INTEGRATING DIGITAL TECHNOLOGIES IN THE EARLY CHILDHOOD CLASSROOM: HOW COMPETENT ARE IN-SERVICE UNDERGRADUATE TEACHERS?

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ABSTRACT

Digital technologies such as programmable toys, camera, android phones, IPad, lab tops, educational robots, industrial robots, videos, video games, VCDs, Internet, Photoshop suites, and the likes have become essential tools that support instructions at all levels of education. These technologies are used either directly or as items to support instruction. This situation places great demand on teachers' competence in using these technologies effectively in the emerging teaching and learning ecosystem which demands the application of new knowledge and skills. This study investigated in service degree early childhood education teachers 'competence in integrating digital technologies in implementing the early childhood education curriculum. The descriptive survey design was adopted for the study. The population for the study was 200 students in contact one to four in the 2022 session in Federal College of Education, Pankshin , Nigeria. The sample for the studies consisted of 150 students who were selected using simple random sampling. Five research questions guided the study. The instrument used was the Tech Check Questionnaire (TCQ). Data was analysed using mean and standard deviation to answer research questions raised. Findings indicate that teachers' competence in using technology in areas of presentation of instructions, educational robotics and internet usage was low. It was recommended among others that hands on training on use of relevant digital technologies in presentation, educational robotics and internet use be mounted for teachers to improve competency for digital curriculum implementation.

Keywords: Early Childhood, Competence, In - service Teachers, Digital Technologies

INTRODUCTION

Digital technology has progressively become an important feature of the 21st century early childhood classroom instructional strategy. Digital technology refer to electronic

gadgets such as handsets, electronic toys, robots, SMART boards video machines, projector, and applications such as zoom, WhatsApp and internet used for dissemination of information and for teaching and learning in schools (Obiweluozo, Onwurah, Oraelosi, Uzodinma, & Dike, 2021). These electronic tools, systems, devices and resources that generate, store, or process data in pictures, audio and video forms. The easy access to Information and communication technology has transformed every aspect of human life particularly in the area of teaching and learning. A growing trend today is that children have become technologically exposed daily in areas such as gaming, play toys, phones, labtops, and computers, television, and videos at home and outside the home (Erna, Risma, Fadel, & Titin, 2022; Khodabandeh, 2022;Okwor, & Taiwo, 2021). Sadly, must Nigeria teachers especially those teaching at the early childhood levels are not that digitally literate (Obiweluozo, Onwurah, Oraelosi, Uzodinma, & Dike, 2021). If Nigerian children must survive and succeed with increasing roles of digital technologies required in fourth industrial revolution era that is significantly becoming part of our culture at home, school, and in their immediate environment. Digital learning should be an integral part of learning in the early childhood curriculum and teacher training programmes. Morrison (2012) listed some commonly used digital technologies in early childhood programme to include computers, educational robots, mobile devices like smart phones and tablets, smart boards, the internet, cameras, iPhones, iPads, digital cameras, online games, social media, mobile phones multimedia and many types of assistive technology. These devices have been progressively applied in early childhood STEM classroom learning particularly in developed countries.

Early childhood education is education given to children from birth to five years. NERDC (2007) views early childhood care or early childhood education; as the initial stage of organised instruction designed primarily, to introduce very young children to a school-type environment. It serves as a bridge between the home and a school-based atmosphere. Federal Republic of Nigeria in her National Policy on Education (FRN, 2013) conceptualise it as education given to children in an educational institution prior to their entering into primary school. Children at this level of education are digital natives. Obiweluozo, Onwurah, Oraelosi, Uzodinma, and Dike (2021) asserts that children born into a digital world where the web, podcast and Google are basic vocabulary words require a high level of engagement in their learning to survive and succeed. They read, write and think digitally. Thus, provision of digital technology in the classroom is vital to support teaching and learning of science engineering and technology activities (STEM). For instance, STEM corners are a critical requirement in all early childhood classrooms based on the Regio Emilia approach. Incorporating digital technology will encourage active learning, knowledge construction inquiry and exploration among learners. The

devices make it easier for remote communication as well as data sharing to take place between teachers and, or learners in different physical classroom locations (Katniyon, 2006). Obiweluozo, Onwurah, Oraelosi, Uzodinma, and Dike (2021) affirms that general use of technology in classrooms increased motivation, improvement in self-concept and mastery of basic skill, more learner-centred learning and engagement in the learning process. Digital technology can also be used as a scaffolding tool in the early childhood classroom. For instance, digital cameras can be used to create literacy activities for the children. These digital cameras can also be used to document children's learning; daily documentation, wall displays, portfolios (Khodabandeh, 2022). They can be used to create electronic books, child-created books, among others. Digital technology enables children to use Google Earth, an online resource to virtually visit a location they have been learning about. Integrating technologies in learning puts a great role on the teacher as he plays a critical role in the effective use of digital technologies in early childhood classroom.

The Federal Republic of Nigeria (2013) defines the teacher as an individual that has been professionally trained in any teacher education programme such as from the Colleges, Universities and institutes of Education, Early childhood teachers receive special training to teach young children, these teachers are known as early childhood teachers. Morrison (2012) sees early childhood teachers as professionals who successfully teach all children, promote high professional standard and continually expand their skills and knowledge. In order to meet the demand of digital technology in early childhood classroom, teachers need to possess digital competence.

Competence refers to teachers' knowledge, skills and attitude in using digital literacy and equipment to deliver on classroom learning outcomes. Teachers' competence in the use of digital technologies involves the ability to utilize presentation skills, educational robotics skills, internet usage and all other digital related skills effectively to perform various activities inside and outside the classroom. Early childhood school teachers need the competencies pertinent for the effective use of digital technology in a play based manner in the classroom to allow children to be able to perform tasks, solve problems, communicate, collaborate as well as to create and share contents towards encouraging critical thinking in children.

The minimum qualification for teaching in Nigeria is the National Certificate in Education. NCE holders have received some forms of training in digital technologies in general studies courses and in their two majors as requirements for graduation. Despite this training one wonders how computer complaint the NCE holders are in the use of digital technology in the early childhood classroom. Key competencies include digital

presentation skills, educational robotics skills and internet usage skills. Presentation skill is an essential skill in teaching and learning, especially when using computer. Presentation skills include content of subject matter as well as flow of presentation. Information can be presented using zoom, WhatsApp, Google classroom and Power Point projectors. With digital technology, concepts that are difficult to explain, can be easily presented to the children in a simple way using any presentation software with audio, video and other animations to further aid understanding. PowerPoint presentation can be used to promote emotional intelligence of children, social competence, and curriculum implementation, among others. It affords a teacher the opportunity to incorporate visual and auditory aspect to presentation. It allows variety of manipulations by editing or text modification, removal of existing slides and addition of new slides to make lesson more organised and flexible (Gambari, Yusuf and Balogun 2015). The question however is How competent are teachers to harness this technology?

Robotics is a digital learning tool that lays the foundation for programming and computational science at the early childhood level. Lerch (2018) defines educational robotics as programmable machines or gadgets that is used in performing a range of tasks by executing input commands. It is programmed to move, make noise, light up, and follow instructions as directed. In the early childhood school setting, educational robots enhance children's problem-solving, creative thinking, and a healthy sense of competition that drives innovation from learners. It is an interesting way to bring STEM to life for young children. It encourages experimentation, teamwork, problem-solving and knowledge application and tech use in the simplest possible form (DriveMind Group, 2018).

Another digital learning tool is the internet. Internet are network of global computers interconnected to each other and available to any individual. Uses of the internet includes communication, teaching and learning and dissemination of information, basic processes, operating system basics, software installation from removable, media, step by step downloading software, creating the upload page, create or open a web, testing the page. Early childhood school teachers appear to lack the internet usage skills. Katniyon (2006) observed that most teachers lack the competencies in the use of information technologies to procure, process, store, print, and retrieve information from the computers and internet. Palaiologou (2016) seems to support this view when he asserted that early childhood teachers lack Information and Technology knowledge and related skills is a key barrier to enhancing the use of digital technology. It is against this background that this study explores the early childhood teachers' competencies in integrating digital technology in the classroom.

Purpose of the Study

The purpose of this study is to identify the competencies needed by early childhood school teachers for effective use of digital technology in the classroom. Specifically, the study sought to identify:

1. Digital presentation competencies exhibited by early childhood school teachers in the science technology engineering and mathematics (STEM) classroom.

2. Educational robotics competencies exhibited by early childhood school teachers in STEM classroom.

3. Internet usage competencies exhibited by early childhood school teachers in STEM classroom.

Research Questions

The following questions guided the study:

1. What are the digital presentation competencies exhibited by early childhood school teachers in the STEM classroom?

2. To what extent do early childhood in-service teachers exhibit competency in educational robotics in STEM teaching?

3. To what extent are early childhood teachers competent in internet usage in STEM delivery?

METHODS

The descriptive survey research design was used for the study. This design is considered appropriate since it tends to obtain data from early childhood school teachers about their competences in effective use of digital technology in the classroom. The study was conducted in Federal College of Education Pankshin LGA of Plateau State. The population of the study comprises of all early childhood in-service teachers in 2022 contact session. Intact population of early childhood in-service teachers made the population. The instrument was a 32 -itemed teacher self-reported questionnaire titled Tech Check Questionnaire (TCQ). It was developed by the researchers and used to collect data for the study. The TCQ has three sections A-C. Section A sought information on digital presentation skills covering zoom, WhatsApp, Google classroom and slide, while section B assessed teachers educational robotics skills competencies covering knowledge familiarity and application and section C assessed competencies on the internet usage skills exhibited by early childhood school teachers for effective usage of digital

technology in the classroom. The instrument was assigned a four-point response scale of Highly Competent (HC), Moderately Competent (MC), Slightly Competent (SC), and Not Competent (NC) with corresponding numerical values of 4, 3, 2 and 1. Experts in Childhood Education, Computer Education, Measurement and Evaluation, all from the Federal College of Education, Pankshin validated the instrument for face and content validity. Their suggestions were carefully implemented in the final draft of the questionnaire. The instrument was trial tested on non-participants using Cronbach alpha coefficient and it gave an internal consistency of 0.76. Data obtained was analysed using mean and standard deviations. The decision rule on cut off mark was mean score of 2.50 and above for acceptance.

RESULTS AND DISCUSSIONS

Results are discussed based on research questions formulated as seen below.

Research Question one: What are the digital presentation competencies exhibited by early childhood school teachers in the STEM classroom?

Table 1: Mean and Standard Deviation on Digital Presentation Competencies of Teachers.

SN	Statements	X	SD	Decision
1	Ability to initiate a zoom presentation	2.2	0.75	**NC**
2	Ability to share a zoom slide with viewers	2.0	0.88	**NC**
3	Ability to initiate a whatsApp group presentation	2.7	0.80	**C**
4	Ability to share video on whatsApp presentation	2.3	0.92	**NC**
5	Ability to add audio to whatsApp presentation	2.8	0.84	**C**
6	Ability to initiate Google classroom presentation	2.1	0.64	**NC**
7	Ability to initiate a slide presentation	2.5	0.82	**C**
3	Ability to apply a background to a slide	2.3	0.66	**NC**
4	Ability to customize the colour scheme	2.9	0.90	**C**
5	Ability to insert and format picture, video and tables	2.7	0.81	**C**
7	Ability to scale, move, and rotate objects	3.4	0.95	**C**
8	Ability to apply slide transitions	3.0	0.92	**C**
9	Ability to apply simple animations	2.2	0.75	**NC**
10	Ability to sort slides in Slide Sorter view	2.4	0.69	**NC**
11	Ability to time presentations	2.8	0.83	**C**
12	Ability to add action buttons	2.6	0.70	**C**
13	Ability to navigate slide screen	3.5	0.94	**C**
14	Ability to customise headers and footers	3.7	0.81	**C**

Key: Competent = C Not Competent = NC

Data from Table 1 indicate that respondents show competence in only 6 of the 14 digital presentation skills assessed, while respondents reported not being competent in 8 areas of digital presentation competence. Mean scores in competence shows that respondents show poor competence in zoom, WhatsApp, and Google classroom presentations while they showed better competence Microsoft slide presentation. The standard deviation scores shows that there was minimal variation in the mean scores.

Research Question Two: To what extent do early childhood in-service teachers exhibit competency in educational robotics in STEM teaching?

Table 2: Mean and Standard Deviation on Educational Robotics Competencies.

SN	Statements	X	SD	Decision
1	I am aware that educational robotics exists	3.6	0.80	C
2	I use robotics in my early childhood class.	2.0	0.92	NC
3	I am anxious about the prospect of using robotics.	2.2	0.84	NC
4	I am familiar with parts of an educational robot	2.5	0.64	NC
5	I am familiar with the motors parts of a robot	2.2	0.82	NC
6	I can operate the sensor phase part of the robot	2.1	0.66	NC
7	I am familiar with operating the remote control phase of a robots	2.1	0.90	NC
3	I can apply educational robotics in the classroom.	2.3	0.81	NC
4	I am able to integrated robotics into the curriculum	1.5	0.95	NC
5	I can scan a robot to perform a task	2.4	0.92	NC
7	I can build a simple robot with children	2.4	0.75	NC
8	I can recognize robots components in a picture	2.6	0.69	C

Key: Competent = C Not Competent = NC

Result on Table 2 shows that teachers are aware of educational robotics with a mean of 3.5 they however show low mean score on integrating it into the curriculum with a mean of 1.5.This indicates poor competence in knowledge familiarity application and use of educational robotics in STEM instruction. The standard deviation scores shows that there was minimal variation in the mean scores.

Research Question Three: To what extent are early childhood in-service teachers competent in internet usage in STEM delivery?

Table 3: Mean and Standard Deviation on Internet usage competencies of teachers.

SN	Statements	X	SD	Decision
1	Ability to locate a search engine for website search	3.2	0.91	C
2	Ability to input a web address	3.0	0.78	C
3	Ability to down load and safe a file	2.8	0.80	C
4	Ability to copy and paste information from website	2.7	0.92	C
5	Ability to copy and work on a picture	2.2	0.84	C
6	Ability to create a class blog	2.0	0.64	NC
7	Ability to use installed browsers	2.5	0.82	C
8	Ability to reference downloaded information	2.0	0.66	NC
9	Ability to open referenced cites in the internet	2.3	0.90	NC
10	Ability to upload teaching materials to the internet	2.1	0.81	NC

Key: Competent = C Not Competent = NC

Result on Table 3 shows that in-service teachers show competence in internet usage with high mean scores in 6 skills areas. Result however show low mean score on creating a class blog with a mean of 2.0.This indicates that respondents show deficiencies in some areas of internet digital skills. Also standard deviation scores shows that there was minimal variation in the mean response scores.

Discussion

This study investigated in-service degree early childhood teachers competence in integrating digital technologies in the early childhood STEM classroom. The competencies investigated included Digital presentation skills using zoom, WhatsApp, Google classroom and Microsoft slide. It also investigated educational robotics competencies of the teachers as well as inter use competence. Results from the study revealed that early childhood in- service teachers show poor competence in digital presentation skills with zoom, WhatsApp and Google classroom, with low mean scores in these skills areas. They however show better competence in slide presentation skills. These include skills such as selecting a slide layout, insert and format picture, set slide timing, among others. The finding is in agreement with Techno Hella's (2012) who found that teachers show some presentation competencies in slide presentation. However newer technologies requires that teachers must brace up to integrating them in learning in STEM. WhatsApp for instance is a social media messaging application that allows its users to send free text messages, pictures, audio files, and videos to each other. This makes WhatsApp's a practical learning tool within the early childhood educational

environment. Its usage has been tested by many teachers, and its potential for supporting and delivering course contents growing in popularity (Alamer & Al Khateeb, 2021). One then wonders how early childhood instruction will benefit from this digital technologies if in-service teachers continue to show poor competence in its use?

Results from this study showed that in-service teachers were aware about the existence of educational robotics. They however show low competence in the knowledge of robot parts, application, ability to follow programmed instructions and identify the moving part of a robot. The findings of this study is consistent with the views of Fabiyi, Abdulmalik and Taimiu (2016) who posited that some teachers exhibit lack of competence in application educational robotics. Palaiologou (2016) has emphasised that robotics competence is needed for effective use of technology integration in early childhood STEM programmes. If Nigeria must take part in the 21st century fourth industrial revolution which centred on effective deployment of digital technology, then deliberate efforts must factored such improving in-service teachers' competence to implement educational robotics programmes in their early childhood STEM classrooms. Robotics encourages children's interests toward learning of a variety of scientific concepts, including force and motion, simple machines, mechanical advantage, speed ratios, force ratios, electron flow, Ohm's law, series and parallel circuits, as well as basic arithmetic and understanding the big idea for equations later in STEM. Since robotics also can be used to introduce modern technologies to children, efforts should be geared towards improving teachers competence to actively engage robotics in STEM, and providing them with the opportunity to explore and think in a constructivist way.

Also, regarding the internet usage skills competencies of early childhood in-service teachers for effective use of digital technology in the classroom; teachers report some fair competence in the ability to arrange concepts or titles which are to be browsed from the internet, ability to employ appropriate search engine in locating a website; ability to attach appropriate name tag to a folder, among others. Teachers need to be proficient in internet usage to effectively integrate this in teaching and learning. Okeke and Edika (2011) had lamented that most teachers lack the competencies needed in the use of information technologies to perform task such as: accessing, processing, storing, printing and retrieval of information from the internet. In this light Netliteracy (2012) maintain that basic internet usage skills are necessary for effective access to the internet integration in learning. Early childhood school teachers need these competencies for their effective use of digital technology in the classroom.

CONCLUSION

Early childhood level of education is a significant period for overall development of a child. This early period requires the best care and nurturing practices needed for the child's foundation and learning. Teachers are responsible for engaging the children using technologies in the classroom. Applying appropriate digital presentation competencies, using educational robots and internet usage skills are competencies required for effective use of digital technology in the classroom. This will lay a solid foundation for children's future collaborative learning, creativity and problem-solving skills.

RECOMMENDATIONS

Based on the results, the following recommendations are made:

1. Early childhood in-service teachers should endeavour to build capacity in zoom, WhatsApp, and Google classroom digital skills for use in teaching and learning.

2. State Universal Education Boards and TRCN should design Continuous professional Training packages and workshops should enable teachers acquire the competencies needed for effective use of digital technology in the classroom.

3. Federal and State Governments should endeavour to provide adequate number of digital devices for use in early childhood classroom by teachers and Children.

4. State Government and NGOs should make available internet facilities in all schools in Plateau state to enable early childhood school teachers acquaint themselves with the technology and develop the necessary competencies for their application.

5. Review curriculum to include teaching of robotics at the early childhood learning.

References

Alamer, A. & Al Khateeb, A. (2021): Effects of using the WhatsApp application on language Learners' motivation: a controlled investigation using structural equation modelling, Computer Assisted Language Learning, DOI: 10.1080/09588221.2021.[accessed Nov 06 2022].

Christiana (2019). STEM robotic kits and STEAM robotics in preschool education. https://kinderlabrobotics.com/blog/blog/stem-kits-andsteam-robotics-in-preschool-education/

DriveMind Group (2018). Safety and security, robotics and STEM, infectious control. The importance of robotics in education.

https://drivemindgroup.com/the-importance-of- robotics-in-education/

Erna, N., Risma, A. A. G., Fadel, M. & Titin S. (2022).The effectiveness of media zoom meetings as online learning during the Covid-19 pandemic. *Studies and Perspectives in English Language Teaching, 9*(1)

Fabiyi, S.D., Abdulmalik, A.O. & Tiamiu H.A. (2016). Introducing robotics into Nigerian secondary schools curriculum: likely impacts challenges and possible solutions. International Journal of Engineering Research and General Science,4(4), July-August, 2016ISSN 2091-2730

Federal Republic of Nigeria (2013). National policy on education. Lagos: NERDC Press

Gambari, A. I. Ysusuf, H. T., & Balogun, S. A. (2015). Effectiveness of power point presentation on students' cognitive achievement in technical drawing. Malaysian Online of Educational Technology 3 (4). https://www.researchgate.net/publication/28799479

Katniyon, H.D. (2006). Changing the face of the Nigerian classroom in the 21st century: ICT as an emerging instructional resource. Being a paper presented at the National conference on Critical and emerging Issues in Nigerian Education organized by COEASU Gindiri Chapter. 6th – 19th June 2006

Khodabandeh, F. (2022). Exploring the viability of augmented reality game- enhanced education in WhatsApp fipped and blended classes versus the face-to-face classes. Education and Information Technologies https://doi.org/10.1007/s10639-022-11190-6

Lerch, Beverly (2018). 7 Reasons Why robotics should be taught in schools. https://blog.robotiq.com/7-reasons-to-teach-robotics-at-school

National Association for the Education of Young Children (2012). Technology and interactive media as tools in early childhood programs serving children from birth through age 8. http://www.naeyc.org

Nigeria Educational Research and Development Council (2007). National minimum standard for early childcare centres in Nigeria. Supported by UNICEF. Abuja: NERDC Press.

Morrison, G.S. (2012). Early childhood education today. New Jersy: Pearson Pentice Hall

Netliteracy (2012). Basic internet skills. microsoft windows PCs. http://www.netliteracy.org/wp-content/uploads/2012/07/Basic-InternetSkills.pdf. Accessed 20 October 2022.

Obiweluozo, P. E; Onwurah C. N.; Oraelosi, C. C. ; Uzodinma, U. E. & Dike, I. C. (2021). Competencies needed by pre-primary school teachers for effective use of digital

technology in the classroom. The Educational Psychologist, 14(1),103

Okeke, F.C. & Edika, E. C. (2011). Competency and utilization of information management among school teachers: implications for e-learning service delivery. In Onyegegbu, N & Eze, U. Optimising e-learning opportunities for effective educational service delivery. A publication of the Institute of Education, University of Nigeria, Nsukka.

Okwor, A. N. and Taiwo, O. K. (2021). A comparative analysis of undergraduate's use of internet for socio academic reasons. DOI :http://dx.doi.org/10.21474/IJAR01/12707

Palaiologou, I. (2016). Teachers' dispositions towards the role of digital devices in play-based pedagogy in early childhood education. Early Years. 36(3), 305-321, DOI:10.1080/09575146.2016.1174816

TechnoHella (2012). Presentation skills in the classroom. https://www.technokids.com/blog/technologyintegration/presentationskillsintheclassr zoom/. Accessed 7th Nov., 2022

Ukonze, J. A. & Olaitan, S. O. (2008). Competencies needed by teachers of agricultural science for effective computer application in agriculture in secondary schools in Enugu State. In Nworgu, B.G. Education in the information age: Global challenges and enhancement strategies. Proceedings of first international conference of the Faculty of Education, University of Nigeria, Nsukka.