ASSESSMENT OF LECTURERS' READINESS TO USE ARTIFICIAL INTELLIGENCE FOR EDUCATION IN A NIGERIAN UNIVERSITY

GLORY THOMAS, HARUNA MUHAMMAD MUFTAWU, ABDULAZIZ ABDULRAZAK, STEPHEN JAMES & ESTHER NNADZWA GANA
Department of Educational Technology, Federal University of Technology Minna, Niger State
Department of Educational Foundations, Prince Abubakar Audu University Anyigba, Kogi State
Zion Academy Minna, Niger State
Government Secondary School Gawu, FCT, Abuja
glory.pg202321443@st.futminna.edu.ng

Abstract

Nigerian universities are yet to fully explore AI in their educational activities, which may be due to inadequate awareness, lecturers' attitude, lack of self-efficacy, opposition to change, lack of adequate preparedness to utilise AI. Hence, this study assessed lecturers' readiness to use Artificial Intelligence for education in a Nigerian university. The study adopted a descriptive survey of research design. A sample of 271 lecturers was selected using Proportionate Stratified Randomly Sampling Technique. The study was guided by two research questions and a corresponding research hypothesis. A researcher-designed structured questionnaire validated by four experts was used for data collection. The pilot questionnaire was tested, and the data obtained were subjected to statistical analysis using Cronbach Alpha Correlation Formula and a reliability coefficient of 0.80 was obtained. The study revealed lecturers are ready to use AI, no significant difference in the mean response of male and female university lecturers' readiness to use Artificial Intelligence. It was recommended among others that conferences, seminars and workshops should be organised for lecturers to enable them use AI in augmenting their educational activities; enabling environment with adequate facilities that will enable the lecturers to acquire adequate knowledge and skills on the use of AI should be provided by education stakeholders.

Keywords: Keywords: Artificial Intelligence, Readiness, Nigerian University, Gender

Introduction

Information and Communication Technologies have brought into education, facilities for virtual learning, integration of digital media in teaching and learning which will continue to enhance the development of 21st-century learning skills (Ezugwua *et al.,* 2016). The advancement of ICTs has set the pace for the fourth educational revolution (Education 4.0). In this Education 4.0, innovations are becoming faster, more efficient and more widely accessible than before, thus advancing abilities, skills and technologies in education. Examples of these technologies are; Internet of Things (IoT), Cloud Computing, and Artificial Intelligence (AI). Artificial Intelligence provides a better picture of how the human mind works as it is being imitated by machines. The present progressive rate of AI has already impacted the profound nature of services within education (Popenici & Kerr, 2017). With the effective integration of AI for education, the role of lecturers are being modified to be a guide of knowledge for ensuring unlimited access to knowledge, life-long learning, and enhancing 21st-century learning. This innovation significantly made efficient modifications to the quality of services rendered and time spent teaching students in a university. In Nigeria's education system where students are subjected to the traditional approach of learning, AI technologies can assist learners with different learning styles around the world as it fosters personalised learning. Therefore, lecturers should take advantage of AI as it can motivate learners and lecturers. It will also enable teachers to perform more tasks and activities without stress and also improve learning outcomes.

With the use of AI, lecturers can analyse learners' needs in the class and recognise those who are slow learners in understanding the topics and provide timely remediation. AI technology of machine vision using face surveillance would capture the learner's face and showcase it to the lecturer for appropriate action to be taken by the lecturer to improve learning. In addition, games learning platforms powered by AI make lessons fun, motivate the learners and sustain the interest of the learners during instructional delivery. Create a link in all paragraphs. Lecturers need to be ready to utilise AI for education by being provided with skills on how to use computers and ICT effectively and creatively. Lecturers' readiness refers to their willingness to incorporate new technologies in performing tasks (Lai &

Ong, 2010). Similarly, Serdyukov (2017) added that lecturers' preparation and readiness for life-long learning will ensure their constant updating and renewal of knowledge which is necessary for them to be abreast with the recent and innovative technology to enable them use the technology.

Lecturers' readiness can be determined from their willingness to adopt AI in education and willingness to acquire ICT skills and knowledge since Artificial Intelligence is a result of innovation and advancement in ICT. Eristi and Kurt (2012) noted that lecturers need sufficient time for preparation for them to use technology for teaching purposes as they face problems in determining how technology can be used effectively in the classroom. A university lecturer is a person who lectures as an occupation in a university. In education, the role of a university lecturer is that of a guide, mentor, facilitator, academic supervisor, and instrument to ensure comprehensive learning. The investigation of the readiness of lecturers to utilise AI technologies is paramount since they are the key players in the successful utilisation of Artificial Intelligence for education. Hence, the need to assess lecturers readiness to use Artificial Intelligence in education in a Nigeria university.

The sociocultural features and roles attributed to female and male in any community are referred to as gender. Gender, according to Abioye (2018), refers to the social interactions and possibilities that come with being male or female, as well as the relationships that exist between women and men, girls and boys. Previous studies also revealed that male lecturers were more ready to use technologies (Alazzam, *et al.,* 2012; Badri, *et al.,* 2014). Study by Egunjobi, (2015) reported that there was no significant difference between male and female teachers' readiness to use ICT facilities for education. Although, studies by Alazzam *et al.* (2012) and Badri *et al.* (2014) showed that male lecturers were more ready to utilise technologies for education than the female. Based on these inconclusive findings, the present study assessed the influence of gender on lecturers' readiness to use AI for education.

Statement of the Research Problem

In this digital age, Artificial Intelligence plays a significant role in the educational success of lecturers and learners by offering them new innovative ways of teaching and learning, assessment, acquiring skills, communicating, sharing, creating, grading, analysing and interacting with learning materials. Artificial Intelligence when effectively integrated and used optimally in the teaching and learning process will enhance the development of digital literacy and informed citizenship in the digital age. The work of a lecturer is demanding, especially in Nigerian institutions with insufficient technologies and large class size with learners of different learning abilities. AI devices, applications and software can be used by lecturers as very effective supporting tools (Pokrivcakova 2019). Despite the numerous benefits associated with the utilisation of AI in education, lecturers in Nigerian universities are yet to fully explore AI in their educational activities, which may be due to inadequate awareness of the intelligent devices, applications (apps) and software systems available in education. Lecturers' attitude, lack of self-efficacy, lack of sufficient technical know-how, opposition to change, lack of adequate preparedness to utilise AI in education among others. Therefore, the need to assess lecturers' readiness to use Artificial Intelligence for education in a Nigerian university. Furthermore, studies have been conducted on teachers' and lecturers readiness to use ICT technologies, e-learning, electronic resources, electronic information resources, instructional media, virtual learning, turn-it-in software, machine learning, mobile learning, nanotechnology, Internet services and resources. But none of such study was conducted on lecturers' readiness to use Artificial intelligence for education. Hence, this study is intended to fill this research gap by assessing university lecturers' readiness to use Artificial Intelligence for education in a Nigerian University.

Research Questions

The following research questions were answered in this study:

(i) To what extent are university lecturers ready to use Artificial Intelligence for education?

(ii) What is the difference between male and female university lecturers readiness to use Artificial Intelligence for education?

Research Hypotheses

HO_1: There is no significant difference in the mean response of male and female university lecturers' readiness to use Artificial Intelligence for education

Research Methodology

The research design adopted for this study is descriptive survey research design. The Nigerian University selected for this study is the Federal University of Technology (FUT) Minna. The population of this study comprised all the 903 lecturers across the nine schools in FUT Minna, Niger State (Information Technology Service, 2021). Proportionate Stratified Random Sampling Technique was used to select 30% of lecturers across the nine schools of FUT, Minna. The sample distribution of lecturers in Federal University of Technology, Minna across the nine schools is presented in table 1.

Table 1: Proportionate sample size of lecturers from each school in FUT, Minna

S/N	Schools	Male	Female	Sample Size
1	School of Agriculture and Agricultural Technology	34	9	43
2	School of Electrical Engineering and Technology	24	2	26
3	School of Environmental Technology	36	5	41
4	School of Information and Communication Technology	19	7	26
5	School of Life Sciences	15	10	25
6	School of Physical Sciences	34	6	40
7	School of Science and Technology Education	14	4	18
8	School of Infrastructure, Process Engineering and Technology	36	4	40
9	School of Entrepreneurship and Management Technology	9	3	12
	Total	**221**	**50**	**271**

A structured questionnaire developed by the researcher titled Lecturers' Awareness of Artificial Intelligence for Education (LAAIE) consists of 30 items, structured on four points rating scale of FA (Fully Aware = 4), A (Aware = 3), NFA (Not Fully Aware = 2) and NA (Not Aware = 1) was used for data collection. To ascertain the appropriateness of the questionnaire, it was validated by four experts, two senior lecturers from the Department of Educational Technology, a lecturer from the Department of Science Education Department and a Guidance Counsellor all in the Federal University of Technology Minna. All the corrections, suggestions and modifications made were effected. To determine the internal consistency of the questionnaire, a one-shot pilot test was conducted at the University of Abuja, on 45 lecturers. The data were subjected to statistical analysis using Cronbach Alpha Correlation Formula, and a reliability coefficient of 0.87 was obtained. Cronbach alpha scores greater than 0.70 are considered as indicative of acceptable reliability (Taber, 2016). Hence, the instrument was considered reliable to collect the needed data.

Results

Research Question one

To what extent are university lecturers ready to use Artificial Intelligence for education?

Mean and Standard Deviation were used to answer research question one as shown in Table 2.

Table 2: Mean and Standard Deviation on the extent of university lecturers' readiness to use Artificial Intelligence for education

S/N	Level of readiness to use	N	$\bar{X}$	Std	Decision
1	AI writing assistants such as Grammarly to improve my students writing skills.	271	3.37	0.57	Ready
2	Smart board to promote class discussions and improve students' experiences and presentation skills.	271	3.41	0.56	Ready
3	AI learning platforms such as goggle classroom to enhance lecturers and learners interaction	271	3.28	0.69	Ready
4	AI learning platform like Netex learning to create customized students learning materials and incorporate interactive elements such as audio, video and self-assessment into the learning material.	271	3.05	0.68	Ready
5	Gooru, an AI learning platform to find, remix and share collections of web resources to my students	271	3.12	0.72	Ready
6	Intelligent tutoring system to provide personalized learning to student based on their learning style.	271	3.25	0.68	Ready
7	Presentation translator to present learning content both orally and visually to students	271	3.09	0.73	Ready
8	Embibe to provide customized materials and personalized feedback to my students.	271	3.01	0.77	Ready
9	Padlet to enhance collaborative learning and gauge my students understanding of a topic or concept.	271	3.01	0.80	Ready
10	Khan Academy to identify gaps in my students' understanding of a concept, tailor instruction to meet the needs of every students.	271	2.82	0.87	Ready
11	Blendspace to create digital lessons or use free lessons and activities created by other educators and assess my students' performance.	271	2.96	0.77	Ready
12	Brainly to connect with their peers to address subject specific questions and answers which are verified by over a thousand moderators who recommend a peer that can offer hints to get the correct answer	271	3.07	0.70	Ready
13	Robots to provide customized answers in response to learners´ messages, grade their performance, and provide tips on what area learners need to improve.	271	2.94	0.72	Ready
14	Automated facial recognition like biometric face scanning surveillance to automate attendance roll marking in class and during examination.	271	3.00	0.65	Ready
15	AI software such as Turnitin to assess, provide feedback to students and ascertain their level of plagiarism.	271	3.34	0.62	Ready
16	I am ready to use AI-powered cameras to track students' movements, monitor their facial expressions and enhance automating examination supervision.	271	3.20	0.68	Ready
17	WriteToLearn, to evaluate the meaning, relevance of text and correctness of grammar and spellings of my students' writing.	271	3.09	0.73	Ready
18	Kahoot, a game-based learning platform for formative and summative evaluation.	271	2.77	0.89	Ready
19	I am prepared to use Gradescope to assess word length, spelling errors, and the ratio of upper case to lower case letters, which	271	2.80	0.88	Ready

	offer students immediate grades and feedback on their submitted work.				
20	Intelligent Essay Assessor an internet-based tool to automatically evaluate the meaning of the text, grammar, style, and the mechanics of my students' text structure.	271	3.05	0.73	Ready
21	GradeCam to read my students' numeric handwriting, automatically score the answer based on the answer key I provide.	271	2.99	0.72	Ready
22	Statistical Package for Social Science (SPSS) for immediate manipulation and computation of statistical and mathematical calculations.	271	3.41	0.69	Ready
23	Google scholar to quickly see the main journals, disciplines and authors that publish in my area of interest	271	3.44	0.63	Ready
24	Grammarly Premium to automate proofreading identify and correct errors in my writing while preventing plagiarism.	271	3.35	0.70	Ready
25	Cited reference search in Web of Science to monitor current development and track prior research in over 100 years record and back files.	271	3.23	0.76	Ready
26	Scopus a source neutral abstract and citation database, to generate precise citation search results and automatically create and update my research profile.	271	3.14	0.76	Ready
27	Mendeley to predict citation impact, automate extraction of metadata from PDF articles, organise and share research questions.	271	3.14	0.81	Ready
28	Kopernio to easily and legally read the full texts of scientific journal articles.	271	2.94	0.74	Ready
29	Research gate for collaboration with colleagues and peers of similar interest in research	271	3.31	0.68	Ready
30	EndNote to automate the collection and curation of research materials and formatting of bibliographies	271	3.14	0.81	Ready
	Grand mean		**3.12**		**Ready**

Table 2 shows the extent of university lecturers' readiness to use AI for education. From the table, the mean response of all the items had mean ratings within the range of 2.5 – 3.5 (R) which means that University lecturers are ready to use all the itemised AI technologies for education. The table further revealed that the grand mean score response to the 30 items is 3.12 which falls under the mean rating of ready. This implies that university lecturers are ready to use AI for education.

Research Question two

What is the difference between male and female university lecturers' readiness to use Artificial Intelligence for education?

Mean and Standard Deviation were used to answer research question two as shown in Table 3.

Table 3: Mean and Standard Deviation of male and female university lecturers' readiness to use Artificial Intelligence for education

Gender	N	$\bar{X}$	Std. Deviation	Mean Difference
Male	221	77.96	12.42	
				0.94
Female	50	78.90	10.11	

Table 3 shows the mean and standard deviation of male and female university lecturers' readiness to use AI for education in a Nigerian University. From the result, the mean and standard deviation of male lecturers are $\bar{X}$ = 77.96 with SD = 12.42 while the mean and standard deviation of female lecturers are $\bar{X}$ = 78.90 with SD = 10.11 with a mean difference of 0.94 in favour of female. This shows that female lecturers had higher mean rating than their male counterparts on their readiness to use AI in a Nigerian University.

Hypothesis one

There is no significant difference in the mean response of male and female university lecturers' readiness to use Artificial Intelligence for education.

In testing hypothesis one, the mean response of male and female university lecturers' readiness to use Artificial Intelligence for education was analysed using independent samples t-test as presented in Table 4.

Table 4: Independent samples t-test of male and female university lecturers' readiness to use of Artificial Intelligence for education

Gender	N	df	Mean	Std. Deviation	t-value	p-value
Male	221		77.96	12.42		
		269			0.499	0.618^{ns}
Female	50		78.90	10.11		

NS: Not Significant at 0.05 (p>0.05)

Table 4 shows the independent samples t-test results of male and female university lecturers' readiness to use Artificial Intelligence for education. From the table, t = 0.499, p = 0.618. The p-value is greater than the level of significance, hence hypothesis two was not rejected. This shows that there is no significant difference in the mean response of male and female lecturers' readiness to use Artificial Intelligence for education in a Nigerian University.

Discussion of Findings

University lecturers were ready to use AI for education. This is in accordance with the findings of Hassan *et al.* (2014) whose result showed that lecturers were ready to embed soft skills. Badri *et al.* (2014) study revealed that teachers are ready to use technology. Edumadze *et al.* (2014) study revealed that lecturers were ready to use Electronic learning for instructional delivery. Similarly, Yusuf *et al.* (2018) study revealed that lecturers were ready to use podcasts in teaching. Samad *et al.* (2019) study reported that primary school science teachers were ready to use Mobile Learning.

In addition, findings of Kwafo (2019) study reported that students were ready to adopt skills in AI. Tyan *et al.* (2020) discovered that secondary school language teachers were ready to implement 21st Century learning and facilitating skills. Moreso, Falode *et al.* (2018) study discovered that lecturers were ready to adopt WizIQ in their teaching and learning process. However, Summak *et al*. (2010) reported that primary school teachers' overall technology readiness level was moderate. Similarly, Zelkepli *et al.* (2013) discovered that the readiness of teachers in using the Virtual Learning Environment (VLE Frog) for teaching and learning was at a moderate level. Study by Farhan (2016) disclosed that the teachers were moderately ready for M-Learning. Ahmad *et al.* (2020) study revealed that academic staff readiness towards learning technical skills required for Industrial Revolution 4.0 was at an average level. The finding of this study contradicts the findings of Naicker (2017) who revealed that teachers were not ready to integrate ICTs effectively into the teaching and learning process.

Another finding of this study reported that male and female lecturers were ready to use Artificial Intelligence for education in a Nigerian university which corresponds with the finding of Egunjobi (2015) whose study revealed no significant difference between and male and female teachers' ICT readiness for ICT facilities utilisation. Alrashidi (2017) also showed that there was no significant difference between gender and e-learning readiness of subject supervisors to adopt e-learning. However, the finding disagrees with that of Summak *et al*. (2010) which revealed that the male teachers had a higher mean score of technology readiness than the female teachers. Findings of Alazzam *et al.* (2012) revealed that male teachers were ready to integrate ICT in their teaching than their female counterparts. Similarly, Badri *et al.* (2014) revealed that the level of technology-readiness of male teachers was significantly higher compared to their female counterparts. Falode *et al.* (2018) study revealed that level of readiness of male lecturers to adopt OER was higher than that of their female counterparts. The finding contradicts that of Jwaifell (2019) whose

study revealed that female teachers were more ready to integrate augmented reality at the TPACK domains than their male counterparts.

Conclusions

Artificial Intelligence as one of the major technologies in the fourth educational revolution has been integrated into education. The study concluded that lecturers in Nigerian Universities are ready to use Artificial Intelligence (AI) for education. Gender equality is a factor to be considered in every aspect of human endeavour. It is clear from the study that male and female university lecturers were ready to use Artificial Intelligence for education.

Recommendations

Based on the findings of this study, the following recommendations are made:

(i) conferences, seminars and workshops should be organised for lecturers to enable them to use AI in augmenting their educational activities.

(ii) enabling an environment with adequate facilities that will enable the lecturers to acquire adequate knowledge and skills on the use of AI should be provided by education stakeholders.

References

Abioye, M. (2018). *Gender issues affecting the use of humanoid robots in education*. Master's thesis, submitted to Faculty of Science and Technology, School of Computing And Information Systems, Athabasca University. Retrieved from https://dt.athabascau.ca/jspui/bitstream/10791/290/1/MojibolaAbioyeFinal.pdf

Ahmad, A. R., Segaran, G. R., & Sapry, H. R. (2020). Academic staff and Industry Revolution 4.0: knowledge, innovation and learning factor. *Journal of Education and e-Learning Research*, 7(2), 190-194, doi:10.20448/journal.509.2020.72.190.194

Alazzam, A., Bakar, A., Hamzah, R., & Asimiran, S. (2012). Effects of demographic characteristics, educational background, and supporting factors on ICT readiness of technical and vocational teachers in Malaysia. *International Journal of Education Studies*, 5(6), 56-64, doi:10.5539/ies.v5n6p229.

Alrashidi, M. (2017). *Investigating the e-readiness of subject supervisors to adopt e-learning in the State of Kuwait*, (Doctoral Dissertation), University of Southampton, United Kingdom. Retrieved from https://eprints.soton.ac.uk/414106/ on 12th March 2020

Badri, M., Al Rashedi, A., Yang, G., Mohaidat, J., & Al Hammadi, A. (2014). Technology readiness of school teachers: An empirical study of measurement and segmentation, *Journal of Information Technology Education: Research,* 13(1), 257-275.

Edumadze, J. K. E., Ossei-Anto, T. A., Edumadze, G., Tamakloe, W. K., Asamoah, E., & Boadi, E. (2014). Evaluating the awareness and perceptions of lecturers in using E-learning tools for teaching in University of Cape Coast. *International Journal of Computing Academic Research (IJCAR)*, 3(1), 1-11. Retrieved from http://www.meacse.org/ijcar

Egunjobi, A. O. (2015). Teachers' and learners' ICT-readiness assessment form Agricultural Science instruction in Oyo State, Nigeria. *International Journal of Learning, Teaching and Educational Research,* 8(1), 187-214. Accessed from www.iiste.org on 23rd April 2021

Erişti, S. D., & Kurt, A. A. (2012). Teachers' views about effective use of technology in classrooms. *Turkish Online Journal of Qualitative Inquiry*, 3(2), 30-41.

Ezugwua, A. E., Ofema, O. P., Rathodb, P., Agushakaa, O. J., & Harunaa, S. (2016). An empirical evaluation of the role of Information and Communication Technology in advancement of teaching

and learning. *2nd International Conference on Intelligent Computing, Communication & Convergence, Procedia Computer Science* 92, 568–577, doi: 10.1016/j.procs.2016.07.384. Retrieved from http://creativecommons.org/licenses/by-nc-nd/4.0/ on 26th February 2020,

Falode, O. C., Gambari, A. I., Alabi, T. O. & Falode, M. E. (2018). Investigation on awareness and readiness towards the adoption of WizIQ platform for instructional delivery among Education lecturers in tertiary institutions of Niger State, Nigeria. *International Conference on Education, Proceedings Development & Innovation*, 239-245.

Falode, O. C., Ilufoye, T. O., Awoyemi, I. D., & Usman Z. N. (2018). Lecturers' awareness and readiness towards the adoption of Open Educational Resources for teaching in tertiary institutions in Niger State, Nigeria. *International Journal of Education and Educational Research*, 1(2), 1-15.

Farhan, A. B. (2016). Mobile learning readiness among primary school teachers in Saudi Arabia, *International Journal of Advanced Research*, 4(7), 2174-2181, doi:10.21474/IJAR01

Hassan, A., Maharoff, M., Abiddin, N. Z. (2014). The readiness of lecturers in embedding soft skills in the Bachelor's Degree Program in Malaysia's teachers' education institute. *Arts and Social Science Journal*, 5(71), 56-67, doi: 10.4172/2151-6200.1000071

Jwaifell, M. (2019). In-service Science teachers' readiness of integrating Augmented Reality. *Journal of Curriculum and Teaching*, 8(2), 43-50, doi:10.5430/jct.v8n2p43. Retrieved from https://doi.org/10.5430/jct.v8n2p43

Kwafo, D. (2019). The impacts of Artificial Intelligence on management accounting students: A case study at Oulu Business School, Master's Thesis, University of Oulu. Retrieved on 12th December 2019 from http://jultika.oulu.fi/files/nbnfioulu-201905081636.pdf

Lai, J. Y., & Ong, C. S. (2010). Assessing and managing employees for embracing change: A multiple-item scale to measure employee readiness for e-business. *Technovation*, 30(1), 76-85. Retrieved from https://DOI.org/10.1016/j.technovation.2009.05.003

Naicker, T. (2017). *Exploring teacher readiness to integrate Information and Communication Technologies into the teaching and learning process: A case study of two Gauteng Schools*. A Master's thesis submitted to the School of Education, Faculty of Humanities, University of the Witwatersrand.

Pokrivcakova, S. (2019). Preparing teachers for the application of AI-powered technologies in foreign language education. *Journal of language and cultural education*, 13(07), 135 -145, doi:10.2478/jolace-2019-0025

Popenici, S. A. D., & Kerr S. (2017) Exploring the impact of Artificial Intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(2), 23-34, doi 10.1186/s41039-017-0062-8.

Samad, M. R., Iksan, Z. H., & Khalid, F. (2019). Acceptance and readiness to use M-learning among primary school science teachers. *Creative Education*, 10, 3003-3011. Retrieved from https://doi.org/10.4236/ce.2019.1012224

Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning,* 10(1), 4-33, doi:10.1108/JRIT-10-2016-0007

Summak, M. S., Baglibel, M., & Samancioglu, M. (2010). Technology readiness of primary school teachers: A case study in Turkey. *Procedia Social and Behavioural Sciences,* 2, 2671–2675, doi:10.1016/j.sbspro.2010.03.393

Taber, K. S. (2016). The use of Cronbach's Alpha when developing and reporting research instruments in science education. *Journal of Research in Science Education*, 48(2) 1273–1296, doi 10.1007/s11165-016-9602-2

Yusuf, H. T., Gambari, A. I., Daramola, F. O., Badmus, A. O., & Isiaka, A. B. (2018). Lecturers' awareness, readiness and self-efficacy of using podcast for teaching in tertiary institutions in Niger state, Nigeria. *Journal of Science, Technology, Mathematics and Education,* 14(1), 186-196.

Zelkepli, S. N., Hamzah, M., & Mohamed, N. (2013). Teacher readiness and barriers in using the Virtual Learning Environment (FROG VLE) for teaching and learning in secondary schools in Malaysia. *Journal of Mathematics, Science and Technology Education*, 5(3), 235-245.