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To Link this Article: http://dx.doi.org/10.6007/IJARPED/v7-i3/4429 DOI: 10.6007/IJARPED/v7-i3/4429

Received: *03 June 2018,* ***Revised:*** *18 June 2018,* ***Accepted:*** *28 July 2018*

Published Online: 15 August 2018

In-Text Citation: (Francisca & Samsudin, 2018)

To Cite this Article: Francisca, A. D., & Samsudin, S. (2018). Are Biology Pre-service Teachers ready to Implement 21st Century Skill in Teaching and Learning in Nigeria? *International Journal of Academic Research in Progressive Education and Development*, *7*(3), 414–423.

Vol. 7, No. 3, July 2018, Pg. 414 - 423

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Are Biology Pre-service Teachers Ready to Implement 21st Century Skill in Teaching and Learning in Nigeria?

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Abstract
The 21st century skills are important aspect of education in our present age. Numerous benefits of incorporating skill such as Information and Communication Technology (ICT) in education have been unearthed, therefore, ICT should be widely used in teaching and learning (TnL) processes. However, in order to use this skill in teaching, teachers have to possess certain level of readiness in terms of confidence; awareness and motivation; perception, training; knowledge and equipment. In relation to that, this study identified how ready the Biology pre-service teachers in Kaduna State, Nigeria are to implement the use of ICT in their teaching and if gender affect their level of readiness. The respondents comprised of 123 Biology pre-service teachers in two higher institutions in Nigeria. They were all final year students in the teacher education program (Bsc. Ed. Biology). Their readiness was assessed using questionnaire with four-point Likert scale. Descriptive statistics was implored to analyze data. Findings showed that Nigerian biology pre-service teachers were ready to implement ICT skill in TnL in terms of confidence, awareness and motivation, perception, knowledge and training but not ready in terms of equipment. Findings also showed that there was no significant difference between male and female biology pre-service teachers' readiness to implement ICT skill in TnL processes. The study serves as a foundation for further studies to be conducted in other fields and on readiness of Nigerian pre-service teachers to implement other 21st century skills.

Keywords: *Pre-service teachers, 21st century skill, ICT, Teaching and Learning, Readiness*

Introduction

The inception of the innovation-driven age, also known as the digital age, has led to a drastic technological revolution. The scientific and technological innovations have accelerated the practices of teaching and learning (TnL) through diversity of resources and technology, thereby, has also placed enormous demands on students to get ready proficiently for their future work, career and life (Tufail & Malik, 2016). Voogt and Pareja (2010) commented that economic and

societal changes are the major factors that have geared the recent developments in technology and therefore the requirements for successful jobs and the home environment seem to be regarded as the most important drivers of needs for 21st century skills (Voogt & Pareja Roblin, 2010).

The onset of this age is characterized by digital revolution. Technology has brought about ultra-transformation in the people's lifestyle across the globe, including education (Ismail, Bokhare, Azizan, & Azman, 2013). A characteristic feature of the 21st century system is the ease it has led to in education. With the industrial revolution 4.0 for instance, Information and Communication Technology (ICT) tool as portable as smart phones could make it possible for examinations to be taken online by students in the comfort of their homes. More so, the workforce can have virtual companions on smart phones with latest applications. ICT skill as a key component of the 21st century stimulates creativity which is the cornerstone behind these advancements (Henriksen, 2016).

From previous studies, it is confirmed that educators saw the urgent need to reevaluate the techniques, materials and methods of TnL. Hence, they advocated that that the use of instructional systems that is reinforced by technology is essential for meaningful learning to take place (Gambari et al., 2014). If Nigeria as a nation must participate actively in the dynamics of the 21st century economy, the country must give considerable attention to better instructional strategies and resources which include the use of ICT because the present-day learners are digital natives who are used to technological devices (Yaki and Babagana, 2016).

The repercussion of neglecting the use of ICT in the TnL of biology in Nigerian education is that the students' understanding as well as academic performance may never improve, and the country may have deficiencies of manpower in science and technology-related fields hence affect Nigeria's dream to be part of the twenty technologically advanced nations in the world by year 2020 (Gambari et al., 2014).

Although, there is a considerable level of awareness of the relevance of ICT amongst researchers, however, there is a need to know if teachers are ready to involve new approaches and materials in TnL as the 21st century students can only acquire the 21st century skills if they are facilitated by 21st century teachers. But then, research focusing on the pre-service teachers in Nigeria is still rare. To the knowledge of the researcher there was no study conducted on the biology pre-service teachers' readiness to implement the use of ICT as a 21st century skill in TnL in Nigeria. Thus, the study aimed to contribute greatly with significant findings.

Certain factors that hinders teachers' readiness to use ICT in Nigerian Secondary Schools includes; lack of expertise with ICT, insufficient knowledge of appropriate software, insufficient knowledge of how to use ICT equipment, and lack of confidence in using ICT (Tella, Toyobo, Adika, & Adewuyi, 2007). Lack of training and equipment as well as poor perception about the use of ICT in TnL could also hamper the readiness of teachers to implement it in their teaching. More so, there has been contradictions amongst researchers on the manner in which male and female students approach the use of skills. Some confirmed that male students tend to be better in the

use of ICT than their female counterparts (Bakar & Mohamed, 2008; Morreale, Staley, Stavrositu, & Krakowiak, 2015) whereas, other studies opposed that gender has no impact on the acquisition and manipulation of skills (Yusuf and Afolabi, 2010; Yaki and Babagana, 2016).

Teacher education has been confronted by an urgent need to boost the new teachers' capacity to implement new teaching methods and make use of ICT for TnL as it is considered to be an influential medium for generating lasting transformation (Henriksen et al., 2016). With respect to this, pre-service teachers need to be ready to be able to use the new learning system in their TnL. On this basis, this study investigated the readiness of Nigerian biology pre-service teachers to use ICT in their teaching career. The study used two research questions as a guide:

1. What is the level of readiness of biology pre-service teachers to implement ICT skill in TnL?
2. What is the difference between the readiness of male and female biology pre-service teachers in implementing ICT skill in TnL?

Methodology

The study employed quantitative survey approach as a method for data collection. The participants in the study included 123 biology education final year students (2016/2017 academic session) selected purposefully from two higher institutions in Kaduna state, Nigeria. The sample size comprised of 59 males and 64 females. The involvement of the pre-service teachers in the study was strictly voluntary and they were assured confidentiality of their responses to the questionnaire.

Instrumentation

A survey instrument constituting two sections was used for data collection. The first section of the questionnaire focused on demographic information, gender. The second section consisted of four-point Likert-type questions to solicit information on participants' readiness to implement ICT skill in terms of their confidence to involve the use of ICT in TnL processes, awareness and motivation on use of ICT in TnL, perception about ICT, ICT training, knowledge on how to use ICT in TnL and ICT equipment personally owned. The questionnaire was pilot-tested to check the reliability and to confirm whether it was understandable for the target population. The validity was established by experts in the field and reliability estimate as ascertained using Cronbach Alpha was 0.95. The final version of the questionnaire was sent to the pre-service teachers. Table 1 presents the description of the Likert-scale used in the study.

Table 1
Description of Likert-scale

Scale	Description	Mean range	Interpretation
4	Strongly Agree	3.50 – 4.00	Very ready
3	Agree	2.50 – 3.49	Ready
2	Disagree	1.51 – 2.49	Not ready

1	Strongly Disagree	1.0 – 1.50	Not ready at all

Data Analysis

The Statistical Package for the Social Sciences (SPSS version 23) was used for data analysis. The statistical tools used for the study include; frequencies, percentages, means, standard deviation and t-tests. Descriptive statistics was used to answer the first research questions and t-test was used to answer the second research question.

Results and discussion

This section reports the findings obtained from the study based on the two research questions, beginning with the descriptive statistics about the Nigerian pre-teachers' readiness to implement ICT skill in TnL. The second section focus on the t-test result about the difference between gender and readiness to implement ICT skill in TnL.

Readiness to implement ICT skill in TnL

There were six constructs used to measure the level of readiness of pre-service teachers to implement ICT skill in their TnL. The constructs included confidence (6 items), awareness and motivation (7 items), Perception (6 items), training (3 items), knowledge (4 items), and equipment (4 items). The biology pre-service teachers were asked to indicate their level of agreement or disagreement regarding the questionnaire statements.

a) Confidence for ICT skill

According to the result of the analysis, it was found that all the six items in the confidence sub-construct were statistically significant. Table 2 revealed that the pre-service teachers can use ICT effectively in teaching. However, most do not to feel very confident in using multimedia for teaching. The average mean score for the items was M=3.08.

Table 2
Confidence to implement ICT skill in teaching and learning

Confidence ICT Items	M	SD
I can use ICT effectively in teaching.	3.13	0.85
I have the confidence to integrate ICT in my teaching.	3.11	0.60
I am able to design learning experience using ICT.	3.04	0.76
I feel very confident in using multimedia for teaching.	3.04	0.74
I am able to motivate students to use ICT in learning.	3.11	0.77
I have the skills to teach using ICT.	3.08	0.76
Average	**3.08**	**0.74**

b) Awareness and Motivation about ICT

Likewise, Table 3 revealed that the sub-construct of awareness and motivation was statistically significant. The Use of ICT in education is not something new to the respondents and they know that ICT helps to facilitate the teaching and learning process. The average mean score for all the items was M=3.28.

Table 3
Awareness and motivation about implement ICT skill in teaching and learning.

Awareness and Motivation ICT Items	M	SD
I am willing to try new method in teaching and learning.	3.29	0.83
Use of ICT in education is not something new to me.	3.18	0.76
ICT helps to facilitate the teaching and learning process.	3.51	0.60
Educational technology helps to save time, energy and money.	3.22	0.81
With the use of technology, students will not feel boring in classroom.	3.31	0.77
Technology usage helps to entertain and gather interests from students.	3.32	0.63
With the use of technology, a learning concept can be viewed wholly.	3.24	0.71
Average	**3.29**	**0.73**

c) Perception about ICT skill

The result in Table 4 revealed that the sub-construct of perception was statistically significant. The respondents perceived that ICT can improve teaching and learning processes and that ICT tends to increase learning motivation. The average mean for the six items was M=3.23.

Table 4
Perception about ICT skill in teaching and learning

Perception about ICT Items	M	SD
ICT can improve teaching and learning processes.	3.38	0.67
ICT can enhance students' critical thinking skills.	3.38	0.63
ICT can enhance students' participation, and feedback to teachers.	3.15	0.82
ICT can enhance collaboration among students.	3.13	0.83
ICT can enhance teacher and student interaction.	3.24	0.66
ICT tends to increase learning motivation.	3.10	0.77
Average mean	**3.23**	**0.73**

d) Training on ICT

The result presented in Table 5 disclosed that the training sub-construct was statistically significant. The table showed that the biology pre-service teachers have offered a course on educational technology but only a few attend trainings on the latest trends and applications of ICT. The items had an average mean of M=2.84.

Table 5
Training on ICT skill

Training ICT Items	M	SD

I attend trainings to develop my skills in ICT.	2.79	0.90
I attend trainings on the latest trends and applications of ICT.	2.55	0.87
I offered a course on educational technology.	3.17	0.77
Average mean	**2.84**	**0.85**

e) Knowledge about ICT

The result in Table 6 showed that the respondents know the basic concepts and functions of computer and communication technologies and some of them can use Microsoft excel effectively. The average mean for the four items was M=3.03.

Table 6
Knowledge about ICT

Knowledge ICT Items	M	SD
I know the basic concepts and functions of computer and communication technologies.	3.28	0.60
I can use Microsoft word effectively.	3.07	0.84
I can prepare PowerPoint presentations effectively.	2.93	0.85
I can use Microsoft excel effectively.	2.84	0.89
Average mean	**3.03**	**0.79**

f) Equipment on ICT

Lastly, Table 7 revealed that majority of the respondents do not have access to printer at home. Although, most of them have access to internet at home. The average mean values for the four items was M=2.44.

Table 7
Equipment on ICT

Equipment ICT Items	M	SD
I own a personal computer or laptop.	2.62	0.92
I have access to printer at home.	1.93	0.76
I have access to scanner at home.	2.31	0.94
I have access to internet at home.	2.89	0.83
Average mean	**2.45**	**0.86**

Difference between the readiness of male and female biology pre-service teachers in implementing the ICT skill in TnL

The analysis presented in table 8 revealed that there was no statistical significant difference between the level of readiness of male and female in terms of confidence, awareness and motivation, perception, training, knowledge and equipment. The table showed that the mean for male respondents were higher than the mean for the female respondents.

Table 8
Readiness to implement ICT skill in teaching and learning according to gender

Sub-construct	Gender	*M*	*SD*	*t-value*	*P*
ICT Confidence	Male	18.59	2.65	.299	.766
	Female	18.42	3.59		
ICT Awareness and motivation	Male	19.98	2.14	.636	.526
	Female	19.69	2.92		
ICT Perception	Male	19.71	2.15	1.262	.209
	Female	19.08	3.26		
ICT Training	Male	8.76	1.96	1.461	.147
	Female	8.28	1.69		
ICT Knowledge	Male	12.19	2.29	.303	.762
	Female	12.05	2.77		
ICT Equipment	Male	9.81	2.64	.250	.803
	Female	9.70	2.24		

*Significant at $p < 0.05$

Discussion and Conclusions

From the mean scores, it was concluded that the biology pre-service teachers were ready in terms of their confidence to implement ICT skill in their TnL. This mean score is lower than the level of readiness in the result of Bakar and Mohamed, (2008). After spending at least three years in the teacher education program, it is expected that the mean score should be at least 3.50 rather than 3.08. Nevertheless, such mean score was not the gotten. It could be as a result of the pre-service teachers do not have much experience on how to integrate ICT in teaching despite having ICT skills. It could also be that they do not how to integrate ICT in teaching, or perhaps, teacher educators themselves do not use ICT in teaching (Bakar and Mohammed, 2008).

The awareness and motivation of the biology pre-service teachers as summarized in Table 3 showed that generally, the respondents were aware and motivated to implement ICT skill in their TnL process. This result corresponded with that of Ismail et al, (2013). Also, from the perception items in Table 4, the biology pre-service teachers possessed a considerably high level of perception about implementing ICT skill in TnL. Relatedness of the result of this study was found in earlier studies by Buabeng-Andoh, (2012) on teachers' perception to teach with ICT.

From the analysis summarized in Table 5, it was inferred that the respondents were ready to the training sub-construct. This mean score is slightly higher than the mean score of attendance of in-service to seminar-workshops on the latest trends and applications of ICT by De

Castro et al, (2016). This mean score could be as a result of unwillingness to attend trainings on latest trends and applications of technology to increase their ICT skills as oppose the findings of Ismail et al, (2012). The results also showed that biology pre-service teachers were ready in their ICT knowledge. The average for the four items was similar to the findings of Lau and Sim (2008) and Buabeng-Andoh, (2012) that more respondents were more competent in word processor than on other application.

Lastly, the results of the items associated with equipment readiness sub-construct showed that the biology pre-service teachers were not ready (Table 7). Despite the fact that majority of them have access to internet at home. This finding was an opposite of the findings of De Castro et al., (2016) which showed that more teachers have personal computer or laptop than access to internet at home. Hoseanto, Tobing, & Widiatmika, (2008) opined that for a teacher to implement the ICT skills in teaching and learning, access to ICT equipment is necessary.
The readiness to implement ICT skill in TnL was observed across gender, which gives a picture that there is no variation within the genders. In general, from the result of this study (Table 8), there was no statistical significant difference between the level of readiness of male and female pre-service teachers to implement ICT skill in TnL. This is in agreement with Bakar & Mohamed, 2008; Morreale et al, 2015. Corresponding to Ismail et al, (2013), although the male had mean values slightly higher than the female, the difference between them was insignificant.

From the result of the study, it was recommended that the government should aim at improving ICT infrastructure for Nigerian teacher education institutions, gadget for teachers and students in SSS. This would doubtlessly encourage the involvement of ICT skill in the TnL processes both within the school and outside the school. Training for both pre-service teachers and in-service teachers (to get adapted to the revolution) on the effective usage of ICT tools that could lead to meaningful learning should be organized by school administrators to improve 21st century skills like ICT skill which they would in turn inculcate into the students. Training should focus on how to use specific applications in TnL processes instead of general use of computers. In addition, training should be provided on the use of ICT software other than simple word processing to improve their level of readiness.

Limitations and Future Research

Due to the quite small sample size, a wider generalization from the data is hard to make. Other than that, this research only focused biology pre-service teachers in Kaduna state higher institutions of learning. Therefore, more research need to be carried out on bigger sample size and pre-service teachers in other fields of study. In-service teachers' readiness could also be a relevant aspect to study upon. Also, gender was the only demographic profiles assessed in this study. Other factors, such as age, marital status, prior experience with technology, and personality type should be taken into taken into account for future research.

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