DETERMINATION OF BIOLOGY PRE-SERVICE TEACHERS' READINESS TO IMPLEMENT ICT SKILLS AND COLLABORATION ACTIVITIES IN TEACHING AND LEARNING IN KADUNA STATE NIGERIA

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ABSTRACT

This study investigated the readiness of Nigerian biology pre-service teachers to implement 21st century skills specifically ICT skill and collaboration activities in teaching and learning (TnL). The respondents comprised of 123 Biology pre-service teachers in two higher institutions in Kaduna state, Nigeria. Their readiness was assessed using questionnaire with four-point Likert scale and interview sessions. The validity of the questionnaire was approved and the Cronbach's alpha reliability coefficient was 0.95. Descriptive statistics, ANOVA and correlation was used to analyze quantitative data while responses from the interview sessions were described by grouping and explaining the pre-determined themes. Findings showed that Nigerian biology pre-service teachers are ready to implement ICT skill in TnL in terms of confidence, awareness and motivation, perception, knowledge and training. However, they were not ready in terms of ICT equipment. Findings also showed that equipment were required if they must conduct collaboration activities effectively in their TnL. There was no statisical significant difference between male and female biology pre-service teachers to implement ICT skill and collaboration activities. Positive significant correlation existed between their readiness to implement ICT skill and collaboration activities. In conclusion, findings from this study offered hopeful suggestions and clues that biology pre-service teachers were ready in terms of their confidence, awareness and motivation, perception, knowledge and training to implement ICT skill and collaboration activities in their 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.

PENENTUAN KESEDIAAN GURU PRA-PERKHIDMATAN BIOLOGI TERHADAP PELAKSANAAN KEMAHIRAN ICT DAN AKTIVITI KERJASAMA DALAM PENGAJARAN DAN PEMBELAJARAN DI NEGERI KADUNA, NIGERIA

ABSTRAK

Kajian ini bertujuan menentukan kesediaan guru pra-perkhidmatan biologi di Nigeria untuk melaksanakan kemahiran abad ke-21 bagi kemahiran ICT dan aktiviti kolaborasi dalam pengajaran dan pembelajaran (PdP). Pendekatan kuantitatif dengan kaedah tinjauan digunakan dalam kajian ini yang melibatkan 123 orang guru pra-perkhidmatan Biologi di dua institusi pengajian tinggi di negeri Kaduna, Nigeria. Kesediaan guru pra-perkhidmatan Biologi dinilai dengan menggunakan skala Likert empat mata dan protokol temu bual. Kesahan borang soal selidik telah diperakukan dengan pekali kebolehpercayaan *Cronbach alpha* 0.95. Analisis statistik deskriptif, ANOVA dan korelasi digunakan untuk menganalisis data kuantitatif sementara sesi temu bual dilakukan bagi menerangkan tema kajian yang telah ditetapkan. Hasil dapatan menunjukkan bahawa guru pra-perkhidmatan biologi di Nigeria bersedia untuk melaksanakan kemahiran ICT dalam PdP dari segi keyakinan, kesedaran dan motivasi, persepsi, pengetahuan dan latihan. Walau bagaimanapun, guru pra-perkhidmatan Biologi tidak bersedia dari segi peralatan ICT. Penemuan juga menunjukkan bahawa peralatan diperlukan untuk guru pra-perkhidmatan Biologi menjalankan aktiviti kerjasama dengan berkesan dalam PdP mereka. Tidak terdapat perbezaan yang signifikan di antara guru pra-perkhidmatan biologi lelaki dan perempuan untuk melaksanakan kemahiran ICT dan juga aktiviti kerjasama. Hubungan positif yang signifikan wujud antara kesediaan guru pra-perkhidmatan Biologi untuk melaksanakan kemahiran ICT dan aktiviti kerjasama. Kesimpulannya, guru pra-perkhidmatan biologi bersedia dari segi keyakinan, kesedaran dan motivasi, persepsi, pengetahuan dan latihan untuk melaksanakan kemahiran ICT dan aktiviti kerjasama dalam proses PdP. Implikasinya, kajian ini menjadi asas bagi kajian lanjut yang boleh dijalankan dalam bidang lain dan sebagai kesediaan untuk guru pra-perkhidmatan di Nigeria bagi melaksanakan kemahiran abad ke-21.

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LIST OF ABBREVIATION

ABU	Ahmadu Bello University
ANCOVA	Analysis of Covariance
B.ED	Bachelors of Education Degree
CAI	Computer Assisted Instruction
CFT	Competency Framework for Teachers
DBER	Discipline-Based Education Research
FCE	Federal College of Education
FRN	Federal Republic of Nigeria
GCE	General Certificate of Education
ICT	Information and Communication Technology
IGS	Institute of Graduate Study
JAMB	Joint Admission and Matriculation Board Entrance Examination
JSS	Junior Secondary School
MDGs	Millennium Development Goals
MOOC	Massive Open Online Courses
MOODLE	Modular Object- Oriented Dynamic Learning
NCE	National Certificate of Education
ND	National Diploma
NMC	National Mathematical Centre
NRC	National Research Council

PBL	Problem Based Learning
PPMC	Pearson Product-moment Correlation
SCL	Student-Centered Learning
SDGs	Sustainable Development Goals
SPANOVA	Split-plot Analysis of Variance
SPSS	Statistical Package for Social Science
SSC	Sorsogon State College
SSCE	Senior Secondary School Certificate Examination
SSS	Senior Secondary School
STEM	Science, Technology, Engineering, and Mathematics
TEP	The Education Partnership
TIP	Technological Instructional Package
TnL	Teaching and Learning
TRC	Teachers Registration Council
UK	United Kingdom
UPSI	Universiti Pendidikan Sultan Idris
USA	United State of America
WAEC	West African Examination Council

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CHAPTER 1

INTRODUCTION

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1.1 Introduction

This dissertation documents the readiness of Nigeria biology pre-service teachers to implement 21st century skills, specifically Information and Communication Technology (ICT) skill and collaboration activities in teaching and learning (TnL). The study used questionnaire and interview sessions prepared for the pre-service teachers for data collection. This chapter begins by providing an introduction and the background of the study, followed by the statement of the problem. Next, the research objectives, research questions and research hypotheses are stated. The research conceptual framework, limitation of the study, significance of the study as well as definition of specific terms are explained. Lastly, the chapter ends by statements of conclusion.

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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 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). Globalization has been seen to have a tremendous influence on people and races of all age range, (children, teenagers, youths and adult). The onset of this age is characterized by digital revolution. The evolution of technology has brought about ultra-transformation in the people's lifestyle across the globe, including education (Ismail, Bokhare, Azizan, & Azman, 2013).

Much emphasis has been placed upon 21st century skills development and has directly increased the expectations for teachers to take advantages of evolving technologies to support student learning (Kale & Goh, 2014). Moreover, success in life and work in today's knowledge society calls for 21st century skills, i.e. skills for learning, creative and critical thinking, collaboration, and the ability to utilize ICT in these extents (Binkley et al., 2012). Correspondingly, the National Research Council (NRC) stated that there are various terms related with the 21st century skills as a crucial dimension of human competences that have been given utmost recognition and value for many generation now (NRC, 2013). Notwithstanding, over the generations, differences exist amongst the needs of the society about the levels learners must reach in their skills, knowledge and what they can do with such skills. At the same time, technological revolution has increased the speed through which people communicate and collaborate to fulfil their task in TnL, home, society and workplace.

For over many years, the body of literature give concern to collaboration activities (small group learning) even in higher education as a result of proofs that students that work in small groups develop better knowledge, thinking skills, social skill as well as better academic performance (Davidson & Major, 2014). This has brought about increased interest in incorporating the 21st century skills (such as ICT skill and collaboration activities) in TnL activities instead of going by the traditional path.

1.2 Background of the Study

Biology is a natural science that deals with the physiology, anatomy, morphology, behavior, origin, and distribution of living organisms and their environment: the structure, function, evolution and relationship of plant and animal with their living and non-living environment. In Nigeria, Biology is a prerequisite subject for various other fields of learning that is believed to contribute immeasurably to technological growth of the country. Such fields include medicines, pharmacy, nursing, agriculture, forestry, biotechnology, nanotechnology, and many other areas (Ahmed & Abimbola, 2011). Biology is seen as one of the fundamental subjects in Nigerian secondary school curriculum (Gambari et al., 2014). Due to its significance, more students register for biology in the Senior Secondary School Certificate Examination (SSCE) compared to physics and chemistry (West African Examination Council, 2011). Biology is introduced to students at senior secondary school level as a foundation ground for

human development, where career abilities are prepared, and potentials and talents identified and strengthened (Federal Republic of Nigeria, 2009).

In Nigeria, the federal government is directly involved with tertiary education which consists of a university sector and a non-university sector (WENR, 2013). The Biology pre-service teachers undergo their higher education program after they must have successfully completed their Senior Secondary School (SSS) and have passed basic subjects such as English, Mathematics, Biology and any two-other science related subjects in the SSSCE. The main purpose of training students with quality Biology education from secondary school is to help them fit into their higher level of studies, career and future. However, research showed that despite the recognition of the position biology subject hold amongst students, performance at SSS level has been low (Ahmed, 2009). The repercussion of this in Nigerian education is that 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).

With reference to this, some researchers had address the issue of poor performance of students in their final year examination by finding out first and foremost what could be the possible causes. Their quest revealed that unfavorable learning environment, traditional teacher centered instructional methods, lack of laboratory facilities, refusal to adopt innovative strategies and lack of using computer and technology in teaching and learning biology had been the order of the day (Yaki & Babagana, 2016; Arum, 2015; Ali et al., 2014; Gambari et al., 2014; Yusuf & Afolabi, 2010). Hence, they began to advocate the training of teachers (Yaki & Babagana, 2016;

Arum, 2015) by organizing relevant programs such as workshops, seminars and relevant courses that could help them acquire ICT skills. Some others emphasized that teachers should begin to involve student centered practices in their teaching (Arum, 2015; Gambari et al., 2014; Yusuf & Afolabi, 2010) as it is fundamental in students' acquisition of the 21st century skills such as leadership skills, critical thinking skill, collaboration skill, problem solving skill, metacognition and high order thinking skill, ICT skill, creativity and innovation, to mention a few (P21, 2016).

From these researches, it is confirmed that educators see the urgent need to reevaluate the techniques, materials and methods of TnL at senior secondary school level. To take action on these challenges, it is essential that instructional systems that is reinforced by technology is embraced for meaningful learning to take place (Gambari et al., 2014). They further encouraged approaches that will provoke, fascinate and encourage students to better study, comprehend, and retain biology concepts be adopted in this 21st century to help the students and promote their future involvement. Nevertheless, 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 a student-centered activities and use of technology because the present-day learners are digital natives who are used to technical devices (Yaki & Babagana, 2016).

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, ICT tool as portable as smart phones can 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. This incredible rise of technology due to rapid scientific and technological developments has also led to educators' adaptation to new learning environments and learning theories such as connectivism to guide them (Goldie, 2016). Creativity as one of the key skills of the 21st century is the cornerstone behind these. Subsequently, a need for Education 4.0 has emerged, calling for focus upon getting students ready to take on challenges of their future.

1.3 Problem Statement

The problem of poor performance of senior secondary school leavers in Nigeria in the West African Examination Council (WAEC) has been on the high side in science subjects which includes Biology, a core subject for both science, arts, and social-science senior secondary school (SSS) students in Nigeria. Recently a research stated that the number of students who score below average in WAEC is more than 50%, which implies that those eligible to secure admission into institutions of higher studies are few. Literature has testified the causes for this depressing performance to comprise: unfavorable learning environment, traditional teacher centered instructional methods, lack of laboratory facilities, refusal to adopt advanced strategies and lack of using computer and technology in teaching and learning biology (Yaki & Babagana, 2016; Arum, 2015; Ali., et al, 2014; Gambari., et al, 2014; Yusuf & Afolabi, 2010). Some of these literatures gave recommendations with respect to training of teachers (Yaki & Babagana, 2016; Arum, 2015) and some others laid emphases on practicing student centered teaching (Arum, 2015; Gambari et al., 2014; Yusuf & Afolabi, 2010) which is essential for students to obtain of the 21st century skills to enable them face their future

and career life without fear. Moreover, Nigeria as a developing country should strive to meet the expectations of the industrial revolution by preparing the youngsters towards their work life through latest materials and methods. Acquiring ICT as a 21st century tool can stimulate the acquisition of other 21st century skills such as collaboration (Binkley et al., 2012). Meanwhile, the most common method of teaching in Nigeria is the teacher-centered method (Yaki & Babagana, 2016).

A characteristic feature common to the present generation of students is their preference to learn collaboratively. Teamwork is one of the top agenda in their attempt to solve problems. Whereas, in Nigeria, traditional method of teaching is still prevalent over student-centered approaches (Yaki & Babagana, 2016). This hinders the student from working collaboratively, which could have been a great advantage for them to share ideas with each other and improve their collaboration skill to solve unique problems. In an attempt to check the effect of using ICT and collaboration, a group of researchers revealed from their finding that students have better academic achievements when they work cooperatively with Computer Assisted Instruction (CAI) than individually (Yusuf & Afolabi, 2010). Correspondingly, researchers have been worried about the quality of undergraduate biology education and as a result, contributions to early journals focused extensively on TnL issues such as if collaborative or individual learning would add value to learners understanding and expertise in the discipline (Singer, Nielsen, & Schweingruber, 2013). From these researchers, it is obvious that educators are beginning to see the imperative need to reevaluate the techniques and methods of TnL. To take action on these challenges, they advocated that it is essential that instructional systems that is reinforced by ICT should be involved for meaningful learning to take place (Gambari et al., 2014). Furthermore, captivating approaches

should be adopted by teachers to encourage meaningful learning to take place amongst students in this 21st century to help the students and promote their future involvement.

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 more confident 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 either when students work individually or collectively (Yusuf and Afolabi, 2010; Yaki and Babagana, 2016).

For the pasts five years, billions of naira has been budgeted for the educational sector in Nigeria. Although, there had been a slight decrease in the allocation over the years (From N306.3bn in 2011, to N400.15bn in 2012, to N426.53bn in 2013, to N493bn in 2014, to 492bn in 2015, to N369bn in 2016), but on the other hand, the tuition for students at higher institutions is increasing (Campusbuzz, 2016). More so, the federal government has a proposal in the budget to employ and train 500,000 graduates as teachers (Campusbuzz, 2016). All these budgets and allocation is in an attempt to provide quality education, and make available the relevant infrastructures to meet up with the nation's vision 2020 to equip learners for a successful 21st century living. These informed the researcher to investigate the level of readiness of Biology teachers in implementing the 21st century skills in TnL in Nigeria.

If such level of preparation and awareness of the relevance of new methods and materials exists amongst researchers, 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 21st century skills specifically ICT and collaboration skills in TnL in Nigeria. Thus, it is hoped that the present study will contribute greatly with significant findings.

1.4 Research Objectives

The main purpose of this research was to:

1. Investigate the level of readiness of biology pre-service teachers to implement the ICT skill in TnL. The readiness was divided into six sub-construct which are confidence, awareness and motivation, perception, training, knowledge and equipment.
2. Investigate the level of readiness of biology pre-service teachers to implement collaboration activities in TnL. The readiness was divided into three sub-construct which are confidence, awareness and motivation, and perception,
3. To obtain relationship between gender and pre-service teachers readiness to implement the ICT skill in TnL.
4. To obtain relationship between male and female biology pre-service teachers readiness to implement the collaboration activities in TnL in terms of
5. To determine the relationship between the readiness of biology pre-service teachers in implementing the ICT skill and collaboration activities in TnL.