



Emerging Teaching Techniques: Implications on Pre-service Teachers' Readiness to Integrate Information and Communication Technology in the Teaching of Basic Science

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Abstract

The study aimed at investigating the pre-service teachers' readiness to integrate Information and Communication Technology (ICT) into teaching and learning Basic Science. The population of the study was the total number of NCE Students present in 2017/2018 academic session at the School of Science, Aminu Saleh College of Education, Azare. The method employed in the selection of the sample was Stratified Proportionate Random sampling. A structured questionnaire tagged "Pre-service teachers' Readiness to integrate ICT into teaching Basic Science" was used in the data collection. Five point Likert scale was used to obtain the respondents opinions on their cognitive, operational and attitudinal readiness. The data collected were analyzed by using simple percentage and mean. The result of analysis indicates that the respondents' readiness and determination was favourable and encouraging across all the dimensions of readiness. The findings of this study showed that the pre-service teachers were found to be cognitively, operationally and attitudinally ready to integrate ICT into the teaching and learning of Basic Science. The analysis also indicates that the respondents were competent in articulating many multi-media devices. Based on the major findings, some recommendations were therefore given: Micro-teaching syllabi at teacher

training institutes should be reviewed to capture latest development in ICT into teaching. Teachers should be trained and retrained to match with current trends in teaching and for best global practices, among others.

Keywords: *Pre-service Teachers, Readiness, Integration, ICT Tools, Basic Science*

Introduction

Teaching and humanity have remained together since antiquity. While man grows to sustain, his conducts are concurrently guided by teaching. Teaching for man as a controller of his environment goes vis-à-vis with trending technology. Perhaps, the old age teaching techniques were crude expository and demonstrative types, which exposed followers to invocations, rhymes and body manipulations for rituals and rites.

Today, advancement in technology has vigorously brought a lot of impacts and changes in human endeavours. Specifically, at this age and time, teaching transforms from renowned chalk, pen, paper, and board approaches to electronic and interactive type. By implication, teacher's effort to teach Basic Science without integrating technology is highly likely to fail. This is because; time has come when students interact with internet every day and any information that was intended for them effectively may not reach them

for the mere fact that it was not passed electronically (Meiers, 2009).

Nigeria's government beliefs and is continuing on this spirit that education is the pivot for its transformation to become one of the economically giant nation (Federal Government of Nigeria, FGN, 2014). As a result of this, it has been investing huge amount of fund into this sector, primarily to ensure that, it matches with its contemporaries in all indices of development. Further, in pursuit to realize its vision in education, the country felt the importance of establishing computer classes in some selected secondary schools across the geo-political zones. This was of course started on the backdrop that students of this century are not interested in textual presentations all the times. They are rather attracted and impressed with multimedia presentations which are characterized with fascinating videos, slides, simulation software, computer games and other appealing learning activities (Linways, 2017).

The prime aim of education in every nation and of course Nigeria, is to produce individuals with potential to develop themselves and also the nation to the best of their ability (FGN, 2014). To achieve this particularly, students needed to be guided and encouraged to learn at a higher cognitive level, unfortunately, the reverse is the case in our educational institutions. Consequently this has led to the awful students' performance in Senior Secondary Certificate Examination (SSCE).

Several studies have proffered ways out of the woods. These include but not limited to adopting new methods of teaching (Akwara, 2017), engaging students into practical activities (Udofia & Udoh, 2017), assigning students to thought provoking assignments (Adesulu, 2014) among others. In support of this view ostensibly, Byrnes (2011) avers that students taught at higher cognitive level tend to retain facts for a very long term and consequently, exhibit higher performance in examination and other competencies. In yet subsequent perspective, Abdo & Viwanathappa (2016) corroborate the finding of Akwara (2017) that new teaching methodologies, which of course include inclusion of ICT into teaching, improve retention and promote students' achievement. Precisely, according to Abdo & Viwanathappa (2016), integration of Information and Communication Technology tools into teaching helps students to learn at higher cognitive level; implication for positive cognitive outcomes. Use of smart phones among Nigerian college students has become order of the day (Nwachuku & Onyenankaya, 2017). Although, the Nigerian students use smart phones for academic purposes, Mojaye (2015) reports that most often, students use it for other reasons. Invariably, Nigerians have spontaneously developed a culture of holding phones wherever they are purposely for keeping themselves current on issues related to sports, politics, education and others. Consequent to this, Nigerian students especially at Colleges of education and faculties of education in Universities are not much impressed by learning interaction, which is not electronically based. However, the syllabi for teacher training at colleges and universities have included some rudiment electronic approaches to teaching.

Abdo & Viwanathappa (2016) opined that the electronic contents are not adequate. Truly, Nigerian students are ICT compliant for the fact that, they manipulate smart phones, IPODS, IPAD and other devices for social networking, conducting assignments, educational chatting and other activities (Adeoye, Oluwole & Blessing, 2013). Nonetheless, Mojaye (2015) declares that, the students hold smart phones for either show up or expressing level of affluence. By the foregoing discourse, Magliaro & Ezeife (2017) reported that pre-service teachers are impressed and learn sufficiently by lesson presentations rich in electronic technologies. Consequently, these teachers adapt this teaching

innovation as a norm and thus, find it a best way to improve their pedagogical content knowledge and a reliable modality of teaching after graduation as well. This study investigated the pre-service teachers' readiness to integrate Information and Communication Technology in teaching Basic Science. Three research questions were formulated to guide the study. These were: what is the pre-service teachers' cognitive readiness towards integrating ICT into teaching Basic Science? What is the pre-service teachers' operational readiness towards integrating ICT into teaching Basic Science? What is the pre-service teachers' attitudinal readiness towards integrating ICT into teaching Basic Science? The design of the study was a descriptive survey.

The population of the study comprised of 1,200 students of School of Science (SOS), Aminu Saleh College of Education, Azare (ASCOEA), Bauchi State. The sample size of the study was 291 students as recommended by Krejcie and Morgan (1970). The sample was drawn from the three levels: 100, 200 and 300. The method used for sampling was stratified proportionate random sampling technique.as seen in the Table 1 below.

Table 1: The Composition of Students of the School of Science

Item	Level			Total
	100	200	300	
No. of Students	452	406	342	1,200
Proportion	0.377	0.338	0.285	1.000
No. Selected	110	98	83	291

Source: ASCOEA, Examinations and Records Unit, (2020)

The study employed a structured questionnaire tagged “Pre-service Teachers’ Readiness to Integrate ICT tools in Teaching Basic Science. The students were instructed to respond to the questionnaire item on a five point Likert scale, hence, they were asked to indicate their suitable opinion by ticking one of the followings: SA = Strongly Agree, A = Agree, D = Dis agree, SD = Strongly Dis agree, U = Undecided. Values assigned to the responses were: SA = 5, A = 4, U = 3, D = 2, and SD = 1. The decision rule for accepting an opinion as either agreeable or otherwise is average value of 3.00. Thus, responses of value range from 3.00 and above are considered to agree with the statement of the item. Equally, any response falls short of 3.00 is considered as a rejection to a item. The questionnaire used for the data collection was divided into three dimensions. These are cognitive, operational and attitudinal readiness. The questionnaire was validated by some experts in the field of Science Education. The validated questionnaire was later distributed to the sampled students for the purpose of expressing their opinions on the items of the instrument. Eventually, the data collected were analyzed by using descriptive statistics of percentages

and means. The rationale for the study was based on the Sociocultural Theory of Cognitive Development advanced by Vygotsky (as cited in Kurt, 2020).

Results and Discussion

The respondents as revealed by Table 2 were majorly males (60%) and were mostly within the age range of 20 to 24 years (56%). It also indicates that the respondents were sampled from the three levels of the School of science.

Table 2: Sex, Age and Levels of the Respondents

Sex		Age			Level		
Male	Female	20 – 24	25 – 29	30 and >	100	200	300
720	480	672	406	120	452	406	342
(60%)	(40%)	(56%)	(34%)	(10%)	(38%)	(34%)	(28%)

Source: ASCOEA, Examinations and Records Unit, (2020)

Table 3 presents the readiness dimensions of pre-service teachers towards integrating Information and Communication Technology in Teaching Basic Science. It is indicated from the table that the cognitive level of the subjects was very high in relation to the number of those who expressed their confidence in their understanding of basic and operational principles of many ICT tools. This is really encouraging and promising result from the prospective teachers. Their prowess in the transfer of information from one device to another, setting the ICT tools for effective teaching and of course, their knowledge on the working principles of teaching related tools is quite interesting as revealed by the responses.

Table 3: Opinions on Pre-service Teachers Readiness to Integrate Information and Communication Technology (ICT) in Teaching of Basic Science.

S/N	Statement	SA	A	U	D	SD
Cognitive Readiness						
1.	I understood the basic principles of major ICT tools.	186	87	12	6	0
2.	I understood the operational principles ajor ICT tools.	157	116	0	12	6
3.	I can apply computer skills in teaching Basic Science.	105	140	17	6	23
4.	I can transfer information from a computer to another one.	122	87	35	29	18
5.	I understood working principles of many multi-media devices	93	105	35	29	29
Operational Readiness						

6.	I can design power point for teaching Basic Science	192	58	12	17	12
7.	I can connect projector to a computer for teaching Basic Sci.	105	68	41	35	41
8.	I can browse information from internet to enrich Basic Science teaching.	116	111	18	23	23
9.	I can prepare lesson plan on micro-soft words.	87	99	41	35	29
10.	I can prepare score sheet on micro-soft excel.	134	58	23	47	29
Attitudinal Readiness						
11.	Learning computer related skills is relevant to teaching Basic Science.	93	140	29	6	23
12.	ICT tools improve learning of Basic Science.	145	105	23	6	12
13.	ICT tools ease learning of difficult concept in Basic Science.	76	157	23	18	17
14.	ICT tools facilitate students'-centred approach.	163	81	18	12	17
15.	ICT tools help in understanding scientific abstract concepts.	134	99	12	23	23
16.	I'm proud to be ICT literate teacher.	105	87	52	6	41

The table also shows that majority of the respondents were adept in micro-soft power point, micro-soft word, micro-soft excel for the preparation of lesson plan, projecting soft copies of lessons, and preparation of assessment scores on micro-soft excel respectively. It also indicates the teachers' competency in sourcing relevant information from internet for lesson enrichment.

Table 4: Mean scores of Pre-service Teachers' Cognitive Readiness to Integrate Information and Communication Technology (ICT) in Teaching of Basic Science.

S/N	Statement on Cognitive Readiness	Total responses	Mean	Interpretation
1.	I understood the basic principles of major ICT tools.	1326	4.6	Agreed
2.	I understood the operational principles of major ICT tools.	1279	4.4	Agreed
3.	I can apply computer skills in teaching Basic Science.	1171	4.0	Agreed
4.	I can transfer information from a computer to another one.	1139	3.9	Agreed

5.	I understood working principles of many multi-media devices	1077	3.7	Agreed
Aggregate mean score			4.1	

Table 5: Mean scores of Pre-service Teachers' Operational Readiness to Integrate Information and Communication Technology (ICT) in Teaching of Basic Science.

S/N	Statement on Operational Readiness	Total responses	Mean	Interpretation
1.	I can design power point for teaching Basic Science.	1274	4.4	Agreed
2.	I can connect projector to a computer for teaching Basic Science	1035	3.6	Agreed
3.	I can browse information from internet to enrich Basic Science teaching.	1147	3.9	Agreed
4.	I can prepare lesson plan using micro-soft word.	1053	3.6	Agreed
5.	I can prepare score sheet on micro-soft excel.	1094	3.8	Agreed
Aggregate mean score			3.9	

Table 6: Mean scores of Pre-service Teachers' Attitudinal Readiness to Integrate Information and Communication Technology (ICT) in Teaching of Basic Science.

S/N	Statement on Attitudinal Readiness	Total responses	Mean	Interpretation
1.	Learning computer related skills is relevant to teaching Basic Science.	1147	3.9	Agreed
2.	ICT tools improve learning of Basic Science.	1238	4.3	Agreed
3.	ICT tools ease learning of difficult concept in Basic Science.	1130	3.9	Agreed
4.	ICT tools facilitate students'-centered approach.	1234	4.2	Agreed
5.	ICT tools help in understanding scientific abstract concepts.	1171	4.0	Agreed

6.	I'm proud to be ICT literate teacher.	1082	3.7	Agreed
Aggregate mean score			4.0	

The aggregate mean scores from the respondents' opinions (Table 4, 5 and 6) provides a support to argue that the pre-service teachers' attitude towards integrating ICT devices into teaching Basic Science was very high. In other words, the teachers' belief in incorporating ICT skills into teaching is timely and that ICT devices facilitate and improve learning of science. This finding is in disagreement with the submission of Mojaye (2015) who declares that Nigerian students hold smart phones for either show up or expressing level of affluence. The scores also established that students possessed the ability to construct their knowledge through interaction with electronic facilities. Those scientific concepts, which appear abstract and difficult, can now be concretized and simplified through use of teaching technology.

The Tables 4, 5 and 6 also reveal that the pre-service teachers were more cognitively ready to incorporate the modern teaching technologies (ICTs) than their readiness to operate ICTs and make it an attitude to employ the use of such technologies in teaching Basic Science. By implication, the teachers might have adequate knowledge on ICTs as well as the ability to operate the devices, but may not always make it a habit to use them in teaching their subjects.

Further, the result of data analysis shows that the pre-service teachers' were confident in expressing their understanding of basic and operational principles of variety of related information and communication devices. This finding is in conformity with the report of Molnar (2008) who stated that some of the facilities used in teaching generally include laptops, interactive boards, video projectors, IPAD, IPOD, digital camera, web camera and array of related gadgets. Additionally, the analysis indicates that the teachers were anxious to synchronize ICT devices for effective teaching when they are opportune. Their zeal to participate in such activities may not be unrelated to the experience they derived from the microteaching laboratories as mandated by FGN (2012) that, prospective NCE teachers are to be provided with plethora of opportunities to interact and understand the basic and operational principles of the major ICT related teaching devices. Moreover, the analysis reveals that the prospective teachers were skillful in the articulating micro-soft word, power point and excel. They were also found good in demonstrating competence in surfing related facts from internet to enrich and make their presentations very impressive and appealing. The attitudes of the respondents were also proved to be very high with regards to integration of ICT tools. This result indeed concurs with the report of Bagon and Vodopidea (2016) who reveal that as teachers gradually interact with ICT facilities, their spirit towards integration is similarly elevating.

Conclusion

In a nutshell, the results of the study has indeed established that Pre-service Teachers are cognitively, operationally and attitudinally ready to integrate ICT into the teaching of Basic Science. This may be a testimony of the impact of the fact that, the knowledge they acquired from micro-teaching teaching laboratories, and of course, through their daily use of electronic multi-media has now become part of their interactive skills.

Recommendations

Based on the results of analysis, the following recommendations were given:

1. Regulatory bodies of the universities and colleges of education should review microteaching syllabi and further enrich them with latest teaching technologies for the purpose of keeping our products abreast and equal to the tasks of 21st Century teaching demands.
2. Teacher training institutes should encourage students to undertake projects on integration of technology into teaching science.
3. Relevant bodies, as such, Nigerian Information Technology Development Agency (NITDA) should organize seminars and workshops for teachers of teacher training institutes on technology integration into teaching for capacity building and attitudinal change.
4. Collaborative efforts should be made by governments at various levels and stakeholders to provide relevant multi-media facilities for effective and reliable training and retraining of prospective and in-service teachers respectively.
5. Take home pay of teachers should be peculiar in term of basic and other allowances. Impliedly, if teachers' salary is improved, they will be relaxed and develop desire to own facilities that they will facilitate and improve their teaching delivery.

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