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Teachers' Tablets Use in Facilitating Students' Learning in Public Secondary Schools in Karatu District, Tanzania: A Concurrent Mixed-Methods Study

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ABSTRACT

This study explored teachers' tablet use in facilitating students' learning in public secondary schools after the government had distributed them to all teachers. The focus was on understanding how teachers learn to use tablets in teaching, how they use them, and the challenges they encounter. The study employed a concurrent mixed design with a sample of 191 randomly selected teachers, 10 heads of school and 20 students who were purposively selected from 10 government secondary schools. Data collection employed questionnaires, interviews, and observation methods, and the analysis involved descriptive statistics and thematic analysis. The findings revealed that teachers use tablets primarily for teaching and information searching, and rarely for entertainment. Specific teaching activities for teachers using tablets include searching and downloading teaching materials and delivering lessons, despite 67% of teachers have not received formal training on using tablets. Teachers learn to use tablets through self-initiative and assistance from fellow teachers, while facing limited internet connectivity, insufficient training, and technical issues with the tablets. The findings imply that continued ICT use without adequate TPACK skills among teachers risks the quality of teaching and digital integration in the era of technological advancement. The findings call for interventions to help teachers embrace the power of technology in teaching.

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1. Introduction

Digital technology has increasingly shaped the global education landscape and transformed the interactions in contemporary classrooms. Schools and classrooms widely utilize Information and Communication Technology (ICT) tools and facilities, such as projectors, smart-screens, smartphones,

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tablets, PCs, and learning management systems, to facilitate teaching and learning (Rajab, 2020). In November 2022, the Tanzanian government distributed 293,400 tablets to all secondary and primary school teachers to facilitate teaching and learning, with a focus on enhancing digital literacy and educational quality (Ayo, 2023; Raphael, 2022; World Bank, 2023). The move reflected the long-term plans and the current global trend toward integrating technology into teaching and learning. Despite efforts to provide teachers with these technological tools, they received no formal training to enhance tablet use in teaching and learning. As a result, the utilization of tablets among these teachers is unknown, as to whether teachers use them as per the intended goal. This situation warrants systematic investigation, given the substantial public investment involved and the government's expectation that tablet integration will contribute to improved teaching and learning outcomes. ICT promotes accessibility to educational materials and reduces education costs (Saha, 2023). Since the early 2000s, many educational institutions have introduced user-friendly, portable, wireless touchscreen tablets to enhance student engagement and academic performance (Fernandez, 2022; Salmerón et al., 2021).

Countries worldwide, including the United States, China, South Korea, and, recently, several African nations, have adopted tablets in education (Trucano, 2013). Integrating digital technology, particularly tablets, into education has gained global momentum. In Tanzania, 89,805 tablets were distributed to teachers in government secondary schools to enhance students' learning (Ayo, 2023; Daily News, 2022; Raphael, 2022). Despite this distribution, teachers have a limited understanding of the specific teaching and learning activities in which they use tablets, of their efforts to learn to use them, and of the challenges they face in their effective integration. A study by Haji et al. (2024) revealed that many secondary school teachers lack the necessary skills to effectively integrate tablets into their teaching practices, noting a scarcity of qualified teachers proficient in the use of ICT tools, such as tablets, in teaching and learning (Haji et al., 2024, p. 486). The research highlighted insufficient pre-service and in-service training as a significant barrier, indicating that teachers were not given enough opportunities to practice integrating tablets into teaching during seminars and conferences (Haji et al., 2024). The situation suggests that although teachers are trying to learn how to utilise these tablets fully, the support and training are inadequate. Furthermore, the study discussed various challenges teachers face, including a shortage of ICT infrastructure and insufficient training on using tablets effectively, which hinders their integration into classroom activities.

Studies show potential benefits of tablet use, such as facilitating learning and communication, reducing paper waste, generating new teaching ideas, accessing teaching materials, knowledge sharing, promoting cooperation, taking notes, reading e-books, and enhancing student engagement and academic performance (Dovigo, 2021; Fernandez, 2022; Heinrich et al., 2019; Javid et al., 2023; Velchik, 2020). However, factors such as limited internet access, inadequate teacher training, technical difficulties, limited teachers' digital literacy, and cultural considerations hinder the effective adoption and integration of technology, including tablets, in teaching and learning (Akpan, 2019; Dovigo, 2021; Haji et al., 2024). In Tanzania, while the government has distributed tablets to teachers, most have received little training in effectively integrating them into teaching and learning activities (Haji et al., 2024, p. 481; Mwakapemba et al., 2024). This gap raises questions about whether teachers are using these tablets as intended. The lack of understanding hinders the optimisation of technology initiatives and raises questions about their actual impact on students' learning outcomes and teacher professional development. This research aimed to explore teachers' use of tablets to facilitate

students' learning in government secondary schools. Specifically, the study answers the following questions:

(a) What specific teaching and learning activities do teachers use tablets in facilitating students' learning in secondary schools?
(b) What are teachers' efforts to learn how to use tablets to facilitate students' learning in government secondary schools?

2. Literature Review

The study explored the teachers' tablet use in facilitating students' learning in government secondary schools. The study was guided by the Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and Koehler (2006) and the Diffusion of Innovations (DOI) theory, as described by Rogers (2003). According to Willermark (2018), the TPACK framework emphasises the integration of technology with pedagogy and content knowledge, helping to analyse how teachers use tablets in their teaching activities (RQ1) and their efforts to learn how to use tablets (RQ2). The DOI theory complements TPACK by exploring how innovations are accepted in school settings, providing insights into teachers' efforts to learn with tablets (RQ2), and how tablets are used in schools (RQ1).

2.1. Teaching and learning activities that involve tablets

In Norway, Bjørgen et al. (2021) explored how teachers experience the complexities and challenges posed by using tablets in implementing learning activities and classroom control in Norwegian primary schools. The study found that teachers mostly used tablets to teach Norwegian subjects and English, along with normal textbooks. This qualitative study found that teachers rarely used tablets in subjects such as Mathematics, Natural Science, Music, and Social Sciences. Findings further revealed that teachers use tablets to develop assignments to replace textbooks, shifting from traditional teaching methodologies such as "memorising, standing and talking" to more active learning known as "production of learning" (Bjørgen et al., 2021). Although this study provided insights into tablets, it cannot adequately uncover all the teaching and learning activities that can use them, as it focuses on primary schools. In Malaysian secondary schools, Goh and Ang (2023) investigated the role of self-regulated learning in facilitating knowledge construction through online forum participation in a tablet-based environment. This experimental study employed two groups: one using tablets for online forum participation in science learning and the other using traditional paper-based discussions. The findings showed that students in the tablet group who actively participated in online forums displayed higher levels of self-regulated learning than the control group. The study suggested that tablet-based online forums were practical tools for knowledge construction when coupled with strategies to promote students' self-regulated learning. However, the context in Malaysia differs from that in Tanzania in terms of policies, economic status, and educational quality.

Furthermore, Haji et al. (2024) assessed the extent to which teachers in Micheweni District Zanzibar, are integrating tablets into their teaching and learning activities. The study employed a qualitative approach to explore how teachers incorporate tablets into teaching through classroom observations, documentary reviews, and semi-structured interviews with teachers, headmasters, district officers, and Ministry officers who integrate and supervise tablets in teaching and learning. The study found

that teachers use tablets for demonstrations, display images, diagrams, or videos to students, take students on visual trips to historical sites, museums, or national parks, search for teaching resources on the internet, use apps for education, e-libraries, and e-books, and store multimedia materials. However, this study is insufficient, as it was qualitative and used a sample of only 30 teachers, limiting generalizability. The study also neglected students' views, as tablets were primarily distributed to teachers to facilitate learning.

Another study was conducted by Mwakapemba et al. (2024) to investigate teachers' perceptions of tablet use for educational purposes in Tanzania, focusing on knowledge and skills in tablet use, school-level support for tablet use, sustainability of tablet use, and teachers' attitudes towards tablet use. The study employed a quantitative research approach using the Technological Acceptance Model (TAM) and involved 81 respondents from different regions of Tanzania who completed online survey questionnaires. Findings revealed that tablets are used in teaching and learning activities to enhance productivity, facilitate access to information, and promote interactive and engaging learning experiences. However, this study has limited reach to the population, such as older teachers or those with low digital literacy, thereby underrepresenting them in online surveys, which can lead to biased results. Likewise, not all populations have equal access to the internet, leading to sampling bias and a sample that is not representative of the general population, potentially distorting the findings. Similarly, Albirini (2020) conducted a meta-analysis of the impact of tablet computers on students' engagement and learning outcomes in higher education, synthesising results from 22 studies involving over 4940 participants. The study found that tablet use in higher education positively correlated with student engagement and learning outcomes, particularly in active learning, critical thinking, and collaboration (Albirini, 2020). Since the study was a review, it cannot adequately provide teaching and learning activities that predominantly use tablets to facilitate students' learning.

Likewise, Cheng and Zhang. (2020) synthesised existing research on collaborative learning using tablets in educational settings. The study found that teachers and students used tablets to facilitate collaborative learning through features like shared screens, annotation tools, and interactive applications. It also provides real-time collaboration on projects, reports, and presentations, fostering teamwork and communication skills. Although the study provided valuable information on the potential of tablets, it lacked sufficient detail on specific teaching activities, as the sources were secondary and the credibility of the literature included is unknown. The study by Hamidi and Smith (2021) examined the impact of mobile technology on formative assessment and feedback on student achievement in K-12 education. The study aimed to synthesise evidence on the effectiveness of the intervention by analysing 59 studies involving over 17,000 students. The study found that formative assessment and feedback delivered through mobile technology had a small but statistically significant positive effect on student achievement, as this guided students toward mastery. However, the studies included in the analysis varied in quality and design, and publication bias is a potential concern; hence, it cannot be sufficient to answer the research question.

2.2. Teachers' efforts to learn how to use tablets to facilitate students' learning

Teachers increasingly recognise the potential of tablets to enhance student learning, but learning to use them effectively and acquiring the necessary skills requires ongoing effort. The study conducted by Bjørgen et al. (2021) in Norway explored how teachers in two Norwegian primary schools experience the opportunities and challenges associated with tablet use, including implementation,

learning activities, and classroom management. This qualitative study interviewed three female and two male teachers with 4 to 15 years of working experience. Researchers conducted two in-depth interviews in 2016 and two in 2017 with the same teachers who had participated the previous year. The study revealed that the teachers who participated in implementing a tablet-use training pilot project became proficient users. Once they became experienced with tablets, they often collaborated and provided technical support to one another with tablet use (Bjørgen et al., 2021). Nonetheless, this study is insufficient, as it focused on primary school teachers in Norway, which differs from Tanzania's context, specifically the Karatu District.

Also, Goh and Ang (2023) investigated the role of self-regulated learning in facilitating knowledge construction through online forum participation in a tablet-based environment in Malaysia. The study found that experienced teachers with tablet proficiency mentored and supported less experienced colleagues, fostering a culture of continuous learning. However, teachers' efforts in the Malaysian context cannot be similar to those in Tanzania regarding motivation for using technology and educational levels. Likewise, Albirini (2020) studied the impact of tablet computers on student engagement and learning outcomes in higher education. The findings revealed that proactive teachers actively research and experiment with tablet apps and tools to discover their potential for specific learning objectives. Correspondingly, Cheng and Zhang (2020) analysed existing literature on collaborative learning with tablets in educational settings. The findings found that some teachers organise workshops and training sessions for their colleagues, sharing their knowledge and expertise in using tablets. Nevertheless, this synthesis cannot answer our research question, as most of the literature reviews synthesised are not from our Tanzanian context. Hamidi and Smith (2021) also conducted a meta-analysis to examine the impact of mobile technology on student achievement in K-12 education through formative assessment and feedback. The analysis found that many schools and districts offer professional development programs focused on tablet integration, providing teachers with structured learning opportunities to help them integrate tablets into their teaching activities. However, this meta-analysis cannot provide a clear picture of teachers' self-directed efforts to learn to use tablets. Most of the literature analysed is not from the Tanzanian context, and its credibility is unknown.

2.3 Theoretical and Conceptual Framework

The study was guided by the Technological Pedagogical Content Knowledge (TPACK) framework and the Diffusion of Innovations (DOI) theory. TPACK, originally rooted in Shulman's (1986) concept and later extended by Mishra and Koehler (2006), examines the integration of technological, pedagogical, and content knowledge. It explains the role of technology in teaching (Swallow & Olofson, 2017) and emphasizes the intersection of Technological knowledge (TK), Pedagogical knowledge (PK), and Content knowledge (CK) (Koehler et al., 2013). This framework analyzes how teachers use tablets in instructional activities (Research Question 1) and their efforts to develop tablet-related skills (Research Question 2). Its strengths include providing a comprehensive framework for technology integration, emphasizing contextualized teaching (Willermark, 2018; Koehler et al., 2013), and guiding professional development initiatives (Swallow & Olofson, 2017). However, its complexity and limited attention to infrastructural and technical challenges (Brantley-Dias & Ertmer, 2013) limits its use. Despite these limitations, TPACK remains appropriate due to its alignment with the pedagogical focus of the study.

The DOI theory, developed by Rogers (2003), explains how innovations are adopted within social systems. It highlights factors such as relative advantage and compatibility that influence adoption decisions (García-Avilés, 2020) and outlines stages of adoption, knowledge, persuasion, decision, implementation, and confirmation (Zhang et al., 2015). DOI supports understanding how teachers adopt tablets in schools (Research Questions 1 and 2) and helps to identify barriers and facilitators to integration. Although criticized for oversimplifying complex educational processes and underemphasizing contextual and whole school factors (García-Avilés, 2020; Zhang et al., 2015), it provides valuable insights into systemic aspects of technology adoption. Together, TPACK and DOI offer a complementary framework that addresses both pedagogical integration and the broader adoption process of tablets in schools. Despite their weaknesses, the combined use of these theories strengthens the study's theoretical foundation by capturing both instructional and systemic dimensions of technology integration.

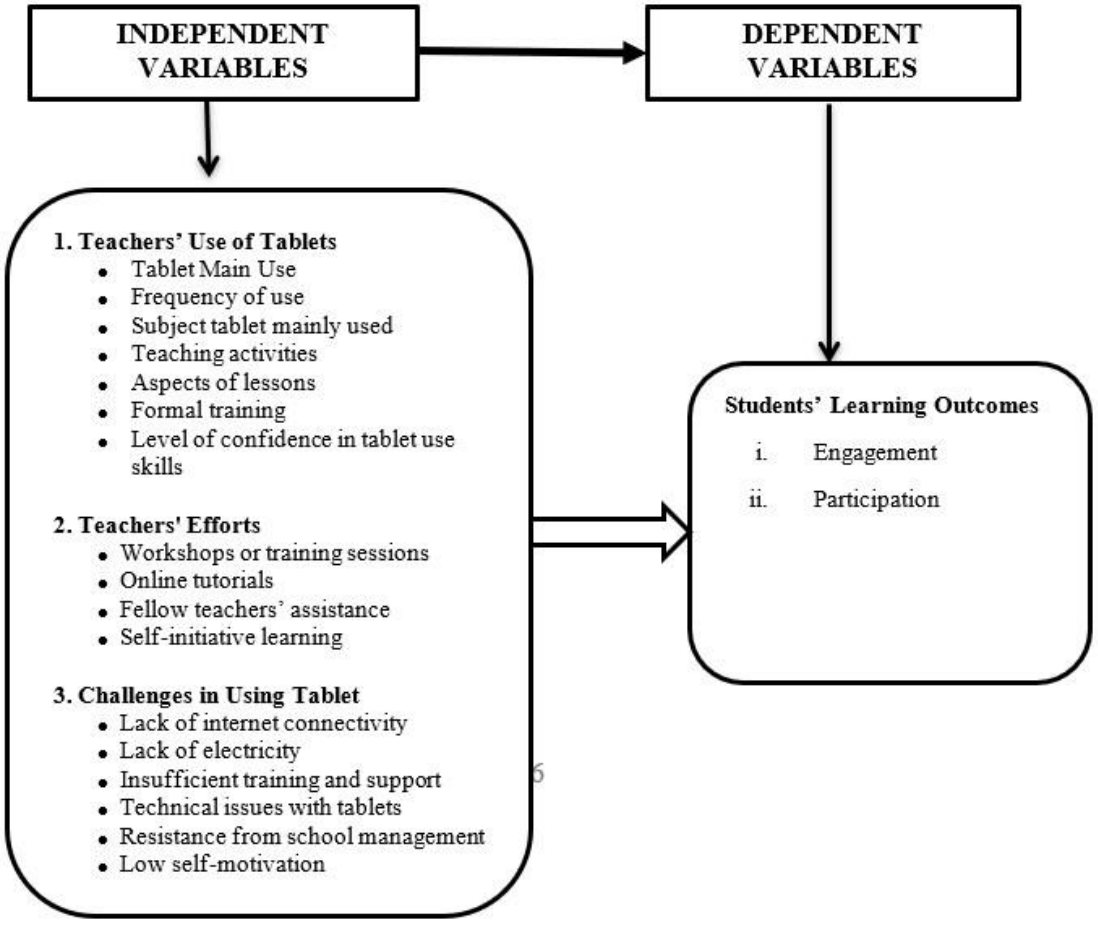


Figure 1: The conceptual framework
Source: Researchers' design (2024)

3. Methodology

This study used a mixed-methods, concurrent design to understand the research problem comprehensively. This approach allows for the simultaneous collection and analysis of quantitative and qualitative data, offering a strong triangulation of findings (Sharma et al., 2023, p. 7). The rationale for this design is to capture the extent of tablet use across a large sample of teachers while also gaining deeper insights into individual experiences. Data collection included questionnaires, interviews, and observations. One hundred ninety-one (191) teachers from 10 selected schools were randomly selected and completed the distributed questionnaires. The survey required the respondent to confirm their consent to proceed with filling in the items. This approach facilitated the collection of adequate quantitative data on the extent and nature of tablet use among teachers. It ensured a broader representation of the teacher population within the selected schools. This method helps minimise selection bias and enhance the generalizability of the findings. Ten (10) heads of schools and twenty (20) students who were purposively selected participated in semi-structured interviews. The study included respondents from five rural and five urban schools. The schools were purposively selected based on predefined criteria relevant to the objectives of the study. This approach enabled the researchers to deliberately identify schools that possessed specific characteristics considered essential for generating rich and relevant data. The selection criteria included factors such as school type, location, and contextual relevance to the tablet integration. The semi-structured interview guide was developed based on key themes emerging from the literature review and theoretical constructs (TPACK and DOI). Questions were organised into thematic sections, including specific teaching and learning activities, professional learning efforts, and perceived challenges. The interview guide was piloted with two participants to assess clarity and logical flow. The semi-structured interviews allowed for flexibility in exploring relevant topics in depth, enabling participants to share their experiences regarding tablet use for education. Classroom observations were also an integral part of the data collection process. Researchers conducted classroom observations to gather real-time, contextual data on how teachers use tablets in classroom settings. Researchers used an observation checklist. The checklist was developed to ensure systematic and consistent data collection across classrooms. The checklist included indicators such as frequency of tablet use, types of applications used, instructional strategies supported by tablets, and technical challenges observed. The checklist items were aligned with TPACK components to assess how technology was integrated into pedagogy.

The questionnaire was developed based on constructs derived from the TPACK and DOI theoretical frameworks and aligned with the study objectives. To ensure content validity, the instrument was reviewed by two experts in educational technology who evaluated the clarity, relevance, and alignment of items with the study variables. Reliability was assessed using Cronbach's alpha coefficient. The overall scale achieved an acceptable reliability coefficient ($\alpha \geq 0.70$), indicating satisfactory internal consistency of the items measuring tablet use, efforts to learn, and related challenges. Thereafter, two public secondary schools in Karatu District were purposively selected for the pilot study. Questionnaires were administered to 12 teachers, interviews were conducted with 2 heads of schools and 4 students, and classroom observations were undertaken in two schools. Feedback on clarity and practicality led to shortening and refining the instruments, thereby improving their reliability and validity before the main study.

The study analysed quantitative data using descriptive statistics and presented the results in frequencies, percentages, charts, and bar graphs. These statistical tools provided a clear and concise representation of the data, highlighting key patterns of tablet use. Furthermore, researchers analysed qualitative data thematically, coding it to identify patterns and themes related to teachers' specific tablet use, their efforts to learn to use tablets, and their challenges. Thematic analysis is particularly well-suited to qualitative data, as it allows the identification of recurring themes and the exploration of underlying meanings. To enhance the credibility and trustworthiness of qualitative findings, triangulation across surveys, interviews, and observations was employed. Member checking was also conducted by summarising key interview points to participants for confirmation of accuracy. These multiple data collection methods and various categories of respondents ensured a rich dataset, and rigorous data analysis techniques ensured reliable and valid findings.

Ethical clearance, permission, and consent procedures were adhered to in this study, as recommended by Auerbach and Silverstein (2003), including explaining the study's purpose, procedures, possible risks and benefits, the voluntary nature of participation, and the right to withdraw at any time without consequences. Researchers submitted the ethical clearance form to the University, and after review, the study received approval with Ref. No. MU/DPGS/INT/38/Vol. IV/336 and permission to collect data from the respective council with Ref No. KDC/DED/C.5/4/VOL.III/144. Later, researchers obtained oral consent from teachers to participate in interviews and FGDs, with assurances of anonymity and confidentiality. Oral consent was sufficient as the study did not require respondents' official position or any information related to the institutions. Consent from students was obtained through the head of school, who is in charge of students' welfare, for their care and protection in school contexts, on behalf of parents and those who consented, who participated in the interview.

4. Findings

The study explored teachers' use of tablets to facilitate students' learning in government secondary schools. Table 1 presents the demographic distribution; the sample comprised 191 respondents, mostly male (64.4%). This significant difference in gender representation suggests that the study's findings may better reflect male perspectives and experiences. The age distribution highlights that most respondents (60.2%) were in the 26-35 age group. This age group suggests that the study's findings mainly represent teachers in the early stages of their careers.

Table 1

Demographic Details of Respondents

Respondents' characteristics		Frequency	Percentage
Gender	Male	123	64.4
	Female	68	35.6
	Total	191	100.0
Age Groups	Below 25	9	4.7
	26-35	115	60.2
	36-45	64	33.5
	46-55	3	1.6

	Total	191	100.0
Years of experience	Below 5	48	25.1
	6-10	105	55.0
	11-15	28	14.7
	16-20	8	4.2
	Above 21	2	1.0
	Total	191	100.0
Education level	Diploma	77	40.3
	Bachelor	112	58.6
	Masters	2	1.0
	Total	191	100.0

Source: Field data, 2024

The respondents' experience varied in length, with the majority (55%) having moderate professional experience of 6 to 10 years. The respondents' educational qualifications also varied. Among the respondents, 77 (40.3%) held a Diploma, while a significant majority, 112 (58.6%), held a Bachelor's degree. A small minority of 2 respondents (1.0%) had achieved a Master's degree. This educational profile indicates that the sample is well-educated, with the majority having attained at least a Bachelor's degree.

4.1 Teaching and Learning Activities that mostly use Tablets

The study examined specific teaching and learning activities, mainly using tablets to facilitate students' learning. The findings reveal the teaching practices in which teachers use tablets. Also, it supports informed decisions on curriculum development, teacher training, and student engagement to make tablet use more effective.

Table 2

Main Tablet Use by Gender

		How do you use the government-issued tablet?			Total
		For Entertainment	For Teaching	For information	
Gender	Male	9 (7.3%)	85 (69.1%)	29 (23.6%)	123 (100%)
	Female	3 (4.4%)	51 (75.0%)	14 (20.6%)	68 (100%)
Total		12 (6.3%)	136 (71.2%)	43 (22.5%)	191(100%)

Source: Field data, 2024

Table 2 contains findings indicating that 71.2% of male and female respondents mostly use tablets for teaching. Specifically, 85 of 123 male respondents (69.1%) reported using tablets for teaching, while 51 of 68 female respondents (75.0%) reported the same use. This finding highlights that teaching is the primary function of tablets across both genders. In contrast, fewer respondents use tablets for entertainment and information. Among males, nine respondents (7.3%) use tablets for entertainment, and 29 (23.6%) use them for information. For females, three respondents (4.4%) use tablets for entertainment, and 14 respondents (20.6%) use them for information. Generally, 12

respondents (6.3%) use tablets for entertainment, 136 respondents (71.2%) use them for teaching, and 43 respondents (22.5%) use them for information. These findings suggest that tablets are primarily for educational purposes but have significant secondary uses for information and entertainment. The data underscores the importance of tablets as educational tools and highlights gender similarities in their use for teaching and other activities.

Table 3

Frequency of Tablet Use in Teaching Activities

	How frequently do you use tablets in your teaching activities?					Total
	Daily	Weekly	Monthly	Rarely	Never	
Total	129 (67.5%)	26 (13.6%)	9 (4.7%)	24 (12.6%)	3(1.6%)	191 (100%)

Source: Field data, 2024

The study explored how often respondents use tablets in their teaching activities, as indicated in Table 3. It was significant to include this question because it helps determine how frequently teachers integrate tablets into teaching and learning activities, assists in designing curricula that incorporate tablet use appropriately, and informs assessments of the role of tablets in making lessons more interactive and engaging.

The findings revealed a high level of daily tablet use, with 67.5% of respondents reporting daily use. This observation indicates that tablets have become an integral tool in their daily teaching routines, suggesting a high reliance on this technology for teaching activities, specifically searching and downloading notes. However, the presence of respondents who use tablets less frequently suggests varying levels of adoption and use, and factors such as personal preference and digital skills influence them.

4.2 Teaching activities that use tablets the most

We asked respondents about specific teaching activities in which they mostly use tablets, as indicated in Table 4. The aim was to pinpoint which teaching activities benefit most from tablet integration, ensuring that tablet use aligns with educational objectives and learning outcomes.

Table 4

The subject for which teaching activities mostly use tablets

Which subjects do you mainly use tablets for in your teaching?	What specific teaching activities do you mainly use tablets for?					Total
	Preparing lesson plans	Delivering lesson	Preparing quizzes and tests	Searching &downloading notes	Calling students' names	
Mathematics	3	1	3	9	0	16(8.4%)
Biology	1	7	2	4	5	19(9.9%)
Chemistry	2	0	6	14	2	24(12.5%)
Physics	2	5	1	1	4	13(6.8%)

Geography	1	8	3	17	4	33(17.2%)
History	0	0	5	3	0	8(4.1%)
Civics	0	1	0	2	1	4(2.1%)
English	3	3	3	23	3	35(18.3%)
Kiswahili	1	3	4	5	1	14(7.3%)
Literature	1	0	0	2	0	3(1.5%)
Agriculture	0	0	2	9	1	12(6.2%)
Other subjects	0	6	2	1	1	10(5.2%)
Total	14(7.3%)	34(17.8%)	31(16.2%)	90(47.1%)	22(11.5%)	191(100%)

Source: Field data, 2024

We asked respondents about subjects in which teachers mostly use tablets in their teaching and the specific activities they perform with them, as shown in Table 4. The findings revealed that searching for and downloading notes is the primary use of tablets for teaching activities, with 90 respondents (47.1%) reporting this. They are followed by delivering lessons (34 respondents, 17.8%), preparing quizzes and tests (31 respondents, 16.2%), preparing lesson plans (14 respondents, 7.3%), and calling students' names (22 respondents, 11.5%). This finding highlights the multifunctional role of tablets in supporting various teaching tasks. Similarly, through semi-structured interview questions, the study found that most teachers use tablets offline; for example, file transfers via Bluetooth, Xender, or a USB cable to transfer pre-downloaded materials, notes, videos, and other teaching-related documents from their smartphones or from fellow teachers.

The study findings revealed that English Language (18.3%) and Geography (17.2%) are the subjects for which most teachers use tablets. This finding suggests that teachers of arts subjects, particularly English Language and Geography, find tablets useful tools for searching and downloading materials. Participants stated that most teachers use tablets to search for and download teaching and learning materials, such as pictures, videos, and animations. The Head of School B validated these findings and commented, "*Teachers in this school use tablets for academic purposes, specifically to search materials from the internet for teaching and learning purposes".* Another participant, Head of School from school E, commented, "*Most teachers use tablets to peruse, search, download, and store as well as present lesson notes such as e-books, past papers, as well as other important stuff for improving their teaching and learning process".*

Nevertheless, there were contrasting findings between the reported use of tablets for teaching activities and the actual observations in classrooms. While many teachers (67.5%) and heads of schools claimed that tablets are primarily used for searching, downloading and presenting teaching materials, the observations conducted during the study revealed a different reality. Despite the widespread claims that tablets are essential tools for teaching, none of teachers were observed using tablets in the classrooms across all ten sampled schools. Instead, the tablets were mostly found in teachers' offices, often unused during lessons. This inconsistency was further highlighted by the students' feedback. For instance, student "2" from School "B" remarked: "Teachers do not come with tablets in the classrooms; they use tablets for chatting and other activities such as making calls." This statement contrasts sharply with the teachers' and head of schools' claims, suggesting that tablets may not be as integrated into classroom activities as reported.

4.3 Teachers' efforts to learn how to use tablets

This objective aimed to determine teachers' efforts to learn how to use tablets to facilitate students' learning. It aimed to identify respondents who attended formal training, their confidence in their current level of tablet use skills, the current level of ICT or digital skills in using tablets, and the efforts they made to learn to use tablets.

4.3.1 Formal training

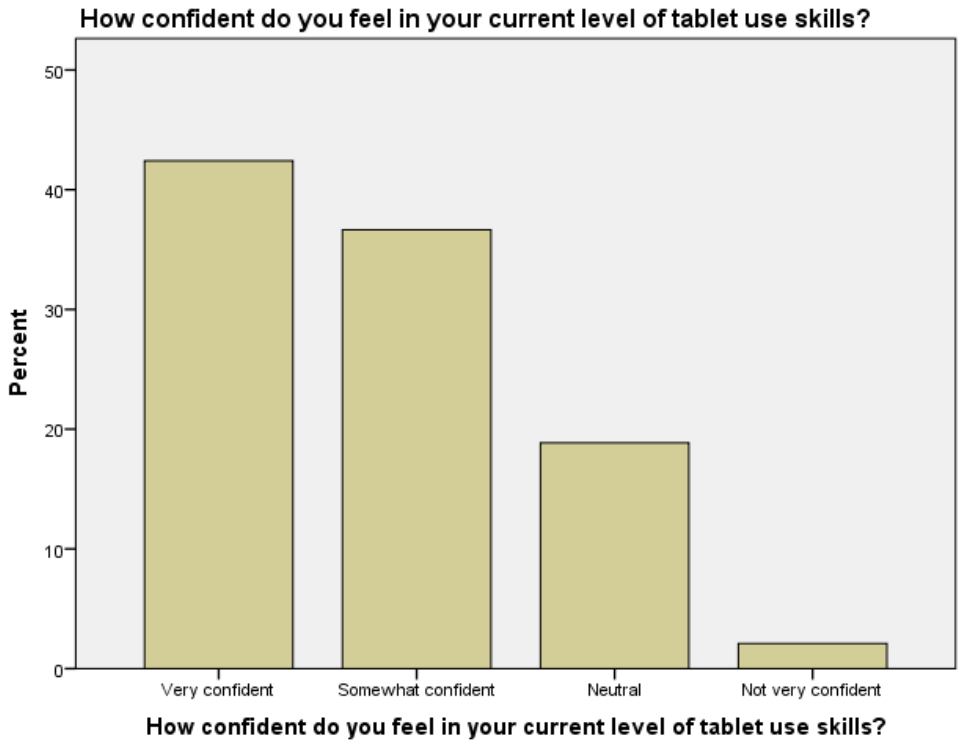
We asked respondents whether they had received formal training in using tablets to improve their teaching. It is important to ask this question because it determines whether teachers have the necessary skills to use tablets effectively in their teaching and helps plan and design professional development programs focused on tablet use. The findings revealed that 128 (67%) of 191 teachers had not received formal training on using tablets, while 63 (33%) of 191 teachers replied that they had not. It implies a clear need for more comprehensive training programs to ensure that all teachers have the skills to use tablets effectively in their teaching. However, most respondents who said they had not received formal training reported learning on tablets through experience with smartphones, personal experience, assistance from fellow teachers, and knowledge from the college or University.

4.3.2 The current level of tablet uses skills

We asked respondents to state how confident they feel in their current tablet-use skills—the question aimed to measure teachers' self-perceived confidence in using tablets. Figure 1 indicates that 81 teachers (42.4%) are very confident in their current level of tablet use skills, 70 teachers (36.6%) are somewhat confident, and 36 teachers (18.8%) responded that they are neutral. In comparison, only 4 teachers (2.1) reported not being very confident in their current level of tablet use. The finding implies that while most teachers are confident in their tablet use skills, there is a clear need for ongoing professional development to support those who are less certain or neutral about their abilities.

Figure 1

Current level of tablet use skills



4.3.3 The current level of ICT or digital skills in using tablets

The questionnaire required respondents to rate their current ICT or digital skills in using tablets. This aimed to provide insights into how teachers perceive their digital competence and help to identify perceived strengths and weaknesses in ICT skills related to tablet use.

Table 5

Current level of digital skills

How do you rate your current level of ICT or digital skills in using tablets?		
	Frequency	Percentage
Novice	5	2.6
Beginner	31	16.2
Intermediate	99	51.8
Advanced	45	23.6
Expert	11	5.8
Total	191	100.0

Source: Field data 2024

The findings indicated that 99 out of 191 teachers (51.8%) have an intermediate level of ICT or digital skills in using tablets is intermediate, 45 (23.6%) were advanced, 31 (16.2%) were beginners, and 11 teachers (5.8%) were experts as well as only five (2.6) were a novice (see Table 5). The presence of beginners (16.2%), experts (5.8%), and novices (2.6%) indicates a wide range of ICT skill levels among the teaching staff. This diversity suggests that the government must provide differentiated professional development programmes to cater to varying proficiency levels. However, while most teachers have intermediate or advanced ICT skills, there is a clear need for differentiated professional development to support all teachers in effectively using tablets in their teaching.

Tablet 6

Teachers' efforts to learn how to use tablets

Gender	**Male**	**Female**	**Total**		
Fellow teachers' assistance	78	40	118 (37.9%)		
Self-initiative learning	84	34	118 (37.9%)		
Online tutorials	35	25	60 (12.6%)		
Workshops or training sessions	30	21	51(10.6%)		
Other initiatives	4	1	5 (1.0%)		
Total	123(64.4%)	68(35.6%)	191 (100%)		
Level of Education	**Diploma**	**Bachelor**	**Masters**	**Total**	
Fellow teachers' assistance	57	59	2	118 (37.9%)	
Self-initiative learning	48	68	2	118 (37.9%)	
Online tutorials	27	32	1	60 (12.6%)	
Workshops or training sessions	24	26	1	51(10.6%)	
Other initiatives	0	5	0	5 (1.0%)	
Total	77(40.3%)	112(58.6%)	2(1.1%)	191 (100%)	
Age	**Below 25**	**26-35**	**36-45**	**46-55**	**118 (37.9%)**
Fellow teachers' assistance	7	62	46	3	118 (37.9%)
Self-initiative learning	1	68	46	3	60 (12.6%)
Online tutorials	3	41	14	2	51(10.6%)
Workshops or training sessions	1	35	12	3	5 (1.0%)
Other initiatives	0	3	2	0	191 (100%)
Total	9(4.7%)	115(60.2%)	64(33.5%)	3(1.6%)	118 (37.9%)

Years of experience	**Below 5**	**6-10**	**11-15**	**16-20**	**21+**	**Total**
Fellow teachers' assistance	26	64	20	6	2	118 (37.9%)
Self-initiative learning	24	64	22	6	2	118 (37.9%)
Online tutorials	14	32	10	2	2	60 (12.6%)

Workshops training sessions	15	25	3	6	2	51(10.6%)
Other initiatives	2	1	2	0	0	5 (1.0%)
Total	48(25.1%)	105(55.0%)	28(14.7%)	8(4.2%)	2(1%)	191(100%)

Source: Field data, 2024

The respondents rated their efforts to learn how to use tablets, as indicated in Table 6. It was significant to ask this question because it identifies the various methods teachers use to develop their tablet-use skills and helps understand the preferred and most effective learning avenues for teachers. The respondents were required to select the appropriate answers. The findings showed that among fellow teachers' assistance and self-initiative learning, 118 (37.9%) of 191 were the most frequently used efforts or initiatives for teachers to acquire tablet-use skills. Additionally, 60 (12.6%) of 191 teachers used online tutorials, 51 (10.6%) used workshops or training, while only 5 (1.0%) used other efforts, such as attending computer short courses.

The interview with school heads found that most teachers learn tablet skills from experience with smartphones. The findings further reveal that some teachers seek assistance from other teachers. One of the Head of School G replied, *"In most cases when teachers fail to use tablets in their normal activities, they ask assistance from their fellow teachers with ICT skills or knowledge to help them".* The study findings from open-ended questionnaires revealed that the school did not provide support in enhancing tablet use in teaching. Few teachers reported that the school provided in-house seminars or workshops, installed power sources such as electricity or solar energy, and encouraged collaboration among teachers to help each other.

5. Discussion

The study explored teachers' use of tablets to facilitate students' learning in government secondary schools. This section discusses the study's findings, focusing on tablet use among teachers in government secondary schools.

5.1 Teaching Activities that use Tablets

The findings of this study revealed that teachers in government secondary schools mostly use tablets for teaching activities, including searching for and downloading notes, delivering lessons, preparing quizzes and tests, and creating lesson plans. The frequent daily use of tablets by 67.5% of teachers underscores their integral role in modern teaching practices. However, many teachers use tablets less frequently, suggesting inconsistent adoption levels, possibly influenced by individual preferences and digital skills. These findings are consistent with previous research by Bjørgen et al. (2021), Haji et al. (2024), and Mwakapemba et al. (2024), who found that teachers use tablets to teach subjects such as English and Norwegian. Albirini (2020), Cheng and Zhang (2020), Goh and Ang (2023), and Hamidi and Smith (2021) also highlighted the prominent role of tablets in enhancing the accessibility of digital resources and interactive content in classrooms.

The correlation of these findings with the TPACK framework by Mishra and Koehler (2006) and the Diffusion of Innovations (DOI) theory by Rogers (2003) is significant. The TPACK framework suggests

that effective technology integration in education requires a harmonious combination of technological, pedagogical, and content knowledge. The study's findings demonstrate that teachers who have developed these competencies through personal experience are more confident and frequent users of tablets in their teaching practices. The DOI theory, which explains how innovations are adopted and spread within a social system, also aligns with the study's findings. The variability in tablet use among teachers reflects different stages of adoption as proposed by the DOI theory. Early adopters and innovators use tablets daily, while late adopters use them less frequently, often due to a lack of training.

5.2 Teachers' efforts to learn how to use tablets

This study aimed to determine the efforts teachers make to learn using tablets. The findings revealed that teachers rely on fellow teachers' assistance, self-initiated learning, online tutorials, workshops or training sessions, and other initiatives, such as attending computer short courses. These efforts demonstrate teachers' positive approach to enhancing their technological skills despite limited access to formal training programs. The findings of this study are consistent with previous research. For instance, Bjørgen et al. (2021) found that teachers in Norwegian primary schools collaborated to learn using tablets. Similarly, this study found that teachers often seek assistance from colleagues with ICT skills, indicating a collaborative culture in which teachers support one another in overcoming technological challenges. Albirini (2020) highlighted that proactive teachers actively research and experiment with different tablet apps and tools to discover their potential for specific learning objectives. This study similarly found that many teachers engage in self-initiated learning, demonstrating a proactive approach to developing their tablet-use skills.

Furthermore, Cheng and Zhang (2020) and Hamidi and Smith (2021) noted that some teachers organise workshops and training sessions for their colleagues, sharing their knowledge of using tablets. This study also found that seminars or training sessions are among the efforts teachers make to enhance their tablet-use skills. Goh and Ang (2023) found that experienced teachers with tablet proficiency mentored and supported less experienced colleagues, fostering a culture of continuous learning. This finding aligns with current research showing that teachers with more experience or ICT skills assist their colleagues, highlighting the importance of mentorship and peer support.

The findings also correlate with the TPACK and DOI theories. The TPACK framework emphasises the integration of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). The observed self-initiated learning and engagement with online tutorials reflect teachers' efforts to strengthen their Technological Knowledge (TK), particularly their operational understanding of tablet functions and applications. Peer collaboration and mentorship practices further indicate the development of Technological Pedagogical Knowledge (TPK), as teachers collectively explore how tablet features can support specific teaching strategies such as lesson delivery, assessment preparation, and classroom management. However, the limited evidence of structured integration of subject content with tablet use suggests that Technological Pedagogical Content Knowledge (TPACK) remains at an emerging level, requiring more systematic professional development that deliberately connects technology use with subject-specific instructional goals.

The DOI theory explains how individuals adopt new technologies over time. According to Rogers (2003), adoption is influenced by categories such as innovators, early adopters, early majority, late majority, and laggards. The study findings show that teachers are adopting tablets at varying rates,

with some very confident and others still at the beginner level. Teachers who independently explore tablet applications and mentor colleagues demonstrate characteristics of innovators and early adopters, particularly in terms of higher risk tolerance and greater openness to experimentation. In contrast, teachers who depend primarily on peer guidance reflect the early majority stage, where adoption is influenced by interpersonal networks and observable benefits. Efforts such as peer support and self-initiative learning align with the DOI theory, representing the early stages of adoption and diffusion of tablet use among teachers.

Additionally, the reliance on workshops and collegial sharing reflects the DOI indicators of communication channels and social systems, which facilitate the diffusion process within the school context. The gradual increase in teachers' confidence suggests movement along the DOI innovation decision process stages from knowledge acquisition to persuasion and early implementation. The findings acknowledge that teachers' efforts to learn to use tablets are credible, particularly given limited formal training opportunities. However, there is a clear need for more accessible and structured training programs that explicitly address TPACK components and support teachers across different DOI adoption categories in order to bridge the current skills gap and ensure sustainable integration of tablets into pedagogical practice.

6. Summary, Conclusion, and Recommendations

The study explored teachers' tablet use in government secondary schools in Karatu District and provided valuable insights into the use of digital tools in education. The findings indicate that substantial challenges hinder their practical use. In contrast, many teachers actively use tablets for various teaching purposes, including searching for and downloading notes, delivering lessons, and preparing instructional materials. The lack of formal training is a critical issue: 67% of teachers have not received formal instruction on tablet use. The government must address challenges, such as a lack of internet connectivity, technical issues, and insufficient training, and highlight the infrastructural and support deficiencies. First, the study recommends developing and providing subject-specific digital content and applications aligned with the curriculum. This recommendation will support subjects like English and Geography, which have shown higher tablet usage. The government should also encourage and support the use of tablets in other subjects, such as civics, literature, history, and agriculture, by providing relevant apps and digital tools. Second, to ensure that tablets are actively used for teaching and not just stored in offices or staffrooms, the study suggests that educational authorities develop policies and frameworks to encourage and monitor tablet use in classrooms. One limitation of the study is its small sample size. Despite surveying 191 teachers, the findings may not be fully generalizable to all government secondary schools in Karatu District or other regions. The purposive selection of 10 schools from 32 may have introduced selection bias, limiting the sample's representativeness. Further comparative studies across different regions or school types should be conducted to explore variations in tablet use and identify best practices for replication.

Declarations

Competing Interests
Authors declares they have no conflict of interest to declare

Ethical Approval
This study was granted an ethical approval No. Ref. MU/DPGS/INT/38/Vol. IV/336 by the Mzumbe University as part of graduate research study. After obtaining the approval, the study received a research permit with Ref. No. Ref No. KDC/DED/C.5/4/VOL.III/144 from Karatu District Council, which was the study area. As such, it adheres to institutional guidelines that classify this type of study as low-risk and not subject to formal ethics approval.

Author's Contribution
Author[1]: Conceptualization, proposal development, data collection, Data curation, Formal analysis, Writing – original draft
Author[2]: Supervision, co-designing data collection tools, revising the original draft
Author[3]: Co designing the methodology, validation, writing – review and editing

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