Laboratory Activity for Chemistry Practical at Nigeria and Pakistan

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ABSTRACT

This survey research focused on the effect of ICT tools in Chemistry practical for manipulative and observational skills development. The population was Secondary school Chemistry teachers of Nigeria and Pakistan. Purposive random sampling technique was used to sample 180 Chemistry teachers from each country. Instruments used for data collection was teachers attitude scale questionnaire (TASQ). The questionnaire covered their attitude towards the use of ICTs tools: Simulations and modeling, CD-ROMS, data logging, teacher web publishing, word processing, data-base, E-mailing, Smart board, Internet, whiteboard as Pre-laboratory activities. Data was collected and analyzed by mean and standard deviation.. Findings revealed that ICTs are mostly used in science teaching but not practical's, whereas ICTs can be effectively used for Practical. In countries like Nigeria and Pakistan there is the need for support in the supply of computers and ICT tools, teachers training for computer skill acquisition and computers engineers for maintenances.

Keywords: Information and communication technologies (ICTs), Chemistry practical, students and teachers, Nigeria and Pakistan

INTRODUCTION

We are living in a constantly evolving digital world. The digital age has transformed the way young people communicate, network, seek help, access information and learn. The importance of students taking ownership of their learning, whether in the school or beyond, is a key component of their education (Sarwar et al., 2011). We must recognize that young people are now an online population and access is through a variety of means such as computers, TV and mobile phones. Such impacts of Information & Communication Technologies (ICTs) can be observed on nearly every aspect of our lives - from working to socializing, learning to playing.

Rodrigues (2010) declares that digital literacy is the ability for someone to use application software in a fashion way that enables the performance and accomplishment of a task. The influence of ICTs on students' motivation has become a strong motivator in education circle. For this reason as technology becomes more and more embedded in our culture, we must provide our learners with relevant and contemporary experiences that allow them to successfully engage with technology and prepare them for life after school.

Carla and Joab (2007) asserted that the inclusion of ICT in an educational framework is fundamental for a country's development through the broader education of its citizens and their ability to demonstrate flexibility and communication skills. Such education will enable them to become better integrated in a world that is constantly undergoing change.

Seyed and Safa(2009) supports that the use of information and communication technologies in teaching and learning environments provides good learning climates, attracts teachers and

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students interest and motivates them. However, social reality is changing rapidly. Teaching methodologies needs to be reviewed to meet this reality.

Rodrigues (2007) stated that much e-learning rhetoric in chemistry education has for many years eluded the notions of learners control, proactive learning or increased students engagement, motivation and e-learning tools have the potential to promote learning. Therefore, the high rate of the evolution of technology leads the educational systems to establish greater learning standards, according to the introduction of the new technology in the classroom. However, Introducing ICT in the teaching and learning process may change the isolated, teacher-centered and text-bound classrooms into the student-focused and interactive knowledge environment. Teaching used to be on blackboard and handful of tattered textbooks in some African schools, but now schools in Africa are going digital with encouraging results (WHO, 2012).

So, even some years ago it was hard to think that we can use the computer in Natural Sciences or Mathematics teaching process. Rogers and Fankyson (2003) observes, if ICT in science really work in the classroom. But, nowadays the introduction of virtual instrumentation in Geometry, Physics, Chemistry or Technology teaching becomes one of the usual methods. (Rodrigues, Pearce, and Livett, 2001) asserts, ICT represent an incontestable presence in the educational environment, hence improving the quality of education.

Beskeni (2010) agreed that the use of ICT in teaching process provides pupils with an active learning environment that will lead to an easier understanding of the Science concepts and these can be achieved using ICT hardware's such as computers, TV, Cameras and mobile phones. Information and communication technologies (ICTs) such as data loggers, the Internet, modeling, simulations, CD-ROMs and spreadsheets are commonly advocated for use in science classrooms (Brooks and Brooks, 1996; Rodrigues, 1996). They also pointed out that cost of data logging kits and the difficulty in programming for modeling is an impediment to the inclusion of these technologies in classroom practice. Similarly the cost, quality of access and the time to access relevant information has made Internet use within classroom time equally difficult.

The importance of students taking ownership of their learning, whether in the school or beyond, is a key component of their education. Most importantly, a successful education system refers to a system that can apply new information and communication technologies and employed trained experts. Students have prior knowledge before coming to learn science, so the teacher has to consider it for its teaching (Beskeni et al., 2010). Teachers have the responsibilities other than teaching and so are to prepare lab work accordingly for students (Yousuf et al., 2013). Nevertheless ICTs tools such as Simulations and modeling, CD-ROMS, data logging, teacher web publishing, word processing, data-base, E-mailing, Smart board, Internet, whiteboard could be used for pre- laboratory activities for acquisition of manipulative and observational skills (Beskeni, 2010).

OBJECTIVES

The objective of this research were:

1. To observe the use of ICTs in Chemistry practical by teachers at Nigeria and Pakistan.
2. To highlight teachers' perceptions on the effectiveness of ICTs in secondary Schools Chemistry practical as laboratory activity.
3. To identify the ways of improvements for the use of ICTs for Skill acquisitions in Chemistry practical.

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MATERIALS AND METHODS

Population

The population of the study was secondary school chemistry teachers at Nigeria and Pakistan.

Sampling

Purposive sampling technique was used to obtain a sample of 360 teachers and so 180 teachers from both countries were targeted from Secondary school Chemistry classes in Nigeria and Pakistan.

Methodology

This research paper is an extension to the research sponsored by UNESCO at University of Dundee, UK and covers limited aspects related to teachers' perceptions derived from original settings of:

a. Familiarization and application of various ICTs : Simulations and modeling, CD-ROMS, data logging, teacher web publishing, word processing, data-base, E-mailing, Smart board, Internet, whiteboard.

b. Development of questionnaire for Chemistry teachers and students in Nigeria and Pakistan: Teachers attitude scale questionnaire (TASQ).

Instrument for Data Collection

The instrument used for data collection was teacher's attitude scale questionnaire (TASQ) which covered demographic information of the teachers, ICT teaching experience, types of ICTs used, benefits of the ICTs use of ICTs for acquisition of Chemistry practical skills.

RESULTS

Table 1. Demographic information of respondents

		Nigeria	*Pakistan*
Gender	Male	60 %	50 %
	Female	40 %	50 %
Age Range		25-41 yrs.	25-45 yrs.
Qualification	B.Sc.	52 %	39 %
	M.Sc.	48 %	63 %
Experience	≤ 2 year	08 %	20 %
	up to 10 yrs.	53 %	66 %
	Above 10 yrs.	39 %	14 %
Average Students in Practical Class		30	35

The result shows that 60% respondents were males and 40% females, their age's ranges from 25years to 41 and above. Most of the respondents were holders of BSC (52%) and area of specialization was mostly Chemistry (56.7%).Their years of teaching experience ranges from

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less than 2years to more than 9years, the most participate were those greater than 5years and less than 9years (53%).While their years of teaching experience using ICTs differ, those with less than 2years were the highest with 86.1% and none is above 9years,but the least was greater than 5years and less than 9years(2.2%).Most of the respondents were teachers in government owned institutions(63.3%) others were private and others such as mission schools with 20% and 16.7% respectively. Whereas the number of students in class they teach ranges from less than 20 to above 60. 58.3% had 20-40 students and the least was 3.3% with above 60 students.

Table 2. Use of some ICTs by Chemistry teachers

Types	*Yes*				*No*			
	Nigeria	*%*	*Pakistan*	*%*	*Nigeria*	*%*	*Pakistan*	*%*
Simulations and Modeling	28	15.6	12	6.7	152	84.4	168	93.3
CD ROMs	10	5.6	93	51.7	170	94.4	87	48.3
Teachers web publishing	2	1.1	5	2.8	178	98.9	175	97.2
Words processing	46	25.6	98	54.4	134	74.4	82	45.6
Data logging	0	0	0	0	180	100	180	100
Database	5	2.8	8	4.4	175	97.2	172	95.6
Internet	58	32.2	107	59.4	122	67.8	73	40.6
Smart board/White board	17	9.4	105	58.3	163	90.6	75	41.7

Table 2 shows teachers use of ICTs. The highly used ICTs by Chemistry teachers at Nigeria was internet (32.2%) followed by word-processing (25.6%) and the least is data logging (0%). Whereas in Pakistan highly used ICTs by Chemistry teachers were internet (59.4%) followed by smart/white board (58.3%) and least the data logging (0%). Comparison also shows the significant difference in use of ICTs by teachers with greater intensity at Pakistan for CD ROMs, Words processing, Internet and Smart board/White boards. Teachers at both countries have never considered Data logging as a tool for Chemistry practical. Internet was highly used at both the countries but still a sufficient number of teachers at both the countries have negated such use of internet.

Table 3 depicts the perceived impacts of ICTs in teaching Chemistry practical. Greater mean score was reported by teachers at Pakistan as compared to teachers at Nigeria for the aspects of school having computerized modeling system and that by the use of ICTs students become contented, allowed repetition of experiments, can save laboratory resources, feeling good about its integration, technical problems as hindrance for its use and that having better understanding with it. Chemistry teachers at both countries don't consider the ICT teaching as time consuming. The teachers at Nigeria were found uncertain about having computer skills for ICT use whereas teachers at Pakistan negated for deficiency in such skill (mean score 1.98).

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Table 3. Perceived impacts of ICTs in teaching Chemistry Practical

Items	Nigeria		Pakistan	
	Mean	*SD*	*Mean*	*SD*
School has computerized modeling systems for practical's	2.06	25.89	2.80	21.55
ICT may provide incorrect information to students	2.45	23.21	2.05	12.58
I prefer traditional teaching than using ICTs	2.84	22.38	2.53	16.78
I do not have computer skills for that I cannot use ICTs	2.62	21.94	1.98	13.64
ICT teaching is time consuming	2.02	18.12	1.97	13.50
The use of ICTs adding pictures and animation makes a fun	2.39	23.07	2.38	14.39
ICT teaching makes students contented	2.55	25.77	3.41	24.62
Experimental skills cannot be gained using ICT teaching	2.06	18.38	2.27	14.09
Simulation exercise using ICT allowed repetition of experiments	2.54	26.06	3.10	21.87
ICT teaching saves a lot of laboratory resources	2.42	25.01	3.47	26.18
ICT teaching does not promote teacher-student, student-student interaction	2.17	19.15	3.52	27.06
I feel good about integrating ICT in teaching Chemistry Practical	2.15	22.58	3.30	23.60
Technical problems is an impediment to the use of ICT in teaching Chemistry Practical	2.52	26.30	3.47	25.28
Students understand Chemistry better using ICT teaching technique	2.25	20.50	3.05	20.19

Responses about How to Improve the Use of ICTs in Chemistry Practical

The suggestions given by Chemistry teachers at Nigeria and Pakistan are grouped into three: Firstly, majority at both the countries suggested that ICTs resources (internet bandwidth, computers and the ICTs Soft ware's) should be supplied to schools by the government. Secondly, sufficient numbers of respondents at both the countries opined that teachers should be trained and given incentives for encouragement and thirdly. Some of the respondents at Nigeria suggested that Computer experts/engineer's should also be in place to maintain the hardware and software for durability whereas at Pakistan such support was not recognized. Further the individual teacher's views on the use of ICTs in teaching Chemistry Practical had a favorable disposition or favorable attitude towards the issue at stake.

CONCLUSION

The findings show that there is great desire in teachers on the use of ICTs as pre-laboratory activities at Nigeria and Pakistan. The summed up benefits of ICTs use in Chemistry practical that ICTs can provide the pupils with an active preparatory environment for the real laboratory work which can lead to easy acquisition of manipulative and observational skills in Chemistry practical. However, there were impediments to the use of the ICTs as Inadequate supply of electricity, poor internet bandwidth, and inadequate supply of computing facilities, teachers' uneasiness to accept the technology. Also there is the need for teachers training for computer skill acquisition and computers engineers for maintenance, to be able to achieve effective capacity building for Industrialization. Nevertheless, if these

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impediments are considered and solutions provided this is a perfect method of pre-laboratory activities for acquisition of science process skills for effective industrialization.

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