Influence of Demographic Factors on Utilization of Digital Technology in Tanzanian Secondary Schools

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ABSTRACT

The integration of digital technology in education has become a global priority in advancing Sustainable Development Goal (SDG 4) on quality education. However, effective utilization of these technologies is often shaped by demographic factors such as age, gender, class level of students, parents and teachers. This study examined these influences using a phenomenological research design guided by the Technological Acceptance Model (TAM). A total of 417 participants, including students, teachers, and parents, were selected through convenience sampling. Data were collected through questionnaires and unstructured interviews. Findings indicate that gender participation across Forms I–IV was nearly balanced, enabling a gender-sensitive analysis of digital technology adoption. Younger students (Forms I–II) showed minimal preference for digital tools, while older students (Forms III–IV) demonstrated stronger interest due to curriculum demands and examination preparation. Age also influenced adaptability: younger teachers and parents were more supportive of digital integration, whereas older counterparts expressed hesitancy. The study highlights the societal impact of digital learning by bridging educational gaps, equipping learners with digital skills, and fostering a digitally competitive generation. It recommends strengthening digital technological infrastructure, providing continuous professional development for teachers, engaging parents, and systematically integrating digital technology into the geography curriculum. These measures are essential for promoting inclusive, effective, and future-oriented learning in Tanzanian secondary schools.

Keywords: Digital Technological, Geography Education, Technological Acceptance Model (TAM), Demographic Factors, Sustainable Development Goals (SDG)

INTRODUCTION

The integration of digital technology in education has become a global priority as nations strive to achieve Sustainable Development Goal 4 (SDG 4), which calls for ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all by 2030 (United Nations, 2015). Digital technologies are increasingly recognized as transformative tools that can enhance teaching and learning processes, improve access to knowledge, and equip students with 21st century skills (UNESCO, 2022). However, the effective utilization of these technologies is often influenced by demographic factors such as age and gender of students, classes of students, parents and teachers in term of teaching experience, which shape teachers' adoption, perspectives, attitudes, and competencies in integrating digital tools into classroom practice.

In the United States, studies have shown that younger teachers tend to adopt digital tools more readily than older ones, reflecting generational differences in technological familiarity and training (Inan & Lowther, 2010). Similarly, in the United Kingdom, gender disparities have been reported, where male teachers often display higher confidence in technology use compared to female teachers, although the gap is gradually narrowing due to targeted professional development initiatives (Selwyn, 2016). In India, research highlights

teaching experience as a determinant of digital technology utilization, where novice teachers may be more flexible and experimental with digital tools, while experienced teachers may show resistance due to established pedagogical routines (Kumar & Daniel, 2016). In Arabic countries, such as Saudi Arabia and the United Arab Emirates, socio-cultural norms and gender roles have influenced access to and engagement with educational technologies, highlighting how demographic contexts affect digital adoption (Alenezi, 2019).

In the context of East Africa, digital technology integration remains constrained by infrastructural challenges, but demographic differences continue to play a role in adoption. For instance, research in Kenya and Uganda indicates that younger teachers demonstrate greater enthusiasm in using digital tools, while older and more experienced teachers often require additional training to adapt effectively (Mugisha, 2018; Oloo, 2019). In Tanzania, although the government has invested in digital education initiatives such as the Tanzania Institute of Education (TIE) digital learning platforms, studies reveal limited utilization of these tools in secondary schools due to demographic disparities among teachers (Mtebe & Raisamo, 2014). Many secondary school teachers still rely on traditional teaching methods, with age, gender, and teaching experience influencing their willingness and ability to integrate digital technologies (Ngussa & Chiza, 2021).

Despite these insights, there remains a research gap in understanding the specific ways demographic factors shape the utilization of digital technology in Tanzanian secondary schools. Most existing studies in Tanzania focus on infrastructural challenges such as lack of electricity, internet access, or insufficient digital resources (Mtebe, 2015; Katunzi, 2020), with limited attention to how teachers' demographic characteristics contribute to the underutilization of available technologies. Addressing this gap is crucial to inform targeted interventions that can enhance teacher training, bridge digital divides, and promote equitable adoption of digital tools in line with SDG 4.

The significance of this study lies in its potential to contribute both theoretically and practically. Theoretically, it adds to the growing body of literature on digital technology adoption in education by highlighting demographic influences in a Sub-Saharan African context, an area often underrepresented in global scholarship. Practically, the findings will inform policymakers, teacher training institutions, and educational leaders in designing differentiated capacity-building programs tailored to diverse teacher profiles. This will ensure that no teacher is left behind in the digital transition, ultimately enhancing the quality of education and preparing students for the demands of a digital economy.

Research questions:

I.   How does age influence the utilization of digital technology among secondary school students, teachers and parents in Tanzania?

II.   What is the role of gender in shaping the use of digital technology in Tanzanian secondary schools?

III.   In what ways does teaching experience affect teachers' adoption and utilization of digital technology in classroom practices?

IV.   In what ways do class levels influence the utilization of digital technology among secondary school students in Tanzania?

Research objectives

I.   To explore how age influence the utilization of digital technology among secondary school teachers in Tanzania

II.   To investigate the role of gender in shaping the use of digital technology in Tanzanian secondary school

III.   To understand teachers' teaching experience in adoption and utilization of digital technology in classroom practices.

IV.   To investigate the influence of class levels in utilization of digital technology among secondary school students in Tanzania
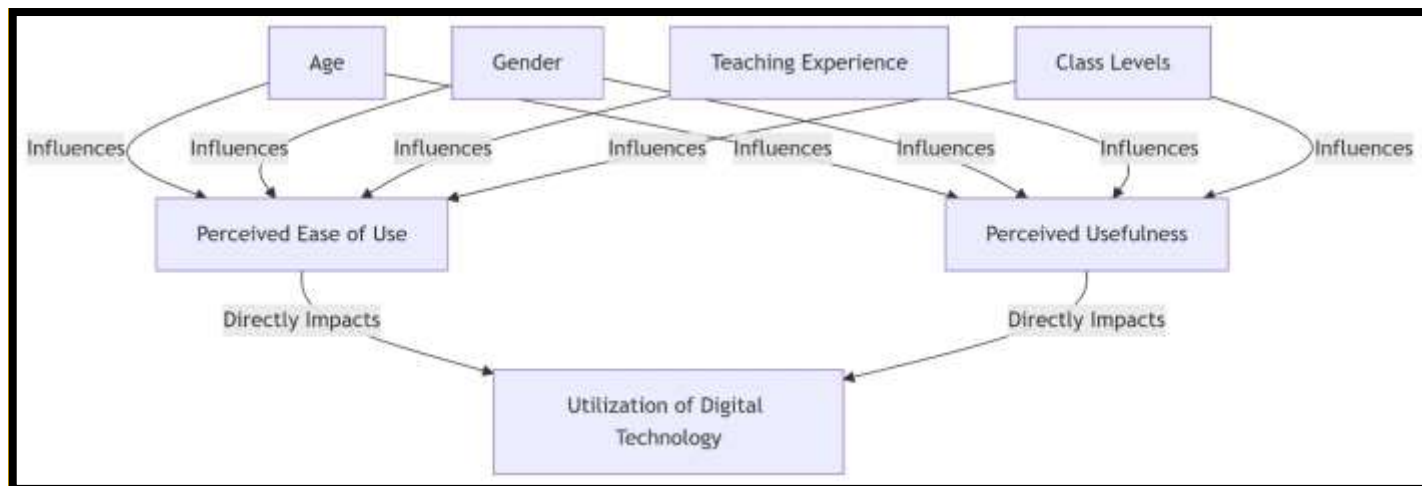
Conceptual and Theoretical Framework

Figure 1: Illustrating conceptual and theoretical framework

Source: Designed by Researcher (2025)

Despite many theories have been developed like connectivism (Siemen, 2005); social learning theory (Bandura, 1977); diffusion of innovation (Rogers, 1962); constructivism (Piaget, 1952) and Technological Pedagogical Content Knowledge (Mishra & Kohler, 2006) the present study as Figure 1 illustrated investigates the influence of demographic factors on the utilization of digital technology in Tanzanian secondary schools, is guided by the Technology Acceptance Model (TAM) developed by Davis (1989). TAM is one of the most widely applied theoretical frameworks in educational technology research because it explains how individuals come to accept and use new technologies. The model posits that technology adoption is primarily determined by two key factors: perceived usefulness the extent to which an individual believes that using a technology will enhance their job performance and perceived ease of use the extent to which an individual believes that using a technology will be free of effort.

In the context of Tanzanian secondary schools, teachers' demographic characteristics, such as age, gender, and teaching experience, play a significant role in shaping both perceived usefulness and ease of use, thereby influencing the adoption of digital technologies. For instance, younger teachers are often more familiar with digital tools and may find them easier to use, reflecting higher perceived ease of use, whereas older teachers may face challenges in navigating new technologies, leading to lower adoption rates. Gender differences have also been observed, where male teachers sometimes demonstrate higher confidence in using digital tools, potentially increasing their perceived usefulness, while female teachers may require additional support or training. Similarly, teaching experience can influence teachers' attitudes toward digital technologies; novice teachers may be more flexible and willing to experiment with innovative tools, while experienced teachers might adhere to traditional methods, limiting the integration of technology in classroom practice.

Applying TAM to this study allows for a systematic understanding of how these demographic factors influence teachers' engagement with digital technology in secondary schools. It provides a framework to examine not only whether teachers use digital tools but also the underlying beliefs and perceptions that drive or hinder adoption. By focusing on perceived usefulness and ease of use, the model aligns closely with the study's objectives of identifying how age, gender, and teaching experience shape technology utilization. Moreover, TAM has been successfully applied in Sub-Saharan African contexts, including Tanzania, where it has helped explain variations in technology adoption among educators (Mtebe & Raisamo, 2014).

METHODOLOGY

Research Approach and Design

This study adopted a mixed methods approach, with a larger emphasis on the qualitative component and a smaller quantitative contribution. The qualitative strand was prioritized to capture the in-depth lived

experiences of teachers, students, and parents regarding the influence of demographic factors (age, gender, and teaching experience) on the utilization of digital technology in Tanzanian secondary schools. The limited quantitative strand, drawn from questionnaires, was included to provide supportive numerical insights that complemented qualitative findings (Creswell & Plano Clark, 2018). This integration allows for triangulation, strengthening both the validity and comprehensiveness of the results (Kothari, 2004; Tashakkori & Teddlie, 2010). Moreover, the study employed a phenomenological research design, which seeks to explore and interpret the *lived experiences* of individuals concerning a specific phenomenon (Moustakas, 1994). In this case, the phenomenon is the utilization of digital technology in Kisarawe secondary schools, and the focus is on how demographic factors shape these experiences. This design was appropriate because teachers of different ages, genders, and experiences perceive technology differently, and phenomenology provides a lens to understand these unique perspectives in depth (Creswell, 2014).

Methods of Data Collection

The construction of the research instruments was conducted meticulously to ensure the collection of robust and credible data. Two distinct tools were developed: qualitative semi-structured interview guides and quantitative questionnaires, tailored for teachers, students, and parents respectively. The interview guides were designed with open-ended questions to facilitate in-depth discussions and capture the participants' nuanced views on digital technology. Conversely, the questionnaires were constructed with structured items and underwent a pilot testing phase. This pilot study was essential for refining the tools, assessing question comprehension, eliminating ambiguities, and establishing internal consistency reliability.

The validation process involved a rigorous expert review by the research supervisor. This critical step was undertaken to evaluate the instruments' content validity judging whether the items sufficiently represented the construct of digital technology adoption and their face validity, ensuring the questions were clear and suitable for each respondent group. This multi-stage process of pilot testing and expert validation ensures the methodological rigor and trustworthiness of the findings. (Patton, 2015).

Targeted Population and Sampling Techniques

The population comprised teachers, students, and parents in selected Tanzanian secondary schools from Kisarawe district. Teachers were key participants because they are the primary users and implementers of digital technology in classrooms. Students provided insights into how demographic variations among teachers affected their learning experiences, while parents offered perspectives on external support and challenges in digital learning adoption (URT, 2019). Moreover, convenience sampling was used to select participants who were readily available and willing to provide information. This approach was practical due to time, geographical, and resource limitations often encountered in Tanzanian school contexts (Etikan et al., 2016). Although not statistically representative, convenience sampling allowed access to diverse voices within the selected schools.

Geographical location of Kisarawe District

Kisarawe District is one of the six districts that make up the Pwani (Coast) Region of Tanzania. It lies on the eastern part of the country and forms part of the administrative areas that border the bustling city of Dar es Salaam. The district headquarters is located in the town of Kisarawe, which serves as the administrative and commercial center of the area. Geographically, Kisarawe District is situated between latitudes 6°50′ to 8°35′ South and longitudes 38°15′ to 39°30′ East, placing it within the coastal hinterland of Tanzania.

The district shares boundaries with several important administrative areas. To the north, Kisarawe is bordered by Kibaha District and Kibaha Town Council. On the northeastern side, it connects with the Ilala Municipal Council of Dar es Salaam Region, which highlights its proximity to Tanzania's largest commercial hub. To the east, Kisarawe is bordered by Mkuranga District, while to the south and southeast it shares borders with Rufiji and Kibiti Districts. On the western side, Kisarawe meets the Morogoro Region. These borders position Kisarawe as a strategically located district, acting as both a link between the hinterland and the coast and a peri-urban zone to Dar es Salaam.

Reliability and Validity

To ensure reliability and validity, the study used triangulation of data sources (teachers, students, parents) and methods (interviews and questionnaires). Member checking was also applied, where participants reviewed transcripts to confirm accuracy. In qualitative studies, validity is strengthened by credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). For the questionnaire, pre-testing was conducted in a non-sample school to refine questions for clarity and reliability.

Statistical Analysis

The qualitative data from interviews were analyzed thematically, following Braun and Clarke's (2006) six-phase approach: familiarization, coding, generating themes, reviewing themes, defining themes, and reporting. Quantitative data from questionnaires were analyzed using descriptive statistics (frequencies, percentages, and mean scores) to summarize trends in students' responses. NVivo software supported qualitative coding, while SPSS 29 version was applied for quantitative analysis.

6.0 Ethical Considerations

Ethical approval was sought from the appropriate Tanzanian educational authorities; permission letter of data collection was given to researcher from Kisarawe Executive Director (KED) under forwarded signature of Kisarawe District Education Officer (KDEO) Furthermore, before data collection the researcher presented the research proposal and modified under Institutional Review Board (IRB) of Galgotias University. Not only that but also informed consent was obtained from all participants. Teachers, students, and parents were assured of confidentiality, anonymity, and voluntary participation. Interviews were conducted in Swahili as the national language, to ensure participants were comfortable and could express themselves freely This approach enhanced inclusivity and minimized misinterpretation of responses (Mkono, 2016). Proper citation of all sources used in form of American Psychological Association (APA) 7th version was used.

RESULTS

Table 1. Demographic Profile of Respondents

Variables /Targeted Population	Age Category	Class	Gender		Experience years	Number of teachers experience	Number of teachers experience
			Female	Male		Female	Male
Students	Below 13 yrs	Form I	21 (51.2%)	19 (48.7%)			
	14–16 yrs	Form II	24 (52.17%)	22 (47.8%)			
	17+ yrs	Form III	76 (51.01%)	73 (48.9%)			
		Form IV	23 (51.1%)	22 (48.8%)			
Total Students							
Geography teachers	20–30 yrs		2 (28.57%)	3 (37.5%)	6-10 yrs	4 (57.14%)	1 (12.5%)
	31–40 yrs		3 (42.85%)	3 (37.5%)	11-15 yrs	2 (28.57%	5 (62.5%)
	41–50 yrs		2 (28.57)	2 (25%)	16-21 years	1 (14.28%)	2 (25%)
Total Teachers			7 (100%)	8(100%)			
Parents/Guardians	30–40 yrs	38 (58.46%)	37 (64.91%)				
	41–50 yrs	23 (35.38%)	10 (17.54%)				
	51–60 yrs	3 (4.61%)	4 (7.01%)				
	61+ yrs	1 (1.53%)					
Total Parents/Guardians		65 (100%)	57 (100%)				

Source: Research Field (2024)

DISCUSSION

Table 1 presents the demographic distribution of the study respondents, disaggregated by age, class, gender, and years of teaching experience. In total, the study involved 417 respondents, comprised of 280 students (67.14%), 15 Geography teachers (5.35%), and 122 parents/guardians (29.25%). Presenting these characteristics is critical in educational research because it provides transparency on sample composition and enhances the credibility of the study's findings (Creswell & Creswell, 2018; Cohen, Manion, & Morrison, 2018).

For teachers, the Table 1 indicates a relatively small but diverse sample. Out of the 15 Geography teachers, 7 were female (46.6%) and 8 were male (53.3%). Teaching experience was also distributed across different ranges: for instance, 4 female teachers (57.14%) and 1 male teacher (12.5%) had 6–10 years of experience, while 2 male teachers (62.5%) and 2 female teachers (28.57%) had 11–15 years of experience. This spread reflects an important methodological consideration, as research has shown that teaching experience influences openness to pedagogical innovation and technology integration (Kini & Podolsky, 2016; Darling-Hammond et al., 2017).

Parents and guardians were also included, providing a wider social context. Of the 122 parents/guardians, 65 were female (53.3%) and 57 were male (46.7%). The largest group fell within the 30–40 years age category, with 38 females (58.46%) and 37 males (64.91%), indicating active parental involvement among younger adults. Including parents is critical, as parental demographics and attitudes strongly influence how students engage with technology at home and in school (Livingstone & Blum-Ross, 2020).

Class and exposure to digital technology

Among students, the Table 1 shows that participation was relatively gender-balanced. For example, in Form I, there were 21 females (51.2%) and 19 males (48.7%), Form II there were 24 (52.17%) females and 22 (47.8%) were males, while in Form III, which had the largest group, there were 76 females (51.01%) and 73 males (48.9%), Form IV female were 23 (51.1%) and 22 (48.8%) as males. This balanced distribution suggests that both genders were well represented, allowing for a gender-sensitive analysis of digital technology use in map reading and interpretation. Such gender disaggregation is aligned with contemporary calls by UNESCO (2021) to ensure inclusivity and equity in education research. Furthermore, the class distribution from Form I to Form IV also aligns with Tanzania's education structure. Secondary education in Tanzania is divided into lower secondary (Form I–IV) and upper secondary (Form V–VI). Lower secondary is particularly critical because it forms the foundation for advanced studies or vocational training. According to MoEST (2022) and NECTA (2023) reports, enrollment tends to be higher in Forms I and II due to automatic progression from primary school, while Forms III and IV typically reflect higher dropout or repetition rates as students approach national examinations. The present data confirms this, as the highest numbers were recorded in Form III (76 females and 73 males), a class level where digital technology was employed in teaching Geography subject, making it strategically significant for this research.

The findings from the current study indicate that Form I and Form II students show less preference for using digital technology in their learning, whereas Form III and Form IV students demonstrate a higher interest in adopting digital tools. This variation can be explained by both developmental and curriculum-related factors.

First, younger students (Form I and II) are still transitioning from primary to secondary school, where exposure to digital learning remains limited due to infrastructural and pedagogical gaps in many Tanzanian schools (MoEST, 2021). As one teacher remarked:

"Most of our Form One students are still adjusting to the new environment, they find textbooks and chalkboard teaching more familiar than using computers or mobile apps." **(Male Teacher, Kisarawe District, October 2024).**

This aligns with reports by the Tanzania Institute of Education (TIE, 2019), which emphasize that introductory secondary classes are heavily grounded in foundational knowledge, often delivered through traditional

methods rather than through technology-mediated learning. On the other hand, Form III and IV students show stronger interest in digital tools because their curriculum demands more complex cognitive tasks such as interpreting maps, analyzing geographical features, and preparing for national examinations. These tasks naturally lend themselves to interactive digital platforms such as Google Earth, Google Map, and simulation models. As one Form IV student explained:

"When we use Google Maps and google earth in our geography lessons, it is easier for us to understand the shape of rivers, mountains and other geomorphological features compared to reading from the textbook." **(Male form IV Student from school B).**

Parents also recognize this difference. One parent noted:

"Older students, especially those preparing for Form Four exams, are more motivated to use technology because they see it helping them to pass NECTA." **(Female parent, Kisarawe District).**

The preference among older classes is also supported by the NECTA (2022) examination performance reports, which stress that digital resources can improve mastery of topics like map reading, which has historically been a weak area for candidates. Therefore, the higher inclination of Form III and IV students toward digital technology is not only a reflection of age and maturity but also of curriculum alignment and exam pressure.

Age and Exposure to Digital Technology

The influence of age on the utilization of digital technology in Tanzanian secondary schools is significant, as age often determines both exposure and adaptability to new learning tools. Data from the study reveal clear distinctions among students, teachers, and parents in their engagement with digital technologies. Among students, those below 13 years (largely in Form I) demonstrated minimal preference for digital learning tools compared to their older counterparts. Conversely, students aged 14–16 years (Form II) showed gradual improvement in technology acceptance, while those aged 17+ years and above (Forms III and IV) expressed the strongest inclination toward using digital platforms to enhance their understanding of Geography.

One Form III student aged 16 years remarked: *"When the teacher shows us Google Earth, I can easily see mountains and rivers. It makes Geography more interesting and easy than just reading from the book."* This perspective suggests that maturity, coupled with increased academic demands, enhances students' appreciation of digital resources. The curriculum for Forms III and IV emphasizes complex map interpretation and geographical analysis, areas that lend themselves well to technological tools such as Google Maps and digital atlases (Tanzania Institute of Education [TIE], 2019). As such, older students not only recognize the relevance of digital tools but also actively prefer them to traditional teaching approaches.

The pattern is also visible among teachers, where age and teaching experience intersect with technology use. Teachers aged 20–30 years were more open to integrating digital platforms into lessons. As one young teacher shared: *"I grew up with smartphones and computers, so using projectors or digital maps in class feels natural."* **(Male teacher from school A)** In contrast, teachers between 41–50 years expressed more hesitation, citing limited training and comfort levels with digital systems. For example, one teacher noted: *"We were trained with chalk and blackboard; sometimes this technology is too fast for us."* **(Female teacher from School C)** This finding aligns with UNESCO (2022), which stresses that professional development and capacity-building are essential for older teachers in Africa to adopt digital pedagogy effectively.

Parents and guardians, too, reveal generational differences in digital technology exposure. Parents in the 30–40 years category demonstrated stronger awareness and support for digital learning, with one parent commenting: *"I see my child using the phone to learn, and I encourage it because the world today depends on technology."* ***(Female parents from Kisarawe District)*** In contrast, older parents (51 years and above) were more skeptical, often associating digital devices with distractions rather than learning. As one parent above 60 years said: *"These phones only make children waste time on games and WhatsApp."* **(Male parents from Kisarawe District)** These contrasting views reflect broader societal trends in Tanzania, where younger generations are increasingly embracing digital technology, while older generations remain cautious (Alenezi, 2019; Tanzania Communications Regulatory Authority [TCRA], 2023).

Gender Differences in Access and Use of Digital Technology

The analysis of gender distribution among students, teachers, and parents/guardians reveals both similarities and differences in access to and utilization of digital technologies within Tanzanian secondary schools. Among students, the representation of females and males is almost balanced across all classes. For instance, in Form I, females accounted for 21 (51.2%) while males were 19 (48.7%), while in Form III the numbers were nearly the same, with females at 76 (51.01%) and males at 73 (48.9%). This balance reflects government efforts in Tanzania to promote gender parity in education, as outlined in the Education and Training Policy (MoEST, 2014) and subsequent initiatives under the Education Sector Development Plan 2021/22–2025/26 (MoEST, 2021), which emphasize equal opportunities for both boys and girls in accessing quality education, including digital learning opportunities.

However, the data also suggest subtle variations in how male and female students engage with digital technologies. Teachers reported that male students often demonstrate higher confidence in exploring digital tools independently, while female students tend to prefer collaborative use. As one teacher observed, *"Boys are more willing to experiment with applications like Google Maps, while girls often prefer guided sessions in pairs or groups."* **(Male teacher from school C).** This aligns with findings from recent Tanzanian studies (Ngussa & Chiza, 2023), which show that cultural and social expectations can influence how boys and girls interact with digital resources, even when access levels are similar.

Among geography teachers, the gender distribution also shows a near balance, with seven females (46.6%) and eight males (53.3%). This gender parity reflects the growing inclusion of women in teaching professions at the secondary level. Nevertheless, male teachers were reported to have slightly higher exposure to digital technology integration in classroom practices. One female teacher highlighted challenges such as limited training opportunities, stating: *"Most digital technology training workshops are scheduled in ways that are not flexible for female teachers, especially those with family responsibilities."* **(Female teacher from school D)** This indicates that while gender balance exists in numbers, structural challenges may hinder female teachers' equal participation in digital pedagogy as also supported by Selwyn (2016).

In contrast, the data from parents and guardians show a more noticeable difference. Female parents accounted for 65 respondents (53.3%), while males were 57 (46.7%). Interestingly, the distribution reveals that male parents in younger age brackets (30–40 years) reported higher use of digital platforms for communication with schools compared to their female counterparts. However, female parents expressed more interest in monitoring students' learning through mobile phones, particularly via WhatsApp groups or SMS updates. As one parent shared, *"I may not know how to use computers, but I use my phone to check if my child has done their homework."* **(Female parent from Kisarawe district)** This reflects findings from UNESCO (2022) which indicate that women, while sometimes having less formal digital training, often use mobile technology creatively to support children's education.

Teaching Experience and Openness to Digital Technology

The findings of this study reveal that teaching experience plays a significant role in shaping teachers' openness to integrating digital technologies in the teaching of Geography. Data show that younger teachers aged 20–30 years, who are relatively early in their careers, demonstrate higher levels of openness to digital tools. For example, five teachers in this category (two females, three males) expressed confidence in adopting technology, with many reporting between 6–10 years of teaching experience. **One female teacher from school B stated**: *"Since I joined teaching recently, I have been exposed to computers and projectors during my training, so I feel comfortable using them in class."* (This reflects how the new generation of teachers, trained under recent curriculum reforms by the Tanzania Institute of Education (TIE, 2019), are more likely to embrace technology compared to their older counterparts.

Teachers in the 31–40 years category also showed significant openness to technology, with equal representation of males and females. However, their responses indicated a more selective use of digital resources. **A male teacher in this group from school A noted:** *"I use Google Maps when teaching map interpretation, but sometimes I still prefer the chalkboard because it is easier when there is no internet."* This

reflects a transitional stage in which mid-career teachers balance traditional teaching methods with digital innovations depending on resource availability.

In contrast, teachers in the 41–50 years bracket demonstrated relatively lower levels of engagement with technology. Although they had extensive classroom experience 16–21 years of teaching their use of digital resources was limited. **One male teacher candidly admitted:** *"I rely mostly on textbooks and atlases because I was not trained with digital tools. I find it challenging to adapt now."* This illustrates how long teaching experience may correlate with resistance to adopting new technologies, especially when professional development opportunities are inadequate as also supported by Kumar & Daniel (2016).

Parental Age and Support for Digital Technology

The role of parents and guardians in supporting the integration of digital technology in secondary schools cannot be underestimated. Findings from the study reveal that the level of support provided by parents varies significantly across age categories, reflecting both generational differences in technological exposure and attitudes toward digital adoption.

The largest proportion of supportive parents were found in the 30–40 age group, with 38 mothers (58.46%) and 37 fathers (64.91%) actively encouraging their children to engage with digital tools. Parents in this age range often belong to a younger generation who themselves have been exposed to technology in their workplaces or social environments. For instance, **one mother in this age group noted,** *"I encourage my child to use digital maps and other online tools because they are part of modern education and the world my child is growing into."* Such statements reflect a progressive mindset and a recognition of the importance of preparing children for a digitally-driven future.

In contrast, support tends to decline in the 41–50 age group, where 23 mothers (35.38%) and 10 fathers (17.54%) reported being supportive. This reduction suggests that while some parents in this group acknowledge the role of technology, others are less confident in promoting it, perhaps due to limited exposure themselves. **A father aged 45 expressed this hesitancy by saying,** *"Sometimes I don't know much about these digital tools, so I leave it to the teachers, but I can see they are useful."* This reflects both awareness of the benefits of technology and a sense of inadequacy in guiding children to use it effectively.

The 51–60 age group demonstrated much lower levels of support, with only 3 mothers (4.61%) and 4 fathers (7.01%) expressing openness to digital technologies. At this stage, generational distance appears to create a technological gap. Many parents in this age category may still value traditional methods of teaching and show reluctance toward new educational approaches. For example, **one father remarked,** *"During our time we studied without computers, and we still succeeded. I don't see why children cannot learn the same way."* Such views illustrate a cautious or even resistant stance towards the integration of digital learning tools.

Finally, support is almost negligible among parents aged 61 and above, where only one parent (1.53%) showed willingness to support digital learning. This group often associates schooling with conventional systems and has limited direct experience with technology, making it difficult for them to relate to or endorse digital resources.

Implication

The findings imply that exposure to digital technology among students increases as they advance from lower classes (Form I–II) to upper classes (Form III–IV), highlighting the importance of aligning digital resources with curriculum progression. Younger students' limited preference for technology suggests that early secondary education requires targeted interventions to build digital literacy foundations. For teachers, the variation in openness to technology according to teaching experience demonstrates the need for continuous professional development programs, ensuring that both young and experienced teachers acquire confidence in using digital technology for Geography instruction. Parents' support, which is strongest among those aged 30–40, indicates that intergenerational awareness and encouragement are crucial for sustaining technology adoption at home and in school. These findings stress the need for differentiated strategies that engage students, equip teachers, and involve parents to maximize the benefits of digital learning. Ultimately, the study

reinforces MoEST (2021) recommendations on embedding digital technologies use systematically within Tanzania's secondary school curriculum. In relation to Sustainable Development Goals, the study advances SDG 4 (Quality Education) by promoting inclusive, technology-enhanced learning, and SDG 9 (Industry, Innovation, and Infrastructure) by emphasizing the strengthening of digital infrastructure and innovations in schools.

Impact to the society

The study impacts society by demonstrating how digital technology can bridge educational gaps and foster equity in learning opportunities. It shows that early integration of digital technology in schools equips young learners with skills needed for a digital economy. Parents become more aware of their supportive role in advancing their children's technological competencies. Teachers gain insights into adopting innovative methods that enhance academic achievement. Overall, the study contributes to building a more digitally literate and competitive society.

RECOMMENDATION

This study recommends strengthening digital infrastructure in schools to enhance accessibility of digital tools. Teachers should receive continuous professional development (CPD) to build confidence and competence in digital pedagogy. Parents must also be engaged in supporting their children's digital learning at home and school. Furthermore, gender-sensitive strategies should be implemented to ensure equal opportunities for both male and female learners. Finally, digital technologies should be systematically integrated into the geography curriculum to improve learning outcomes.

CONCLUSION

This study concludes that digital technology has significant potential in improving learning outcomes not only in Geography but in other subjects. Findings revealed variations in access and openness to digital tools among students, teachers, and parents. Gender, teaching experience, and parental age were critical factors influencing digital adoption. Addressing these disparities can strengthen collaboration between schools and families in promoting digital learning. Overall, integrating technology in Geography education is vital for enhancing 21st-century skills among learners.

Conflict of Interest

This study declares that there is no conflict of interest with respect to any party involved in the research process. The research was conducted independently without any influence from funders, publishers, journals, or the host institution. Supervisors provided academic guidance only, without bias or undue interference in the outcomes. Similarly, the researcher, as well as the respondents including parents, teachers, and policy makers, had no personal or financial interest that could affect the credibility of the findings. Therefore, the results presented reflect an objective and transparent process aimed solely at contributing to knowledge and educational practice.

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