Gender Differences in Teachers' Digital Literacy Skills in Teaching STEAM

Moses Adeleke Adeoye

A B S T R A C T


A B S T R A C T

Teachers' characteristics such as educational level, age, gender, educational experience and digitial 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 teaching 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 Shammary, 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 shown 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 shown 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

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 Shammary, 2021; Maureen et al., 2018; Schlegel et al., 2021). Likewise, searching for information on the Internet is considered a combination of procedural skills (occupying 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 significant 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 is 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


