

Teachers Competency in Utilization of Digital Technologies in Instructional Delivery of Biology Concepts in Secondary Schools in Akwa Ibom State

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Abstract

This study examined teachers' competency in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools in Akwa Ibom State, using the descriptive survey design which was targeted at collecting data to assess the issue of teachers' competency in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools in Akwa Ibom State. The target population were all the 796 Biology teachers in secondary schools in Akwa Ibom State. But a sample size of 311 teachers was used as respondents for this study. Stratified random sampling technique was adopted in sampling the respondents across the state. A 10-item instrument named "Teachers Competency in Utilization of Digital Technologies in Instructional Delivery Questionnaire" was used for data collection. The instrument was duly validated and the internal consistency reliability index of the instrument was estimated using Cronbach Alpha method and the index was 0.72. Mean and standard deviation were used in analyzing the collected data. The findings from the result showed that teachers are not competent in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools. It was recommended that teachers should be trained on use of different digital technologies in instructional delivery.

Key words: Teachers Competency, Digital Technologies, Instructional Delivery

Introduction

Teaching and learning is the principal stock in trade of any educational enterprise throughout human history whether in the developed, developing or under-developed countries. The various developments in the field of digital technologies have been found very useful in the learning environment globally. The need to fully integrate digital technologies in instruction at the secondary school level has become necessary in view of the demand on teachers in secondary school system to be digital literate in an emerging world that is digital technological driven. The concepts taught in the secondary school system are not for the benefits of Nigeria alone but for a collaborative and competitive global village where knowledge is created and shared using digital technologies (Duru, Uko, & Utibe, 2024).

Over the years, events have evolved in the social, economic and technological milieu, and this has given rise to far-reaching changes in the mode of teaching and learning in educational institutions (FRN, 2014). The need for utilization of digital technologies in instructional delivery has necessitated educational reforms and changes in lesson delivery methods. Digital technologies are electronic tools, systems, devices and resources that generate

store or process data. Digital learning is any type of learning that uses technology. It can happen across all curriculum learning areas (Amhag, Hellstrom and Stigmar, 2019). By digital technology one means the use of computer and technology assisted strategies to support learning within schools. Approaches in this area vary widely, but generally involve technology for students, where learners use programmes or applications designed for problem solving or open-ended learning; or technology for teachers, such as interactive whiteboards or learning platform forms.

Dias-Trindade, Moreira and Ferreira (2020) observed that digital technologies are classified into process and product technologies. Amhag, Hellstrom and Stigmar (2019) maintained that digital technologies are grouped into four categories which are digital technologies for all the senses; digital technologies for internet explosion; digital technologies for the wireless revolution; and digital technologies for personal use. Accordingly, the use of these facilities involves various methods which include systematic feedback system, computer-based operation network, video conferencing and audio conferencing, internet worldwide websites and computer assisted instruction. These delivery methods increase the possibilities for how, where and when learners can engage in lifelong learning. Lecturers are reasonably excited about the potentials of new technologies for just-in-time learning delivery (Guillen & Mayorga, 2019).

According to Amhag, Hellstrom and Stigmar (2019), new teachers' roles should follow modern context of basic education which includes such competencies such as a professional teacher (professionalisation requires practical application of knowledge, an intellectual teachers, professional identity, professional development); a teacher as a team member and as an expert with a high degree of autonomy. In order to gain new competencies, future teachers will be in need of new knowledge which should be acquired at teachers' training faculties. Anyone who is preparing to work with students should, in addition to expertise, also pedagogical skills needed to perform in practice. Based on the professional framework, Basantes, Cabezas and Casillas (2020) have defined the models of teachers' competencies which are divided into two groups: competencies specific to the subject and educational competencies. When it comes to the educational competencies, they include: competencies related to the educational process and competencies related to the permanent, lifelong education in which it is important to understand the educational system, to develop the abilities for improving methodical skills, the abilities for improving language skills and the abilities to master the modern information technology.

Considering the lifelong learning context, Batiibwe, Bakkabulindi and Mango (2016) has defined the pedagogical and didactic-methodological competencies of educators: team work ability, communication skills, openness to change, professional autonomy, permanent expert and professional development and openness to information and to application of the new information technology in everyday school context. In this respect, the informatisation of the education implies a new organisation of school life and work, and also a new way of teaching. In the society informatisation conditions, where knowledge and ideas become the basic production resources, school has the role of a carrier of change and becomes an important

media in social environment. Full implementation of information technology requires fundamental changes in the information sphere of teacher education, and teachers; acquisition of digital competencies becomes the pre-condition for successful execution of educational tasks (Walan, 2020).

The usage of modern means such as educational software, multimedia teaching, the internet, gives the possibility to enrich the learning process and therefore the methods and forms of work. According to these aspects, the ICT development has made significant changes to the conceptualization of the teachers' role, and has caused a new approach to the professional training and development of teachers. The focus of teaching is now transferring from the class itself to its planning, preparation and rationalization of teaching that is to modification of the curriculum according to the newest achievements in science and technology (Santos, Pedro & Matter, 2021). In order to achieve the expected educational outcomes, the teacher may realize the class by using the elements of information technology, developed models of multimedia teaching, the achievements of e-learning which will enable the design of the new teaching system called e-teaching, while the teacher's activity within that system is named e-tutor (Krstic, 2014). The realization of such teaching requires a wide range of knowledge and skills within the context of the basic professional competencies, especially focusing on digital competencies which have been designated by the EU as one of the eight basic competencies. According to the reference frame work of key competencies which has been established in 2006, digital competence in a broader sense includes safe and critical usage of technology of information society for work, leisure time and communication. The competence also includes the ability to search, collect and process information as well as its critical and systematical usage, assessing the relevance and distinguishing the real from the virtual.

In the context of education and teachers' development, most authors (Pavlovic, 2014) agree when it comes to defining and determining the essence of digital competence which implies knowledge and skills related to digital media, and refers to logical and critical reflecting about digital teaching content, safe use of information and communication technology in the classroom and also well-developed communication skills in work with students, their parents and colleagues. Therefore, in order to develop teachers' digital competence, Pavlovic (2014) points out the following to be competent is more than just a sum of separate and individual skills and knowledge. In digital terms, this means that the teacher has the ability to apply and to integrate new technology into teaching; uses the advantages, controls the disadvantages and risk of digital technology and develops children's' awareness and habits for its correct use. Teachers use digital technology for planning activities, for observation, evaluation, and documentation and apply digital technology for informational exchange with family, colleagues, and associates; most especially for professional development.

Based on this, the competencies for the informational teaching are differentiated into three approaches of integrating digital technologies into the teaching process: (1) The application of information and communications technology in the classroom where the technological system and the computer are used as the teaching tool; (2) The usage of e-

learning which has the status of an independent procedure in the educational system; (3) The realisation of e-teaching which is regarded as a developed teaching system.

Teachers' competence for the usage of modern information technology in the school curriculum doesn't only refer to their individual plan, but also requires a systematic competence which implies mutual cooperation of individuals, groups and institutions to jointly participate in learning and reflection. The essence of using digital technologies in the teaching process refers to the change of the teacher's and student's role, the change of the resources that are being used and the change of the essence of the teachers' instructions which are provided with the help of technology. Itighise and Wordu (2016) that the teachers' professional development for the application of digital technologies is related to the following aspects: (1) technological literacy-developing teachers' skills which enable the integration of information and communication standards when creating the modern curriculum; (2) enhancing the knowledge- the ability to manage the information, to formulate specific tasks and integrate new technology and application oriented to the subject; (3) The creation of knowledge-connecting new professional skills of teachers and all the possibilities of technological development in order to support and guide the students. This would practically mean that the successful professional training in this area includes the support of the development of teachers (reflective practitioners) as researchers of their own practice and that this training is carried out in everyday practice through the cooperation with colleagues, associates and researchers while it also includes learning the ICT skills by solving and developing the specific curricular and extracurricular activities.

The question of teachers' competencies in reference to using digital technologies often comes down to the issue of their competence to work with the modern technology means and to the understanding of applications which enable efficient and efficacy learning. On the other hand, note Uko and Uko (2020) that in the introduction of The Competency Standards in Reference to Teachers' Profession and their Professional Development it is stated that the teachers should be applying digital technologies and that this is the general condition which must be accomplished in the education and the society. The standards of the application of digital technologies in teaching are defined by the regulations within The Competencies for Module, Subject and Teaching Methods: the knowledge-the teacher is familiar with the technology of the scientific discipline and with his teaching subject; the planning-the teacher is planning the informing on new trends and the usage of appropriate and available technology in teaching; the development- the teacher is continuously improving in the scientific discipline of the subject, in teaching methods and the educational technology. The successful integration of digital technologies in the classroom will depend on the teachers' ability to overcome the traditional ways of learning, that is to say that in order to implement digital technologies in teaching, it must become an integral part of the teacher's personal and professional development (Santos, Pedro & Matter, 2021).

Undoubtedly, the emergence of teachers competency in utilization of digital technologies such as the computer, word processor, the internet, automated teller machines, reprographic machines, micrographic machines, accounting machines, modern telephonic systems including handsets and multimedia, among others, have not only revolutionized the

office environment but have also brought changes in the ways people are doing things. The computer is one of the most visible of the digital technologies. Much as digital technologies are indispensable in biology education programme delivery, the subject of quality service delivery is of utmost importance. Change is the only constant factor in human existence, as a result, in recent years teaching and learning methods have started to change in educational institutions in general and in Biology education in particular (Duru, Uko & Utibe, 2024).

More so, education is seen as a document per excellence in preparing citizens for effective roles in the society. One form of education that equips its recipients to adapt to the changing world of work is Biology teaching. Biology is a branch of natural science concerned with the study of life and living organisms including their structure, functioning, growth, evolution, distribution, identification and taxonomy (Duru, Uko & Utibe, 2023). Being a science of life, Biology occupies a very important position in the secondary school curriculum. In Nigeria, the secondary school Biology teaching Curriculum is designed to prepare students to acquire adequate laboratory and field skills, meaningful and relevant knowledge in Biology. It is also to enable students apply scientific knowledge to everyday life in matters of personal, community, health and agriculture among others (Federal Ministry of Education, 2014). As a subject of study, Biology is perceived to be very interesting, vast and experimental. Its importance in the growth and development of any nation cannot be overemphasized. It serves as a foundation for many other courses like; Pharmacy, Medicine, Nursing among others. Because of its importance to mankind, an element of it has been introduced in all levels of education (from pre-primary through university).

Santos, Pedro and Matter (2021) opined that teachers' functions range from teaching, research and publications, marking of tests and examinations, supervising students' research, supporting students through advisory roles, attending conferences and the provision of community services. This is why Akpan (2022) stated that science education research, innovation and practices must become more responsive to the needs and ambitions of the society and reflect its values. In order for these tasks to be effectively and efficiently accomplished, there is need for the teachers to acquire a considerable level of digital technology competency and proficiency. This is required in order to meet up with the demands of their job. With the aid of electronic system, there is a sharp shift from the traditional approach of teacher- directed instruction to modern methods where computer technology plays a significant role, thereby improving the quality, efficiency and effectiveness of teaching, learning, research and other educational management. The electronic process enhances the delivery and administration of learning opportunities and support via computer, networked and web-based technology facilitate individual performance and development. Thus Akpan (2018) noted that one of the factors that seriously influence the attainment of meaningful use of computer self-efficacy is the teacher's attitude towards the use of technology in teaching and learning process. The teachers' attitude is a major predictor of the acceptance and actual utilization of computers in the classrooms and in the management of their work.

Cabero, Barroso and Palacios (2021) posited that majority of teachers in Europe use digital technologies to plan their lessons more than lecturers in Nigeria. With the use of digital

technologies, teachers will be able to communicate and collaborate with other teachers and this enhances their job performance. For Biology Education programme to remain relevant in providing the needs of individuals and that of the society; it must embrace current trends in the academic, social and economic demands of the society. For our educational systems to deliver on their mandates, the quality of the training given to individuals passing through one course or the other should be such that can give adequate skills and information needed in the world of work. If Biology teaching should serve this purpose of providing the needs of the learners and the society, the Biology teachers' should be ready to embrace and include digital technologies in its curriculum to ensure that, effective and quality of education is given in line with societal demands (Arslan, 2015). This curriculum will be able to integrate digital technologies that can help in passing the desired and required skills to the learners to make them employable and as well as relevant in the ever-changing biology environment. It is perceived that some biology teachers' have not adopted the use of digital technologies for instructional delivery of Biology concepts. In view of this, Dias-Trindade, Moreira and Ferreira (2020) lamented that, there is very low pace of development and utilization of digital technologies and applications for educational purposes, including the teaching and learning of Biology concepts in developing countries, especially Nigeria.

There is urgent need for the adoption of biology technologies in instructional delivery of Biology teaching and learning to ensure efficiency and effectiveness in curriculum implementation for optimal service delivery. But regrettably, in developing countries like Nigeria, digital technologies are confronted with a number of problems such as access to electricity, computer, computer laboratories, internet and e-mail facilities, videophone systems and teleconferencing devices, fax and wireless applications, digital library, digital classrooms and multimedia systems. Akram, Abdelrady, Al-Adwan & Ramzan (2022) revealed that there is dearth of trained teachers for the use of digital technologies, lack of facilities, infrastructures and equipment. It is very worrisome that the use of modern devices in teaching Biology concepts in secondary schools in Akwa Ibom State are challenged by the digital technologies in terms of teachers competency and utilization. It is against this background that this study is carried out to determine the extent of teachers' competency in utilization of digital technologies in the instructional delivery of Biology concepts in secondary schools in Akwa Ibom State.

Purpose of the Study

The main purpose of this study was to examine teachers' competency in utilization of digital technologies in instructional delivery of biology concepts in secondary schools in Akwa Ibom State.

Research Question

What is the competency level of teachers in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools?

Methodology

This study adopted the descriptive survey research design. It is a design which describes the present condition of a particular situation by collecting and analysing data from a representative sample considered for the entire subjects or the entire population. The target population were all the 796 Biology teachers in secondary schools in Akwa Ibom State. But a sample size of 311 teachers was used as respondents for this study. Stratified random sampling technique was adopted in sampling the respondents across the state. A 10-item instrument named "Teachers Competency in Utilization of Digital Technologies in Instructional Delivery Questionnaire" was used for data collection. The internal consistency reliability index of the instrument was estimated using Cronbach alpha method and the index was 0.72. The instrument was duly administered to the sampled teachers, and the data collected was analysed using mean and standard deviation. An item with a mean rating of 2.50 and above was regarded as indicative of teachers' competency in utilization of digital technologies in instructional delivery while a mean rating below 2.50 was regarded as indicative of lack of teachers' competency in utilization of digital technologies in instructional delivery.

Result

Research Question

What is the competency level of teachers in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools?

In order to answer the research question, mean and standard deviation were used and the result is presented in Table 1 below.

Table 1: Mean rating and standard deviation of competency level of teachers in utilization of digital technologies in instructional delivery of Biology concepts

S/N	Items	Mean	SD	Decision
1	I do not use e-learning because I cannot use digital technologies for teaching students	2.04	0.81	LCL
2	It is useful to learn how to apply digital technologies for teaching	2.68	1.08	HCL
3	I can easily use digital technologies to teach my students	2.11	0.83	LCL
4	I can easily use gadgets for lesson delivery	2.23	0.85	LCL
5	I can initiate an online class with digital technologies for teaching	2.34	0.87	LCL
6	I like using digital technologies for lesson delivery	2.02	0.80	LCL
7	I use digital technologies to share information with my students	2.16	0.89	LCL
8	I like to make online appointments with my students through digital technologies	2.15	0.93	LCL
9	It is easy to share study materials through digital technologies	2.18	0.94	LCL
10	I find digital technologies to be user friendly	2.09	1.11	LCL

Key: LCL = Low Competency Level, HCL = High Competency Level

The result in Table 1 indicates the mean rating of competency level of teachers in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools. The result shows that 1 item (item 2) records a mean of 2.50 and above which means high competency level in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools. On the other hand, 10 items (item 1 and 3 to 10) have a mean less than 2.50 which means low competency level in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools. This result implies that the competency level of teachers in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools is very low.

Discussion of Findings

Findings from the study revealed that competency level of teachers in utilization of digital technologies in instructional delivery of Biology concepts in secondary schools is very low which implies that majority of Biology teachers in secondary schools, Akwa Ibom State are not competent in the utilization of digital technologies in all the required areas as stipulated by (UNESCO, 2015). These showed that the Biology teachers need a lot of training in the areas of pedagogical, subject matter and personal ICT competences, such as competency in matching specific curriculum standard to particular software packages and computer applications and describe how these standards are supported by these applications. Incorporate appropriate digital technologies activities into lesson plans so as to support students' acquisition of school subject matter knowledge, use common communication and collaboration technologies, such as text messaging, video conferencing, and web-based collaboration and social environments (UNESCO, 2015).

Furthermore, this finding is supported by the finding of Amhag, Hellstrom and Stigmar (2019) which reported in his study that the successful integration of digital technologies in the classroom will depend on the teachers' ability to overcome the traditional ways of learning, that is to say that in order to implement digital technologies in teaching, it must become an integral part of the teacher's personal and professional development. This has a great implication to the success of digital technologies policy in Nigeria, because the teacher plays an important role in any educational reform strategy at the secondary school level. Therefore the present digital technologies utilization competency level of Biology teachers in Akwa Ibom State contradicts the tenets of the Teachers' Competency Based Teacher Education (CBTE) because here the majority of the teachers are not competent in the utilization of digital technologies.

Conclusion

From the descriptive analysis of data, it was evident to conclude as revealed by the study result, although biology teachers were low in competent of basic operations of digital technologies. It is difficult to say that, they are good enough to utilize digital technologies. This implies that they cannot transfer these technologies to classroom use for education

purposes. They are thus far from creating a student-centered learning environment with digital technologies.

Implication of the Findings

It is evident from the study that most biology teachers' from Akwa Ibom State Secondary Education zone are not digital technology competent and this impedes the utilization of digital technologies in instructional delivery in schools. The numerous benefit of utilization of digital technologies can only be realized when teachers who are the major actors in the teaching and learning process possess the necessary skills and required ICT competency, and where they fail to possess these competencies; there is no way the benefit can be attained. The successful implementation of the digital technology policy of Nigeria lies in the hand of teachers who are the agents of its integration in the educational sector, and where these teachers are not competent, it means that the aspirations of the federal and state Government, who have spent so much in equipping these schools with digital technologies, will not be achieved and being realized.

Recommendations

Based on the implications of the findings, the following recommendations were made:

1. Workshops, seminars, conferences and in-service training on digital technologies should be organized for biology teachers in Akwa Ibom State Education zone to help them improve on their digital technologies competencies.
2. More efforts should be made by the federal, state, and communities to provide adequate and necessary digital technologies facilities for schools so that the teachers will have access to practicing with them even after they have gone for training so as not to lose the knowledge they gained from training.
3. The training and re-training of science teachers using capacity building workshops should be institutionalized.
4. Science teachers should be equally and adequately exposed to the digital curriculum with the same kind of digital technologies to acquire skills and knowledge.

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