Gender Differences in Teachers' Digital Literacy Skills in Teaching STEAM

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A B S T R A K

Karakteristik guru seperti tingkat pendidikan, usia, jenis kelamin, pengalaman pendidikan dan pengalaman menggunakan komputer untuk tujuan pendidikan dapat mempengaruhi adopsi suatu inovasi dalam pengajaran. Penelitian ini bertujuan untuk menganalisis dampak perbedaan gender terhadap keterampilan literasi digital guru dalam pengajaran STEAM di sekolah menengah. Penelitian ini merupakan penelitian deskriptif yang mengadopsi jenis Survei. Empat pertanyaan penelitian diajukan. Populasi penelitian ini adalah guru IPA di SMP Negeri Kaduna. Teknik pengambilan sampel acak sederhana digunakan untuk memilih 150 guru sains senior di tiga pemerintah daerah. Kuesioner ini dirancang untuk memperoleh informasi dari guru sekolah menengah atas mengenai dampak perbedaan gender terhadap keterampilan literasi digital guru dalam mengajar STEAM. Data yang dikumpulkan akan dianalisis menggunakan alat statistik deskriptif yang meliputi diagram lingkaran dan bar chat. Temuan dari penelitian ini menunjukkan bahwa jumlah guru laki-laki di sekolah menengah lebih banyak dibandingkan guru perempuan yang terlibat dalam pengajaran STEAM di sekolah menengah atas, terdapat perbedaan yang signifikan pada jumlah guru laki-laki yang memiliki perangkat laptop dibandingkan dengan guru perempuan. , persentase guru laki-laki yang memiliki lebih banyak keterampilan digital lebih tinggi dibandingkan guru perempuan, kurangnya dukungan sekolah, terbatasnya waktu dan kurangnya akses internet merupakan faktor utama yang mempengaruhi penggunaan keterampilan digital dalam mengajar STEAM. Studi ini merekomendasikan bahwa sekolah harus menyediakan fasilitas yang diperlukan dalam pengajaran STEAM berdasarkan praktik terbaik global.

A B S T R A C T

Teachers' characteristics such as educational level, age, gender, educational experience and digiyal literacy for educational purposes can influence the adoption of an innovation in teaching. This study aimed at analyzing the impact of gender differences on teachers' digital literacy skills in the teaching of STEAM in secondary schools. This study was descriptive research which adopted a Survey type. Four research questions were raised. The population for this research comprised science teachers in Kaduna State secondary schools. A simple random sampling technique was used to select 150 senior science teachers across the three local governments. The questionnaire was designed to elicit information from the senior secondary school teachers on the impact of gender differences on teachers' digital literacy skills in teaching STEAM. Data collected was analyzed using descriptive statistics tools which include pie charts and bar chat. The findings of the study showed that the number of male secondary school teachers was higher than their female counterparts involved in the teaching of STEAM in senior secondary schools. A significant difference exists in the number of male teachers that possess laptop devices compared to their female counterpart. A higher percentage of male teachers possess more digital skills than their female counterpart, lack of school support, limited time and lack of internet access are the major factors affecting the use of digital skills in teaching STEAM. This study recommends that schools should provide the needed facilities required in teaching STEAM based on global best practices.

1. INTRODUCTION

Digital literacy could be seen as the capacity to utilize information and communication technologies in finding, evaluating, creating and communicating information which involves both intellectual and practical skills via capturing additional media on several digital platforms. Digital technologies have widened the scope of communication and helped people become more informed and progressive about the latest environmental trend (Al Shammari, 2021; Bai et al., 2022; Menggo et al., 2021). According to previous study, science is multidisciplinary human action that consists of intended systematic inquiry as well as an understanding of nature and the universe (Olorundare, 2014). Certain trans disciplinary skill-sets are required for digital literacy. Today, digital literacy has turned out to be very prevalent in educational institutions and among learners. A huge rise in

technologies has made significant modifications to our regular lives, one feature that lets us make every effort to become digitally literate (Makarova & Makarova, 2018; Shopova, 2014; Zandkarimi., 2013). Teachers can widely use the media and skills to relate to their environs which are greatly enhanced and integrated. They increase their competence by conducting research, teaching and creating their digital works using contemporary outfits. The potential provided by ICTs in modern education has led to the development of many multimedia and interactive educational products for use in classrooms and online learning (Abderrahim et al., 2013; Mahdum et al., 2019).

There is no need to look for analogies because digital literacy encompasses a variety of literacies, including media literacy and information literacy (Araka et al., 2021; Badaru & Adu, 2022; Hobbs et al., 2013). According to previous study, digital literacy is seen as a series of interconnected skills or proficiencies essential for the accomplishment of tasks in the digital environment (List, 2019). Digital literacy is one of the most important subjects in the education sector and it requires the critical use of digital tools. The impact of computer and digital technologies on the developments of science and technology education and the successes of learners in the training, affirm their positive impact on diverse facets of education (Alhalafawy & Zaki, 2019; Vartiainen et al., 2016). The amount components of digital competence are crucial parts of 21st-century training. We, as educational institutions, cannot disregard the new problems posed by the expanding trend in the development of new technologies such as robotics, the "Internet of Things" or artificial intelligence among many other elements (Barton et al., 2022; Dudek & Heiser, 2017; Samerkhanova & Imzharova, 2018). Digital technological proficiencies were an integral part of the teacher's professional competency profile, not considering the subject taught by the teacher. The content of these competencies depends on the time, and while in the past it was changing very slowly, at present, due to the influence of the rapid development of digital technologies, that has been changing very quickly (Haleem et al., 2022; Lenz et al., 2022).

Schools are continuously updating their curriculum to keep up with accelerating technological developments. This often includes computers in the classroom, the use of educational software to teach curricula, and course materials being made available to students online. Students are often taught literacy skills such as how to verify credible sources online, cite websites and prevent plagiarism. As technology-used has increased over the past ten years, educators are changing traditional teaching methods to incorporate course material on ideas related to digital literacy (Cahyani & Jayanta, 2021; Wang et al., 2018). Beginning with initial teacher training and continuing throughout a teacher's subsequent years of practice, the development of a teacher's digital competency (TDC) is recommended. This is the purpose of using Digital Technologies (DT) to improve teaching and professional development (Baran et al., 2011; Falloon, 2020). New models of learning are being developed with digital literacy in mind. These innovative classroom learning techniques have also helped to foster global connectivity and allowed pupils to develop into citizens with a global perspective.

Base on preliminary observation in Nigeria, teachers and other educators in higher institutions have been involved in some form of informal online communication and discussion process (Ashaver, 2013; Okoye, 2014). These could be harnessed and used as strength towards leveraging the conventional process of teaching and learning in schools. This would create a computer and internet-mediated environment where teaching and learning work is augmented (Lee et al., 2021; Parkes et al., 2015). Teachers' characteristics such as educational level, age, gender, educational experience and experience with the computer for educational purposes can influence the adoption of an innovation in teaching (Badaru & Adu, 2022; Tschand et al., 2020). This study was designed to investigate the influence of teacher gender on digital literacy skills focusing on the kinds of digital devices and skills they possess, how they learn the digital skills, the extent of use of these skills and their proficiency in teaching STEAM in secondary schools in Kaduna state. The main purpose of this study was to analyze the **impact of gender differences on teachers' digital literacy skills** in teaching STEAM in secondary schools.

2. METHOD

This study was descriptive research which adopted a Survey type (Morgan, 2022; Seixas et al., 2018). Four research questions were raised. The population for this research consisted of science teachers in Kaduna State secondary schools. A simple random sampling technique was used to select 150 senior science teachers across the three local governments.

The questionnaire was designed to elicit information from the senior secondary school teachers in Kaduna State secondary schools on the **impact of gender differences on teachers' digital literacy skills in** teaching STEAM. The questionnaire consisted of comprises of demographic characteristics of the teachers which included the teacher's gender, teaching experience and teacher's qualification. Section B comprised six questions on statements the digital literacy skills responses were structured on a four-point scale. Face and content validity of the instrument was carried out by three lecturers at the faculty of science, Kaduna State University. The reliability of the instrument was determined by the test re-test method on the sample that is not

part of the participant in this study. Data collections were analyzed using descriptive statistics tools which included pie charts and bar chat. The results below present the analysis of data obtained from the respondent who participated in this study. A total of 150 respondents participated in this study. Demographic characteristics of respondents are show in Figure 1, Figure 2, and Figure 3.
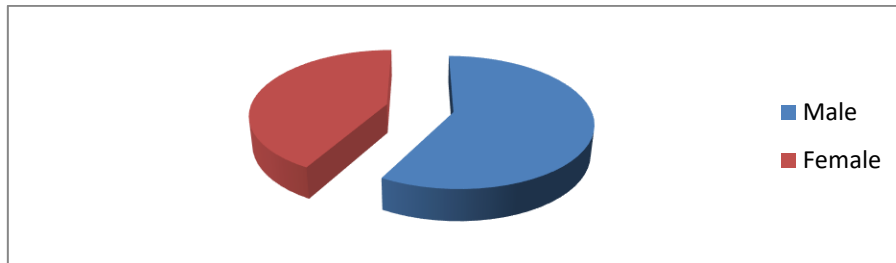

Figure 1. Gender of Science Teachers

The result shown in Figure 1 indicates that both male and female teachers participated in teaching STEAM. this study revealed that the majority of the respondent (58%) are males while the minority (42%) of the respondent are females. Therefore the number of male teachers (87 teachers) that participated in this study is higher than their female counterparts (63 teachers). Hence the number of male secondary school teachers is higher than the number of female secondary school teachers involved in the teaching of STEAM in senior secondary schools in Kaduna state.
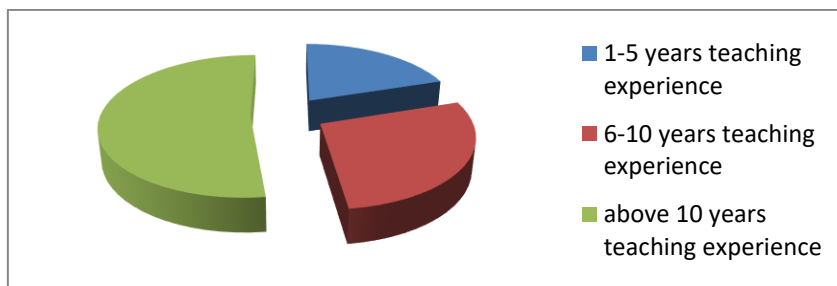

Figure 2. The Years of Teaching Experience of Science Teachers

According to Figure 2, it can be deduced that the majority of the teachers (52%) have been teaching for more than 10 years, while 28% and 20% of the teachers have 6-10 years and 1-5 years teaching experience respectively. However, teachers' gender does not influence their teaching experience.
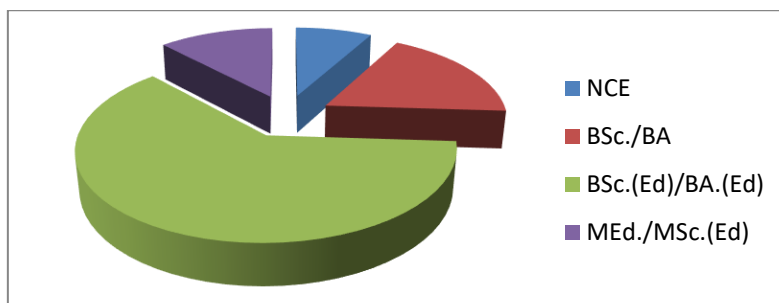

Figure 3. The Educational Qualification of Science Teachers

In Figure 3, we can see that science teachers in secondary schools possess various educational qualifications. However, the largest percentage of the teachers (62%) possess BSc(Ed)/ BA(Ed) degree. This is followed by unqualified teachers who possess BSc/BA degrees (18%). Among these, a smaller percentage (12%) of the teachers possess M.Ed/MSc.(Ed) while the least percentage of teachers (8%) possess NCE. Moreover, there is no gender difference in the academic qualifications of the science teachers as both male and female teachers are equally distributed to each of the qualifications.

3. RESULT AND DISCUSSION

Result

The extent of the use of digital skills by science teachers in teaching STEAM is show in Figure 4.
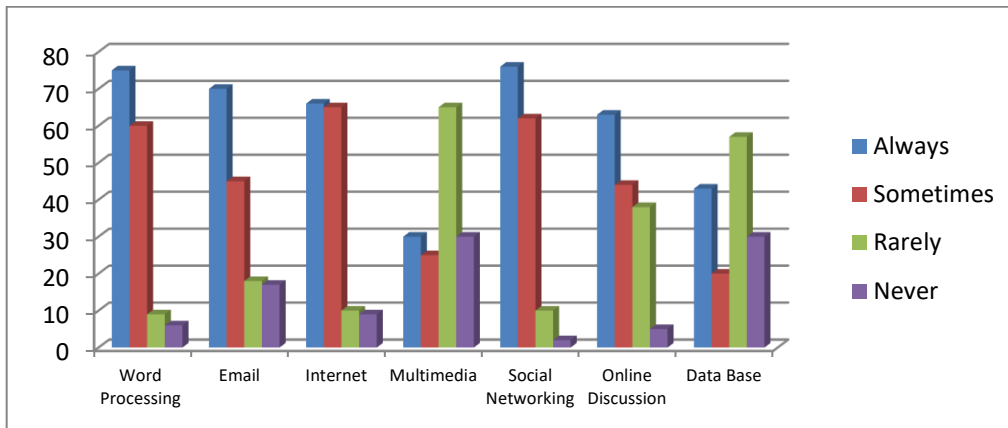

Figure 4. The extent of the use of digital skills by science teachers

Figure 4 reveals the extent of the use of digital literacy skills by science teachers in teaching STEAM. The figure shows that the majority of science teachers always use social networking (76), word processing (75), email and the internet (70) in the teaching of STEAM. Sometimes science teachers use the internet, social networking and word processing in teaching. However, most teachers rarely use multimedia and database for teaching and also a few teachers have never used multimedia and database before for teaching. Therefore both male and female teachers are indifferent in the extent of use of these skills and they enjoy using the internet, social networking and word processing in teaching STEAM. The influence of a teacher's gender on proficiency in digital literacy skills in teaching STEAM is shown in Figure 5.
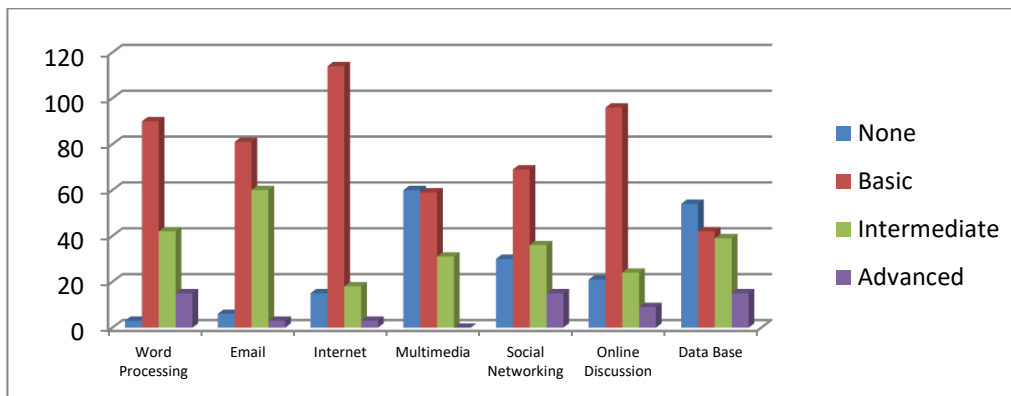

Figure 5. Teacher's proficiency in digital literacy skills for teaching STEAM

Figure 5 tells the proficiency of teachers in using digital literacy skills for teaching STEAM. It can be deduced that majority of the science teachers have a basic proficiency level in using the internet, online discussion, word processing and email. There is no difference in the percentage of teachers that have no proficiency in multimedia and those that have basic proficiency in multimedia. The digital literacy skill possessed by male and female teachers in secondary schools is show in Figure 6.

Figure 6 above indicates the digital literacy skills possessed by teachers based on gender. From the figure we can see that a higher percentage of male teachers possess digital skills in the ability to start and exit a computer program (111), the ability to turn on and shut down a computer (105), the ability to send an attachment through email (90) and ability to print a document using a printer (90) while a lower percentage of their female counterpart can perform these digital skills. However, a higher percentage of female teachers can use web search engines to seek information and also copy and paste inside a document than their male counterparts. A factor affecting the use of digital literacy skills for teaching STEAM is show in Figure 7.
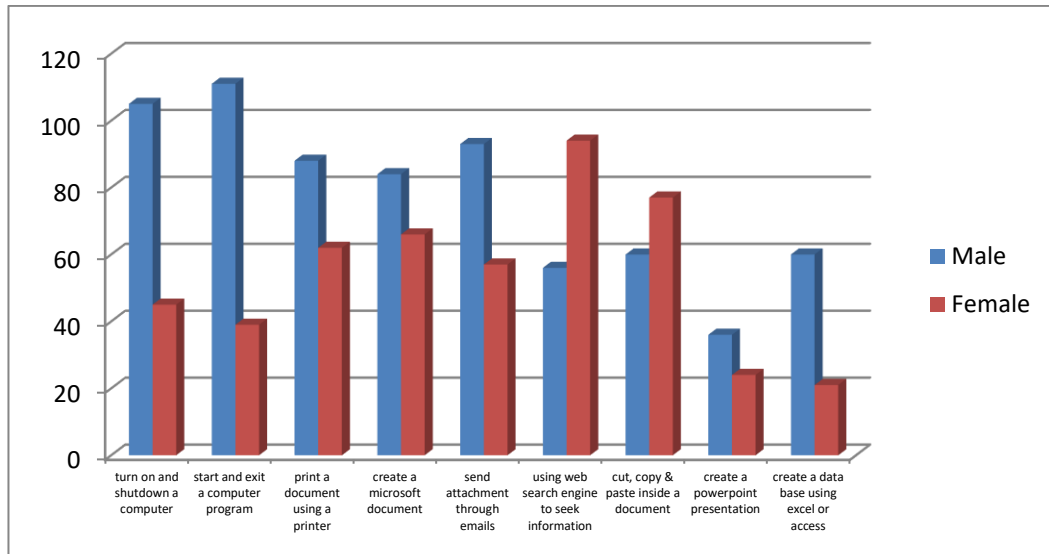
Figure 6. Digital Literacy Skills Possessed by Male and Female Teachers in Ilorin
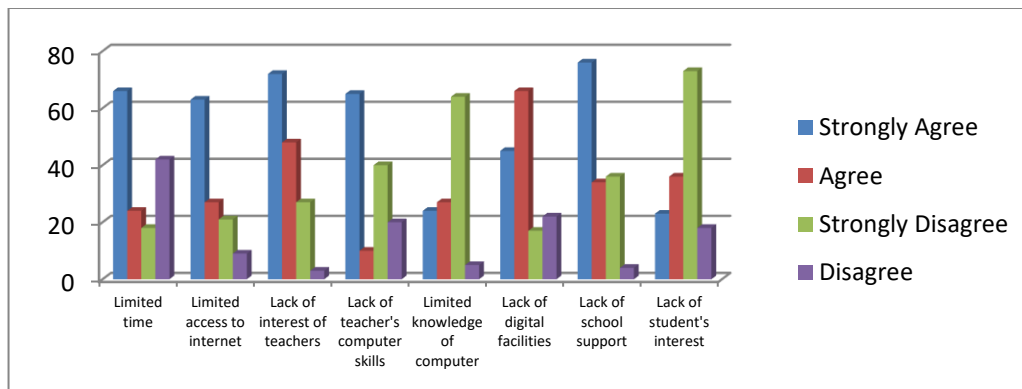

Figure 7. The Factors Affecting the Use of Digital Literacy Skills in Teaching

Figure 7 reveals the factors affecting the use of digital literacy skills in teaching STEAM. This figure indicates that the majority of the teachers strongly agreed that lack of school support, lack of teachers' interest, limited time and lack of internet access are the major factors affecting the use of digital skills in teaching STEAM. However, a high percentage of teachers also agreed that lack of facilities is one of the problems of using digital skills in teaching. Moreover, the majority of the teachers strongly disagree that lack of student interest, lack of knowledge of computers and lack of teacher's computer skills are constraints of using digital skills in teaching STEAM.

Discussion

Digital literacy is generally a blend of technical, procedural, cognitive, emotional and social skills. The use of a computer program indicates the application of procedural skills (for example, editing visual images and processing files), and also cognitive skills (for example, the ability to instinctively read pictorial information embedded in graphical user lines) (Al Shammari, 2021; Maureen et al., 2018; Schlegel et al., 2021). Likewise, searching for information on the Internet is considered a combination of procedural skills (occupied with search engines) and cognitive skills (document assessment, organizing biased files, and also differentiating between important and inappropriate data). Irrespective of the perception and the purpose for which the investigations are conducted, particularly from an interdisciplinary point of view, it is obvious that we are passing a different phase in Western civilization. After the Neolithic and the Industrial Revolution, the digital revolution leads to the third great stage which is the information society (Kergroach, 2017; Morrar et al., 2017). In Nigeria, the gender issue is a significant problem that hinders educational and sustainable growth. The gender gap in teachers' digital literacy in teaching STEAM must be closed if illiteracy in Nigeria is to be eradicated and sustainable development is to be improved (Badaru & Adu, 2022; Tschand et al., 2020). Numerous studies have been undertaken by researchers to examine the gender gap in the use of digital technology for teaching and learning.

Previous study examined how much teachers in Oyo state, Nigeria were aware of and utilizing information and communication technology (Onasanya et al., 2011). Their findings reveal the level of science teachers' utilization of ICT resources for teaching science and health education which was found to be very low and there exists a significant difference between the male and female science teachers in their level of utilization of ICTs, with the male out-performing their female counterparts with higher mean scores. Other study investigated on males had more positive attitudes towards e-learning than females (Ong & Lai, 2006). They discovered substantial gender differences, with males scoring higher than females on perceptions of computer self-efficacy, perceived usefulness and usability and behavioral intention to utilize e-learning. Their results suggested that males perceived the proliferation and development of the Internet to result in a better tool for reducing the digital divide and establishing a society of equity and justice.

This implication of this research can provide a better understanding of gender differences in teachers' digital literacy skills in teaching STEAM (Science, Technology, Engineering, Arts, and Mathematics). This can help in identifying potential gender inequalities in STEM education. In addition, the results of this research can help authorities in developing more inclusive and equitable education policies. They can design specific training programs to address the gender gap in STEAM teachers' digital literacy. However, this research may only be applicable to certain contexts and locations. The results may not be generalizable globally or to different educational settings. Recommendations that can be given are to improve digital literacy, the government should implement a funding program and provide secondary school teachers with smartphones or laptops. Beside that both male and female science educators should work to increase their expertise with the internet, online forums, databases, MS Access, MS Word, MS Excel, and MS PowerPoint. Then, the curriculum should be created in a way that incorporates digital devices into instructional practice while also taking teachers' capacity to complete the program into account.

4. CONCLUSION

The gender of the teachers has no bearing on their teaching experience, and there are no significanse differences in the academic backgrounds of the science teachers based on gender. The percentage of male teachers who own cell phones is higher than the percentage of female teachers, and there is a gender gap in the number of science instructors who own laptops, with male professors being more likely to own one than female teachers. It may be concluded that the most science educators are at a basic skill level regarding to the used of the internet, online forums, word processing, and email. The number of teachers who have no or only minimal skill in multimedia iss the same as those who have. Both genders were in agreement when it came to the main obstacles limited-use of digital skills for teaching STEAM: a lack of school support, a lack of teacher enthusiasm, a lack of time, and a lack of internet connection. The majority of secondary school educators concurred that a challenge to adopting digital tools in the classroom is a lack of infrastructure.

5. REFERENCES

Abderrahim, E. M., Mohamed, E., & Azeddine, N. (2013). An Evaluation Model of Digital Educational Resources. *International Journal of Emerging Technologies in Learning*, *8*(2). https://core.ac.uk/download/pdf/234940265.pdf.

Al Shammari, M. H. (2021). Devices and Platforms Used in Emergency Remote Learning and Teaching During Covid-19: A Case of English Major Students in Saudi Arabia. *Arab World English Journal (AWEJ*, *1*, 80–94. https://doi.org/10.24093/awej/covid.6.

Alhalafawy, W. S., & Zaki. (2019). MZTThe Effect of Mobile Digital Content Applications Based on Gamification in the Development of Psychological Well-Being. *International Journal of Interactive Mobile Technologies*, *13*(8). https://doi.org/10.3991/ijim.v13i08.10725.

Araka, E., Maina, E., Gitonga, R., Oboko, R., & Kihoro, J. (2021). University students' perception on the usefulness of learning management system features in promoting self-regulated learning in online learning. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT*, *17*(1), 45–64. http://erepository.uonbi.ac.ke/handle/.

Ashaver, D. (2013). The Use of Audio-Visual Materials in the Teaching and Learning Processes in Colleges of Education in Benue State-Nigeria. *IOSR Journal of Research & Method in Education (IOSRJRME)*, *1*(6), 44–55. https://doi.org/10.9790/7388-0164455.

Badaru, K. A., & Adu, E. O. (2022). Platformisation of Education: An Analysis of South African Universities' Learning Management Systems. *Research in Social Sciences and Technology*, *7*(2), 66–86. https://doi.org/10.46303/ressat.2022.10.

Bai, J., Zhang, H., Chen, Q., Cheng, X., & Zhou, Y. (2022). Technical Supports and Emotional Design in Digital Picture Books for Children: A Review. *Procedia Computer Science*, *201*, 174–180.

https://doi.org/https://doi.org/10.1016/j.procs.2022.03.025.

Baran, E., Correia, A. P., & Thompson, A. (2011). Transforming online teaching practice: Critical analysis of the literature on the roles and competencies of online teachers. *Distance Education*, *32*(3), 421–439. https://doi.org/10.1080/01587919.2011.610293.

Barton, M. A., Lall, M. D., Johnston, M. M., Lu, D. W., Nelson, L. S., Bilimoria, K. Y., & Reisdorff, E. J. (2022). Reliability and validity support for an abbreviated Copenhagen burnout inventory using exploratory and confirmatory factor analysis. *Journal of the American College of Emergency Physicians Open*, *3*(4), 1–19. https://doi.org/10.1002/emp2.12797.

Cahyani, N. L. P., & Jayanta, I. N. L. (2021). Digital Literacy-Based Learning Video on the Topic of Natural Resources and Technology for Grade IV Elementary School. *Jurnal Ilmiah Sekolah Dasar*, *5*(3), 538. https://doi.org/10.23887/jisd.v5i3.37918.

Dudek, J., & Heiser, R. (2017). Elements, principles, and critical inquiry for identity-centered design of online environments. *Journal of Distance Education*, *32*(2), 1–18. https://search.proquest.com/openview/36da03443bbbdec42efcb9d7d1ceb2d8/1?pq-origsite=gscholar&cbl=446313.

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4.

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*(February), 275–285. https://doi.org/10.1016/j.susoc.2022.05.004.

Hobbs, R., Donnelly, K., Friesem, J., & Moen, M. (2013). Learning to Engage: How Positive Attitudes about the News, Media Literacy, and Video Production Contribute to Adolescent Civic Engagement. In *Educational Media International* (Vol. 50, Issue 4, pp. 231–246). Routledge. https://doi.org/10.1080/09523987.2013.862364.

Kergroach, S. (2017). Industry 4.0: New challenges and opportunities for the labour market. *Foresight and STI Governance*, *11*(4), 6–8. https://doi.org/10.17323/2500-2597.2017.4.6.8.

Lee, L.-H., Braud, T., Zhou, P., Wang, L., Xu, D., Lin, Z., Kumar, A., Bermejo, C., & Hui, P. (2021). All One Needs to Know about Metaverse: A Complete Survey on Technological Singularity, Virtual Ecosystem, and Research Agenda. *ArXiv Preprint*. https://doi.org/10.48550/arXiv.2110.05352.

Lenz, C., Gebauer, B., Hladschik, P., Rus, C., & Valianatos, A. (2022). *Reference framework of competences for democratic culture: Teacher reflection tool*. Council of Europe Publishing.

List, A. (2019). Defining digital literacy development: An examination of pre-service teachers' beliefs. *Computers & Education*, *138*, 146–158. https://doi.org/10.1016/j.compedu.2019.03.009.

Mahdum, M., Hadriana, H., & Safriyanti, M. (2019). Exploring Teacher Perceptions and Motivations to ICT Use in Learning Activities in Indonesia. *Journal of Information Technology Education: Research*, *18*, 293–317. https://doi.org/10.28945/4366.

Makarova, E. A., & Makarova, E. L. (2018). Blending pedagogy and digital technology to transform educational environment. *International Journal of Cognitive Research in Science, Engineering and Education*, *6*(2), 57–65. https://doi.org/10.5937/ijcrsee1802057M.

Maureen, I. Y., van der Meij, H., & de Jong, T. (2018). Supporting Literacy and Digital Literacy Development in Early Childhood Education Using Storytelling Activities. *International Journal of Early Childhood*, *50*(3), 371–389. https://doi.org/10.1007/s13158-018-0230-z.

Menggo, S., Midun, H., & Pandor, P. (2021). Students' Digital Literacy Competence and English Study Habits. *The 1st International Conference on Education, Humanities, Health, and Agriculture*. https://doi.org/10.4108/eai.3-6-2021.2310655.

Morgan, H. (2022). Conducting a Qualitative Document Analysis. *The Qualitative Report*, *27*(1), 64–77. https://doi.org/10.46743/2160-3715/2022.5044.

Morrar, R., Arman, H., & Mousa, S. (2017). The fourth industrial revolution (Industry 4.0): A social innovation perspective. *Technology Innovation Management Review*, *7*(11), 12–20. https://timreview.ca/sites/default/files/Issue_PDF/TIMReview_November2017.pdf#page=12.

Okoye, M. D. (2014). Authentic Assessment and Evaluation: Paramount Means for the Maximization of Teaching and Learning. *Journal of Educational and Social Research*, *4*(7), 31–40. https://doi.org/10.5901/jesr.2014.v4n7p31.

Olorundare, A. S. (2014). Learning difficulties in science education: An analysis of the current status and trends. *KWASU International Journal of Education*, *1*(1), 1–12. https://www.academia.edu/download/61616747/OGUNLEYE_2019_KIU_141141-15420191227-79546-hi21jm.pdf.

Onasanya, S. A., Shehu, R. A., Ogunlade, O. O., & Adefuye, A. L. (2011). Teacher's awareness and extent of

utilization of information communication technologies for effective science and health education in Nigeria. *Singapore Journal of Scientific Research*, *1*(1), 49–58. https://journals.co.za/doi/abs/10.10520/EJC135757.

Ong, C. S., & Lai, J. Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behavior*, *22*(5), 816–829. https://doi.org/10.1016/j.chb.2004.03.006.

Parkes, M., Stein, S., & Reading, C. (2015). Student preparedness for university e-learning environments. *Internet and Higher Education*, *25*, 1–10. https://doi.org/10.1016/j.iheduc.2014.10.002.

Samerkhanova, E. K., & Imzharova, Z. U. (2018). Organizational and pedagogical conditions for forming the readiness of future teachers for project activities in the context of Digitalization of education. *Vestnik of Minin University*, *6*(2). https://doi.org/10.26795/2307-1281-2018-6-2-2.

Schlegel, E. C., Tate, J. A., Pickler, R. H., & Smith, L. H. (2021). Practical strategies for qualitative inquiry in a virtual world. *Journal of Advanced Nursing*, *77*(10), 4035–4044. https://doi.org/10.29173/iasl7898.

Seixas, B. V., Smith, N., & Mitton, C. (2018). The qualitative descriptive approach in international comparative studies: Using online qualitative surveys. *International Journal of Health Policy and Management*, *7*(9), 778–781. https://doi.org/10.15171/ijhpm.2017.142.

Shopova, T. (2014). Digital literacy of students and its improvement at the university. *Journal on Efficiency and Responsibility in Education and Science*, *7*(2), 26–32. https://doi.org/10.7160/eriesj.2014.070201.

Tschand, M., Mayer, B., & Sorkoa, S. R. (2020). An interdisciplinary digital learning and research factory: The Smart Production Lab. *Procedia Manufacturing*, *45*, 491–496. https://doi.org/10.1016/j.promfg.2020.04.061.

Vartiainen, H., Pöllänen, S., & Liljeström, A. (2016). Designing Connected Learning: Emerging learning systems in a craft teacher education course. *Design And*, *21*(2), 32–40. https://ojs.lboro.ac.uk/DATE/article/download/2115/2281.

Wang, H., Buzzetto- Hollywood, N., Elobeid, M., & Elobaid, M. (2018). Addressing Information Literacy and the Digital Divide in Higher Education. *Interdisciplinary Journal of E-Skills and Lifelong Learning*, *14*, 077–093. https://doi.org/10.28945/4029.

Zandkarimi., Y. (2013). The Impact of E-learning on some Psychological Dimensions and Academic Achievement. *International Journal of Education and Learning*, *2*(2), 49–56. https://doi.org/10.14257/ijel.2013.2.2.05.