Digital resource utilization and learners' academic performance in technology-enhanced classrooms in secondary schools in Gakenke District, Rwanda

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ABSTRACT

The purpose of this study was to examine the relationship between digital resource usage and learners' academic performance in technology-enhanced classrooms in secondary schools. The objectives of the study were to examine the relationship between frequency of digital resource usage, to evaluate the effect of type of digital resources, to explore the influence of duration of digital resource usage, and to assess the effect of learners' engagement level during digital resource usage on academic performance in technology-enhanced classrooms in Gakenke district secondary schools. The study area was 18 secondary schools from Gakenke District, Northern Province, Rwanda, with smart classrooms. The Replacement, Amplification, Transformation (RAT) Model was used as the guiding theoretical framework. A descriptive correlational survey design was applied. Questionnaires and interview guides were used to collect both quantitative and qualitative data. The population of the study comprised 306 students, teachers, parent representatives, deputy head teachers in charge of studies, and head teachers from eighteen secondary schools within Gakenke District, Rwanda. Stratified and purposive sampling were used. Yamane's formula was applied to the study population to find a sample size of 83 students, 36 teachers, 18 directors of studies, 18 SEC presidents, and 18 head teachers. A pilot study was conducted at two secondary schools to test the validity and reliability of research instruments. Descriptive statistics was used to summarize the data, while inferential statistics was applied to test hypotheses and look for relationships between different variables. The type of digital resources accessed explained 20.2% of academic performance variations ($R^2 = 0.202$, $p = 0.002$), indicating that many students might not be able to access a good variety of effective tools, and the type of digital resource accessed is not a strong predictor of academic performance. The study calls for improvements in access to digital resources, teacher training, and parental involvement and recommends that policymakers set policies that enable continuous investment in digital resources and decentralization of budgets at the school level. Future researchers should explore the effect of teachers' digital literacy and learners' academic performance.

Keywords: Academic Performance, Digital Access, Digital Resources, Student Engagement, Technology-Enhanced Classrooms

I. INTRODUCTION

Education is a process of imparting knowledge, developing reasoning abilities, and preparing individuals intellectually for mature life (Swargiary, 2025). Technology makes learning more immersive, allowing students to remain focused and engaged with the subject (Amin & Nawe, 2020). The incorporation of technological resources, oral presentations, and group participation in classroom tasks can enhance the dynamic nature of student learning (Haleem et al., 2022).

In America, in K–12 schools, the average number of educational technology tools accessed per district in 2018–19 was over 2,500, which is a significant increase from the 895 viewed per school district during the same year. In America approximately 63% of high school students utilize digital resources on a daily basis, while only 45% of elementary pupils do so. Teacher integration is a significant issue, with almost half (48%) of educators utilizing technology for virtual lesson plans, and slightly less than half employing technology to provide web-based learning games or activities for students. Educators additionally make use of online videos, images, and articles (43%). Key divides in the educational technology landscape, such as digital use, design, and access, have been highlighted by the Department of Education (Keengwe, 2018). This plan requires specific measures to bridge the gaps and improve the utilization of technology in education. The use of digital resources in education has largely become integral to the overall educational experience in America, and initiatives are being made to enhance access and quality (Keengwe, 2018).

In Europe, there is unequal access to digital technologies in the education system between poor families and the richest ones. The differences in terms of digital skills and competencies are also observed among the teachers because the training institutions as well as teacher training programs are unequally accessed. A comprehensive and unified EU-wide initiative was initiated to aid education and training mechanisms in response to the challenges brought about by COVID-19, while also proposing a long-term plan for European digital education. The Organisation for Economic Co-operation and Development's (OECD, 2023) study discovered that less than 40% of educators in the European Union (EU) were willing to integrate digital technologies into their teaching practices.

In Asia, in the midst of the COVID-19 epidemic, the digital divide was highlighted, with students from less fortunate backgrounds often lacking connectivity due to technological advancements and parental absence. In South Asia, only 13% of young people access the internet at home. There is a significant difference in internet access between students from the most privileged and those from less fortunate families. The students from the wealthiest families 'access internet connection almost eight times more than the students from less fortunate families. The rise of digital technology in Southeast Asia has been a swift development, with around 40 million new internet users expected to join. This advancement has led to an enhanced capacity of learners to access education and form connections in isolated locations and during times of crisis (Ra, 2016).

In East African nations, digital resources differ throughout the region. For example, roughly 40% of Kenyans access the internet. In Tanzania, approximately 25% of the population is connected to the internet. In Uganda, Internet penetration is near 24%. In Rwanda, Internet access is about 26%. Mobile phone access is greater, with roughly 75% of the population in East Africa having mobile phones. A notable gap as far as digital skills are concerned is observed between urban people and rural ones, where urbanites enjoy better access to digital education and training in comparison to the rural people. High internet service costs and digital devices continue to pose challenges. For example, affordability levels surpass the global 2% of monthly income benchmark in over 75% of nations in Sub-Saharan Africa. Urban inhabitants are more than three times as likely to have internet access than their rural counterparts. Initiatives to close these gaps consist of enhancing digital infrastructure, improving digital skills training, and formulating inclusive digital policies. Tackling these challenges can enable East Africa to exploit digital resources for economic advancement and development (Antoninis et al., 2023).

In Rwanda's secondary education (all grades), the repetition rate was 4,024% in 2018 (Crawfurd, 2021). The education system's younger generation is primarily affected by repetition. According to the statistical yearbook 2020-2021 published by MINEDUC in February 2022, the share of primary school dropouts increased from 7.8 percent in 2019 to 9.5 percent in 2020-2021, and the percentage of high school dropouts rose from 8.2 percent in 2019 to 10.3 percent in 2020/2021 (Macharia et al., 2024). Among the reasons for leaving school pointed out by the ministry in charge of education in Rwanda is bad driving. The study carried out by the United Nations Educational, Scientific and Cultural Organization in 2021 highlighted that the conditions at school, like lack of teachers, school location, and lack of quality of education, can also significantly affect the increased pressure to drop out of school. The combination of repetition and dropout contributes to over-aged students within the system. High repetition rates lead to longer schooling, which affects the overall graduation rate, so repetition and dropout act as barriers to equity in the education system. The use of technology in the classroom is believed to be the most effective way for teachers to reduce repetitive and time-wasting work.

In order to reduce costs and create more equitable access for students who cannot afford ICT in education policy, MINEDUC has chosen to replace the OLPC with a smart classroom concept (Nsabimana et al., 2024). The ICT in Education program highlights the need for two smart classrooms; each school is equipped with 50 laptops and a projector, as well as internet access. More than 310 million dollars, which is nearly 10 percent of the annual budget, is received annually to promote ICT in education in Rwanda. The National Smart Classroom Program is an important part of this investment. Considering the number of teachers and the distribution of devices to the teachers, the ratio is currently one to six (1:6) and is planned to be one to five (1:5) by July 1, 2022, subject to available resources. In terms of primary education, the biggest difference is in primary education, where the ratio is one to twenty (1:20) compared to one in three (1:3) in secondary schools (Nsabimana et al., 2024).

In Gakenke District, as in other districts in Rwanda, the absence of laptops prevents teachers from applying their knowledge and often leads to their failure to practice what they have learned. The pace of training is still low because of using face-to-face training. Besides, the supplied digital resources are either kept in a cupboard or have minimal access to students for fear of being lost. Findings from the studies indicate that the application of digital resources within the classroom is highly beneficial for academic achievement, with easy access to information, quick retention of information, and overall GPA being higher. By observing national examination results published by the National Examination and School Inspection Authority (NESA), there is a gap in terms of performance related to location (rural-urban), ownership of school (public, district, private, and government aid), and gender. Dropout and repetition rates are higher in rural than urban secondary schools. Equal access and integration of digital resources in teaching practices can address achievement gaps or eliminate educational waste. Therefore, this study is intended to

examine the relationship between digital resource utilization in technology-enhanced classrooms and academic performance in Gakenke District.

1.1 Statement of the Problem

Digitalisation is regarded as an effective means of enhancing the quality of education, knowledge sharing, and collaboration in education. The current process of digitalisation is primarily at a basic level, and due to inadequate infrastructure, students are faced with insufficient access to reliable and affordable internet and computer equipment (Schmidt, 2020).

Using digital resources in education provides many advantages that can greatly improve learners' academic performance. First, digital platforms offer easy access to learning materials from any location, resulting in education that is more flexible and convenient. They also facilitate personalised learning experiences by addressing individual needs and learning styles, which allow students to progress at their own speed. Moreover, interactive and multimedia content can render learning more engaging and enjoyable, thereby enhancing retention and comprehension. Digital tools also promote collaboration among students, enabling them to easily work together on projects and exchange ideas. In addition, instant feedback from digital assessments helps students quickly recognise their errors and learn from them. Finally, digital resources can be economically beneficial, decreasing the reliance on physical textbooks and other materials, thus making education more affordable. In summary, the incorporation of digital resources in education can enrich the learning experience and lead to improved academic outcomes (Haleem, 2022). In Rwanda's secondary education (all grades), the repetition rate was 4,024% in 2018 (Crawfurd, 2021). According to the statistical yearbook 2020-2021 published by MINEDUC in February 2022, dropouts in primary school rose from 7.8 per cent in 2019 to 9.5 per cent in 2020-2021. Based on the same research, the percentage of high school dropouts rose from 8.2 per cent in 2019 to 10.3 per cent in 2020/2021. More than 310 million dollars, which is nearly 10 per cent of the annual budget, is received annually to promote ICT in education in Rwanda. According to NESA's analysis in 2023, the difference in performance is related to location (rural or urban), school ownership (public or district), private and public support, and gender.

Based on the fact that dropout rates and repetition are high as wastage in education, this reduced promotion rate. Seeing that there is the gap in performance related to location (rural-urban), ownership of school (public, district, private, and government aid), and gender. Observing that there are unequal distributions of digital resources like laptops, smartphones, projectors, internet devices, and speakers to schools and head teachers' poor management practices where distributed ones are kept in cupboards or minimise access to students for fear of being lost and being charged. Experiencing how students are motivated during the period reserved for smart classrooms. When some teachers are not willing to learn how the digital tools work, it shows that they are less dedicated to their work. When problems of inequality in terms of distribution, access, and usage of digital resources persist, the overall quality of education is compromised. Researchers decided to carry out research to show teachers, head teachers, parents, and education stakeholders the relationship between digital resource utilisation and learners' academic performance in technology-enhanced classrooms in secondary schools and advocate for equitable distribution, access, and use and management of digital resources in schools.

1.2 Research Objective

Specifically, the study is guided by the following objective:

i. To evaluate the effect of type of digital resources accessed on academic performance of learners in technology-enhanced classrooms in Gakenke district secondary schools.

II. LITERATURE REVIEW

2.1 Theoretical Review

Replacement, Amplification, Transformation (RAT) Model, was used as the guiding theoretical framework, to describe the relationship between digital resource utilization and academic performance in technology-enhanced classrooms in Gakenke district secondary schools.

2.1.1 Replacement, Amplification, Transformation (RAT) Model

The RAT Model was developed by Dr Joan Hughes in 2006. Its aim is to help educators understand how technology can improve teaching and learning. The model focuses on how technology can replace traditional methods, make existing practices better, and create new learning experiences. This framework is useful for teachers to evaluate how digital tools affect learning in the classroom (Hughes, 2006).

The RAT Model has three main elements, such as replacement, amplification, and transformation. First, replacement means using technology to take the place of traditional learning methods while keeping the same goals. For

example, an online quiz can act as a digital substitute for a paper test. Next, amplification involves enhancing traditional approaches with technology, making learning activities more effective. An example is using interactive simulations that provide a deeper understanding than standard textbook explanations. Finally, transformation signifies a significant change in how learning occurs, allowing for new ways of teaching and understanding concepts that were not previously possible. For instance, using online tools for collaborative projects encourages greater student engagement (Hughes, 2006).

Additionally, the RAT Model includes several specific elements: accessibility ensures that all students can use digital tools; engagement focusses on creating interesting learning experiences that capture students' attention, and collaboration enables students to work together using technology, which promotes teamwork. However, other elements include differentiation, which gives teachers the ability to adjust instruction based on each student's needs; feedback, which provides quick responses to students and helps them see where they can improve; assessment, which uses technology to offer different ways to evaluate student learning and provide timely feedback; flexibility, which supports learning anywhere and anytime by adapting to students' schedules; and lastly, empowerment, which gives students more control over their learning by allowing them to make decisions about their studies (Hughes, 2006). These elements all work together to integrate technology into education effectively.

2.2 Empirical Review

2.2.1 Types of Digital Resources Accessed and Academic Performance

Recent research indicates that utilising digital tools has a beneficial impact on academic success in classrooms that are enhanced by technology. For example, a 2021 study by Ivgin and Akcay (2024) revealed that students who utilised digital resources like interactive tools and educational games scored higher and improved their problem-solving skills in contrast to those who relied on traditional methods. Siano et al. (2022) discovered that incorporating e-books and internet resources assisted learners in enhancing their research abilities and attaining improved grades. Talley et al. (2013) revealed that using multimedia resources like videos and podcasts helped students remember information better and resulted in higher test scores, especially in science and math subjects. Lastly, Brugliera (2024) found that learners who worked on digital group projects were more motivated and performed better in their studies. Overall, these studies highlight the important role of different digital resources in improving academic success for secondary school students. Interactive learning tools, such as educational games and simulations, make lessons more engaging and help students understand difficult concepts. For example, platforms like Kahoot! allow teachers to create fun quizzes that motivate students while providing instant feedback, which helps them remember information better (Baker et al., 2022). Additionally, virtual science labs such as Labster let students perform experiments safely, giving them hands-on experience that builds their practical skills and knowledge (Santos & Prudente, 2022).

E-books and digital textbooks provide students flexible access to learning materials, which can improve their study habits. For instance, research by Bikowski et al. (2018) showed that students using digital textbooks felt more engaged and retained information better than those using traditional textbooks. Moreover, platforms like VitalSource offer interactive features, such as quizzes in the form of multiple-choice questions and highlighting tools which work like hints that guide learners and help students learn effectively. Using multimedia resources like videos and podcasts caters to various learning preferences and helps learners to master subject matter. For example, a study by Shek et al. (2023) found that students who watched instructional videos scored higher on tests than those who did not. In addition, educational podcasts offer students an opportunity to learn while they are on the go, helping them to reinforce what they have learnt (Neer, 2024).

Online collaboration platforms allow students to improve their teamwork and communication skills. Tools like Google Workspace allow students to create documents and presentations together in real time, which promotes a collaborative learning environment (Hernawan et al., 2025). Also, platforms like Edmodo enable students to exchange ideas and get feedback, making for richer learning experiences and better academic results (Oskarita & Arasy, 2024). A one-stop hub for course materials, assignments, and assessments, helping students stay organised and informed, provided by Learning Management Systems (LMS). Research by Cerezo et al. (2016) shows that students' ability to manage their coursework and deadlines is facilitated by LMS. Additionally, platforms like Canvas offer analytics, allowing teachers to track how students perform and make timely interventions when needed (Martin & Ndoye, 2016). Educational apps designed for specific subjects help learners to learn individually and address the needs of each learner. For example, math apps like Khan Academy offer practice problems and immediate feedback, enabling students to learn depending on their potential (Vidergor & Ben-Amram, 2020). Similarly, language learning apps like Duolingo use game-like features to make vocabulary learning fun and engaging for secondary school students (Jiang et al., 2024).

For the students to understand theoretical concepts deeply, virtual and augmented reality technologies are applied. A study by Johnson and Thompson (2023) showed that students utilising VR to reflect on past events demonstrated a greater level of understanding of subject matter and retention than those in traditional classes. Furthermore, augmented reality apps, like Google Expeditions, let students visualise complex scientific processes,

improving their educational experience and making concepts clearer (Chiang et al., 2023). Digital assessments offer students immediate feedback, assisting them in recognising their level of mastery of the subject and where more effort is needed. Research by Al Awadh, 2021, suggests that online quizzes can motivate students and enhance their performance due to their interactive nature. In addition, tools like Socrative allow teachers to conduct quizzes and gather data on student understanding, facilitating prompt assistance for those who need it (Carney et al., 2022).

Access to research databases and online libraries provides students with many academic resources, helping them develop some skills in terms of thinking and researching. Research by Umarova et al. (2024) showed that students using digital resources from online libraries improved their writing skills and learnt to evaluate sources effectively. Furthermore, platforms like JSTOR give access to scholarly articles, enhancing classroom discussions and supporting in-depth research projects (Minarti et al., 2023). In technology-enhanced classrooms, several challenges can affect students' academic performance. One challenge is technical difficulties, such as poor internet connection or problems with devices that can disrupt learning (Johnson et al., 2016). To solve this, schools should provide regular tech support to help students when issues arise and make sure all devices are updated. The lack of digital skills, where some students may fail to recognise the resources needed for their classes, is another challenge. Schools can hold training sessions to teach students important skills and offer peer tutoring, where students who are comfortable with technology help their classmates learn (Ironsi, 2020).

However, a third challenge is superficial engagement, where students may skim through resources without understanding them. Teachers can use new ways of teaching that allow students to exchange ideas in order to deepen understanding and conduct guided reading sessions so students can work through materials together. Furthermore, over-reliance on technology can occur, as students may depend too much on digital tools for basic tasks. Teachers can assign offline work that encourages students to use printed materials and take technology breaks during lessons to promote independent thinking (Neuburger, 2021). Another challenge is digital fatigue, which refers to feeling tired or overwhelmed from too much screen time. To combat this, teachers can schedule regular breaks to give students time away from screens and create favourable times for both internet-connected and disconnected activities. Teachers should elaborate a flexible plan in order to allow various forms of learning that keep students refreshed and engaged. Lack of motivation can be a challenge as well, as students might feel less enthusiastic about learning in online settings (Nguyen et al., 2024).

To boost motivation, teachers can incorporate gamification, like rewards for participation, to make learning more fun. Setting up a strategy that pairs students with older peers or professionals who can inspire and encourage them boosts students' concentration levels. Furthermore, distractions from non-academic uses of devices can hinder focus. To help with this, teachers can set clear rules for device use during class and include engaging activities to maintain student interest. By addressing these challenges, schools can establish a more effective technology-enhanced learning environment.

III. METHODOLOGY

3.1 Research Design

The descriptive correlational survey was adopted as a research design to examine how digital resources usage impacts learners' academic performance in technology-enhanced classrooms in secondary schools in the Gakenke district, Rwanda. Descriptive survey design is described as a method of research which is utilised to collect data and outline the traits of a population or phenomenon. Correlational was applied to test the hypothesis using inferential statistics. The primary aim is to offer a comprehensive, precise representation of the topic under investigation. It does not concentrate on discovering cause-and-effect connections but instead on defining the present situation (Nardi, 2018). The study gathered quantitative data through questionnaires given to students, SEC presidents, and teachers to learn about the digital resources usage and how it relates to their academic performance. Interviews with head teachers and the director of studies were gathered as qualitative data, who also completed questionnaires. The combination of questionnaire and interview helps research to get deeper information related to how digital resource utilisation in classrooms affects learners' academic performance.

3.2 Population and Sampling

Data collection focused on students, teachers, head teachers, Directors of Studies (DOS), and Presidents of School Executive Committees (SEC) as study population, from secondary schools in Gakenke district, Rwanda. According to Polit and Beck (2017), a study population includes all individuals eligible for research inclusion. Students participated as they directly experience academic outcomes. Teachers are essential in applying strategies and cultivating an encouraging educational atmosphere. DOS oversee curriculum and evaluations, offering valuable perspectives on educational quality. Head teachers manage school operations and influence education delivery. SEC presidents represent parents and students, providing key views on resources and engagement.

To ensure a representative sample, the study included 173 participants from a total population of 306, which consisted of 83 students, 36 teachers, 18 head teachers, 18 Directors of studies, and 18 SEC presidents. Students and teachers were selected using stratified sampling, while head teachers, directors of studies, and SEC presidents were chosen through purposive sampling based on specific criteria. The appropriate sample size was calculated using Yamane's formula, a recognized method for estimating sample size. According to Yamane (1967), the formula for determining sample size is as follows:

$$\mathbf{n = \frac{N}{1+Ne^2}}.$$

In this equation, N represents the total population, n is the sample size, and e denotes the sampling error, set at 0.05.

3.3 Instruments

To gather detailed information, this study used different methods for collecting data. Participants filled out a questionnaire with Likert scale questions, giving them options ranging from "Strongly agree" (1) to "Strongly disagree" (5) to show how much they agreed with various statements. Researchers also conducted interviews using a pre-designed guide, which allowed for deeper discussions about participants' experiences and views. Additionally, the study included a thorough documentary review, where researchers looked at resources like books, journal articles, and theses to gain a broader understanding of the topic and support the data collected from questionnaires and interviews.

3.4 Validity and Reliability

Before collecting the main data, a pilot test was conducted to ensure that the survey and interview questions were clear and effective (validity and reliability). Experts reviewed the questions and recommended improvements. Next, 17 participants completed the questionnaire in a practice session and gave feedback. This process helped evaluate how well the questions worked together (reliability) using a common method called Cronbach's alpha. The specific results are shown in Table 1.

Table 1

Reliability Results for Digital Resource Utilization

Variables	Pilot sample	Cronbach's alpha	Comments
Types of digital resources accessed	17	0.854	Acceptable

The results of the pilot study from Table 3 showed that the reliability of the variables related to digital resource usage and learners' academic performance was generally acceptable. Cronbach's alpha measures the reliability of questions assessing a single idea, with values ranging from 0 to 1. Scores above 0.7 are acceptable (Cañadas et al., 2020). The Cronbach's alpha values for the frequency of digital resource usage (0.821), types of digital resources accessed (0.854), duration of digital resource utilization (0.782), and engagement level during digital resource utilization (0.837) indicate good internal consistency. The overall Cronbach's alpha of 0.835 was satisfactory, confirming that the tools utilized in the research were dependable for evaluating the effect of digital resources utilization on learners' academic performance.

3.5 Statistical Treatment of Data

Statistical treatment of data was done through data processing and analysis. Data processing for this study involved key steps to ensure accurate results. First, the collected data was edited for mistakes and missing information. Then, coding organized responses into categories, followed by tabulating the data to summarize findings in tables for easier comparison. The data was synchronized to ensure alignment for analysis, with SPSS (Statistical Package for the Social Sciences) used to handle the quantitative data, enhancing the study's validity. For data analysis, the focus was on organizing and interpreting information to draw conclusions. Descriptive statistics summarized the data through measures like average, median, and range, revealing overall observations, while inferential statistics tested hypotheses and explored relationships between variables using t-tests or ANOVA. Additionally, qualitative analysis identified themes and connections in participant responses, providing deeper understanding of their experiences. This combination of techniques ensured a thorough analysis of both numerical and descriptive data, accurately addressing the study's questions.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Demographic Characteristics of Respondents

Information about demographic characteristics of respondents was presented in this section. It includes; gender, age, education levels, and their professional experience, and location of residence.

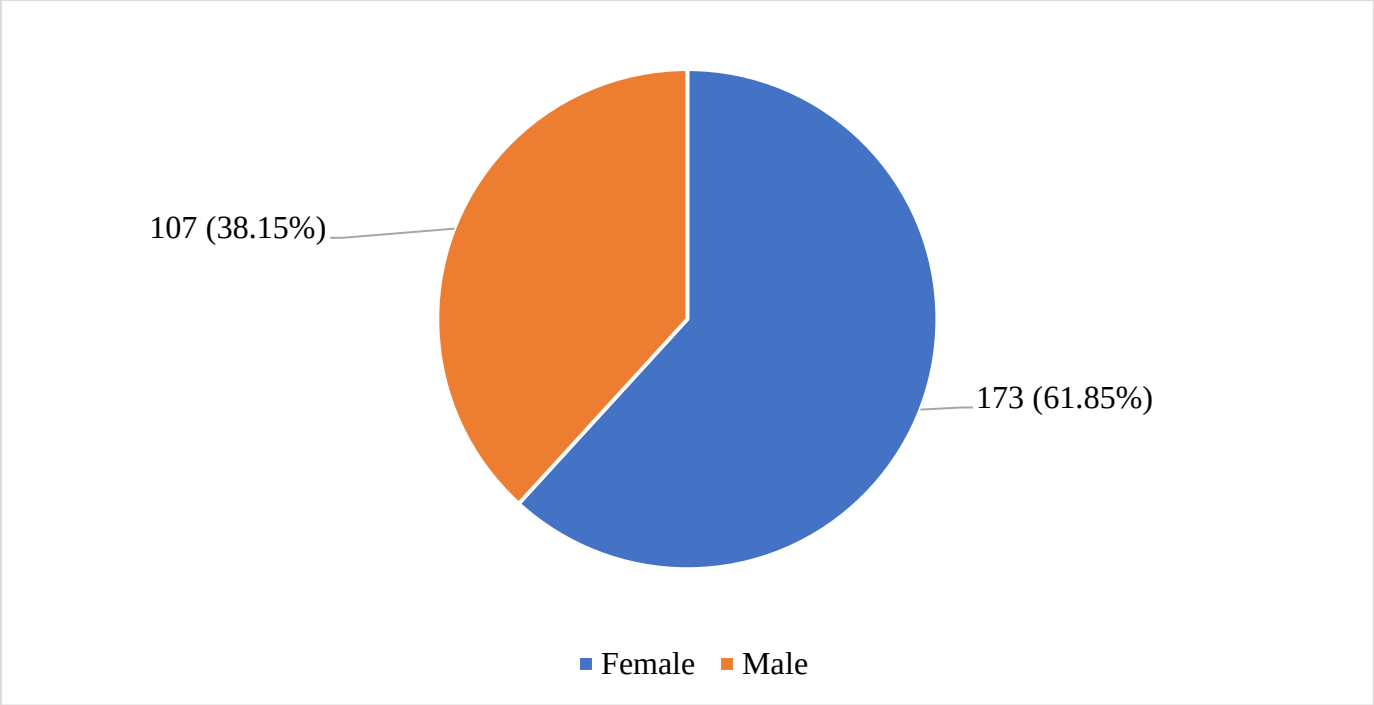

Figure 1

Distribution of Respondents by Gender

Figure 1 indicates that the distribution of respondents by gender. It showed that out of 173 people, 107 (61.85%) were female and 66 (38.15%) were male. This indicated that there were more female respondents than male ones. This difference in gender may have affected the views and experiences represented in the survey results.

Table 2

Distribution of Respondents by Age

Age	Frequency	Percent
Less than 15 years	12	6.93
15-20	64	37.00
20-25	40	23.12
Above 25	57	32.95
Total	**173**	**100.00**

Table 2 shows that the age distribution of the 173 respondents. It showed that 37% were aged 15 to 20, with 64 participants. Another 32.95% were over 25 years old, totaling 57 respondents. Those aged 20 to 25 made up 23.12%, with 40 participants, while the smallest group was those under 15 at 6.93%, or 12 respondents. Overall, most respondents were young adults, particularly between 15 and 20 years old.

Table 3

Distribution of Respondents by Professional Experience

Professional experience	Frequency	Percent
Less than one year	7	9.72%
Three years	13	18.05%
Five years	22	30.57%
More than Five Years	30	41.66%
Total	**72**	**100.00%**

Table 3 shows the distribution of respondents by professional experience. It indicated that 7 respondents (9.72%) had less than one year of experience, while 13 respondents (18.05%) had three years of experience. A group of 22 respondents (30.57%) reported having five years of experience, and the largest group consisted of 30 respondents (41.66%) who had more than five.

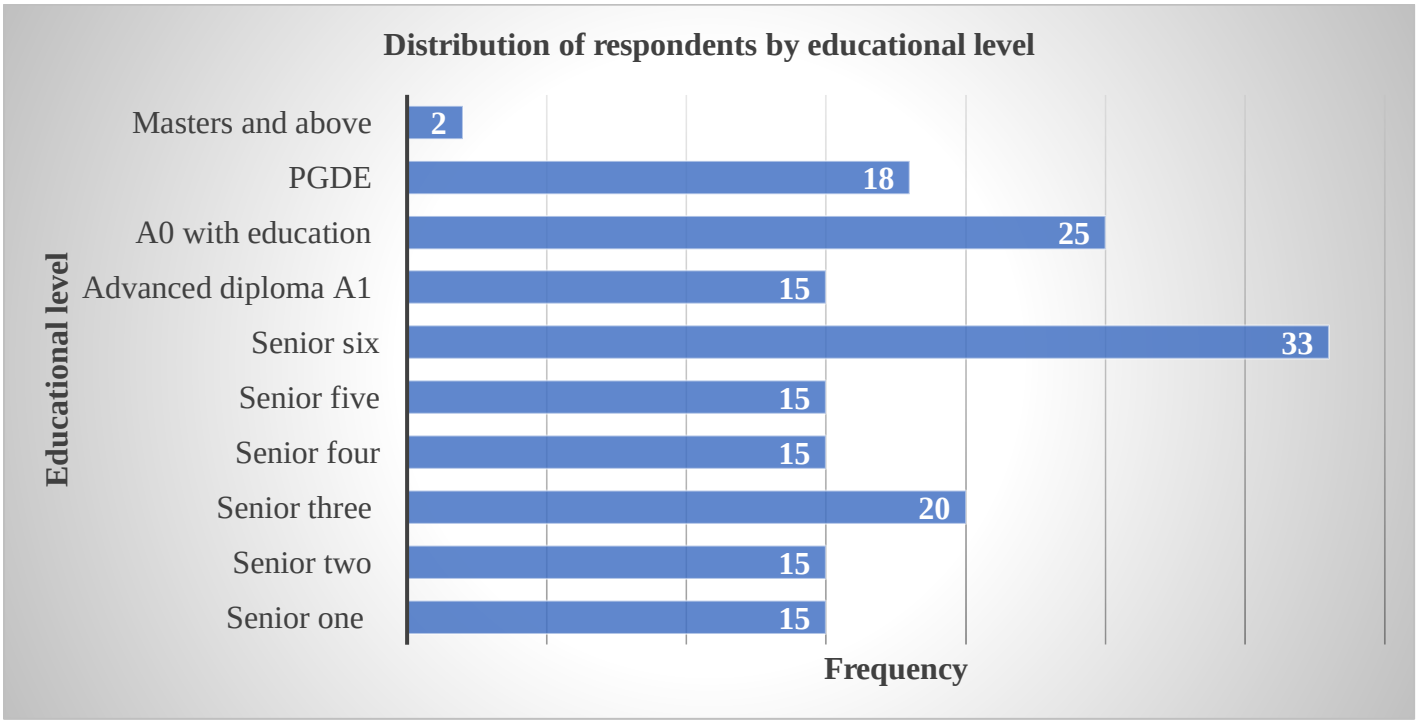

Figure 2
Distribution of Respondents by Educational Levels

The findings in Figure 2 indicates the distribution of respondents by educational level. It showed that out of 173 participants, the largest group had Senior Six qualifications, with 33 respondents, or 19.08%. This was followed by A0 education, consisting of 25 participants, making up 14.49%. Senior Three came next with 20 respondents, or 11.56%. Meanwhile, PGDE qualifications accounted for 18 participants, or 10.40%. Other educational levels, such as Senior One, Senior Two, Senior Four, Senior Five, and Advanced Diploma A1, each had 15 respondents, representing 8.66% each. Finally, the smallest group consisted of those with a Master's degree and above, totaling only 2 respondents, or 1.15%. Overall, most respondents had Senior Six qualifications.

Figure 3
Distribution of Respondents by Location of Residence

The distribution of respondents by location of residence in Figure 3 showed that out of 173 participants, most lived in rural areas, with 78 respondents making up 45.06% of the total. The next largest group was from boarding schools or hostels, which had 44 participants and accounted for 25.43%. Semi-urban areas had 30 respondents, or 17.32%, while peri-urban areas had 15 participants, making up 8.66%. The smallest group was the urban residents, with only 6 respondents, or 3.47%. Overall, this indicated that most respondents came from rural and semi-urban locations, highlighting a strong presence of people living outside big cities.

4.1.2 Descriptive Statistics and inferential statistics for Types of Digital resources Accessed and Academic Performance

Table 4 shows the opinions of respondents about different statement defining types of digital resources accessed. Considering the mean from responses, it follows that statements are in the following category: Moderate, low and very low mean. The results in all these categories show that the respondents mixed answers, disagreed and strongly disagreed with the statements related to the types of digital resources accessed and learners' academic performance in technology enhanced classrooms in secondary schools in Gakenke district.

Table 4

Descriptive Statistics for Types of Digital Resources Accessed

Statements	N	Min	Max	Mean	Std.	% agreement
Using e-books helps students understand course material better	173	1.00	5.00	2.500	0.900	35%
Access to online learning platforms is important for helping students do well in school	173	1.00	5.00	2.800	1.100	40%
Interactive simulations give students valuable experience that helps them learn	173	1.00	5.00	2.200	1.300	30%
Multimedia presentations help students remember information better	173	1.00	5.00	3.000	0.800	50%
Online forums help students work together and improve their academic performance	173	1.00	5.00	2.700	1.000	38%
Digital libraries provide important resources that help students succeed in their studies	173	1.00	5.00	2.400	1.200	32%
Webinars and online lectures help students understand classroom topics better	173	1.00	5.00	2.600	1.400	36%
Podcasts and audiobooks help students learn and remember important information	173	1.00	5.00	2.900	1.000	45%
The learning management system helps improve student performance and engagement	173	1.00	5.00	3.100	0.700	55%
Social media platforms help students learn and share information with each other	173	1.00	5.00	2.300	1.500	28%
Overall	**173**	**1.00**	**5.00**	**2.600**	**1.100**	**39%**

Key: The ranges for mean are: Strongly Disagree= [1-2[= Very low Mean; Disagree= [2-3[=Low mean; Neutral= [3-4[=Moderated mean; Agree= [4-5[= High mean; Strongly Agree= [5[=Very High mean. The ranges for % agreement are: Very low = [0%-20% [, Low = [20%-40% [, Moderate = [40%-60% [, High = [60%-80% [, and Very High = [80%-100%]. The ranges for standard deviation are: Very low = [0-0.5[, Low = [0.5-1[, Moderate = [1-1.5[, High = [1.5-2[, and Very High = [2 and below]. N the number of the respondents; Min: Minimum; Max: Maximum; M: Mean; STD: Standard deviation.

The statements that have a moderated mean are: Multimedia presentations assist students in retaining information more effectively (Mean: 3. 000, STD: 0. 800); and the learning management system aids in enhancing student performance and engagement (Mean: 3. 100, SDT: 0. 700). The statements with a low mean are: Utilizing e-books supports students in comprehending course material more thoroughly (Mean: 2. 500, STD: 0. 900); Access to online learning platforms is essential for aiding students in achieving success in school (Mean: 2. 800, STD: 1. 100); Online forums facilitate collaboration among students and enhance their academic performance (Mean: 2. 700, STD: 1. 000); Webinars and online lectures help students understand classroom topics better (Mean: 2.600, STD: 1.400); and Podcasts and audiobooks help students learn and remember important information (Mean: 2.900, STD: 1.000). Statements with very low mean are: Interactive simulations give students valuable experience that helps them learn (Mean: 2.200, STD: 1.300); Digital libraries offer essential resources that assist students in succeeding in their studies (2. 400, STD: 1. 200); and Social media platforms allow students to learn and to exchange information with each other. (Mean: 2.300, STD: 1.500). Overall mean, standard deviations and % agreement is 2.600, 1.100, and 39%.

The information in Table 14 shows that students in Gakenke district generally feel that the digital resources they use are not very helpful. With an overall mean of 2.6, which is in the ''Low mean'' range, it suggests that many students disagree about the usefulness of these resources. The standard deviation of 1.1 indicates that there is some difference in how students view these resources, meaning while a few may find them helpful, many do not. Additionally, the overall percentage agreement of 39% categorizes it as ''Low,'' which highlights a general doubt about the connection between digital resources utilization to learners' academic performance.

In interview session with school leaders and directors of studies, when asked: "Do type of digital resources accessed have effect on their students' academic performance? If yes, kindly provide brief explanations." Most participants replied:

> *"We think that the kind of digital tools students utilize can significantly influence their academic performance. Different resources, such as educational videos, interactive learning sites, and e-books, support various learning styles. For example, multimedia resources can make difficult subjects more interesting and easier to grasp, while Online quizzes provide instant feedback that allow students to learn according to their capabilities. Nevertheless, we encounter multiple challenges regarding digital resources utilization in Gakenke district. Firstly, outdated or unreliable internet infrastructure and insufficient technical support for equipment maintenance have obstructed the effective use of technology in classrooms. Secondly, some educators have exhibited unwillingness to integrate digital resources in their daily teaching practices. Moreover, instability and high cost of electricity present considerable obstacles to the ongoing use of digital tools, restricting their potential advantages for academic performance."*

The findings from the questionnaire and interviews reveal that digital resources in Gakenke district secondary schools have significant impact on students' academic performance. Many students feel that the digital tools available to them are not very effective, indicating dissatisfaction. However, interviews showed that resources like educational videos, interactive websites, and e-books can support different learning abilities and improve performance when used properly. Key challenges include outdated internet infrastructure, lack of technical support, difficulty of integrating digital resources lesson plan, and some teachers' resistance to change. Additionally, Inconsistent power supply and elevated electricity expenses additionally obstruct the utilization of digital tools. In general, the complete potential of digital resources has yet to be achieved in these classrooms, and more support is needed to overcome these challenges and improve technology use in student learning.

Educational videos enable students to learn according to their potential and assist students in grasping intricate subjects more effectively (Dahlan et al., 2023). Similarly, aligning digital tools with the curriculum is important to maximize their educational value. If the tools don't match what's being taught, they won't be as useful (Ghavifekr & Wan Rosdy, 2015). Additionally, teachers should be trained in order to acquire up to date skills and attitudes. If teachers are resistant to using new technology, it serves as a hindrance of digital resources utilization in the classroom (Ertmer, 2013). These research findings support the primary challenges highlighted in the Gakenke district results. They demonstrate the necessity of involvement of many educational stakeholders and inclusive methods in order to promote digital resources utilization and their effect on student learning.

Table 5 outlines a model examining the link between type of digital resource accessed and learner academic performance in technology-enhanced secondary classrooms. It includes key statistics like model summary, ANOVA and regression coefficient.

Table 5

Model summary for Type of Digital Resource Accessed

Model summary				
Model	**R**	**R-Square**	**Adjusted R-square**	**Std. Error of the Estimate**
1	.850[a]	.202	.189	.410

Predictors: (Constant), Type of digital resource accessed
Dependent variable: Academic performance

The model summary in Table 5 shows a strong relationship (R = 0.850) between the type of digital resources accessed and students' academic performance. According to the results shown in the table 15, digital resource can significantly affect learning outcomes. However, the R-Square value of 0.202 means that only about 20.2% of the differences in academic performance are is associated with the kinds of resources utilized, which points to limited effectiveness. The adjusted R-square of 0.189 confirms that even after considering other factors, the amount of explained variability is still low. Based on the standard error of 0. 410, there is a considerable level of variation in the accuracy with which we can forecast academic performance based on the resources accessed. The limited ability of the model to explain performance shows that other factors may also be important in influencing student success in the Gakenke district.

Table 6
ANOVA for Type of Digital Resource Accessed

ANOVA[a]					
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	15.200	1	15.200	145.327	.002[b]
Residual	39.362	376	.151		
Total	**54,562**	**377**			

Dependent variable: Academic performance
Predictors: (Constant), type of digital resource accessed

Table 6 show that the connection between the type of digital resources accessed and learners' performance is significant. The F-value of 145.327 and a significance level of .001 indicate that these resources can have a beneficial effect on student outcomes. However, the total sum of squares is 54.562, with only 15.200 coming from the regression, meaning that most of the difference in academic performance (39.362 from the residual) is not explained by the types of resources used. Table 16 shows that digital resources can help improve learning but limited access to them in Gakenke district prevents students from fully benefiting in technology-enhanced classrooms. Different educational stakeholders should invest in educational digital resources in order to enhance accessibility and utilization of digital resources.

Hypothesis H_{01}, there is no positive effect of digital resources accessed on academic performance in technology-enhanced classrooms in Gakenke district secondary schools. However, the ANOVA results indicate a significant F-value of 145.327 and a significance level of .002, which leads to rejecting H_{01}. So, the types of digital resources accessed do positively impact academic performance, although limited access reduces this impact. Similarly, Research Question RQ2 asks if digital resources affect learners' performance in these classrooms. The findings from the ANOVA analysis confirm the importance of digital resources in boosting academic success, even with the challenges of limited access.

Table 7
Regression Coefficient for Type of Digital Resource Accessed

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
Constant	2.544	.263		.408	.000
Type of digital resource accessed	1.401	.300	.413	.311	.002

Dependent variable: Academic performance.

Table 7 shows the regression coefficients for the type of digital resources accessed and how they affect academic performance. The constant of 2.544 means that there is the expected level of academic performance even if digital resources are not used. The coefficient for the type of digital resources accessed is 1.401, which suggests that for every unit increase in the quality or availability of these resources, academic performance is likely to increase by about 1.401 units. The standardized beta coefficient of 0.413 indicates a moderate correlation between the resources used and academic performance. The t-value of 4.670 and significance level of .001 show that this relationship is statistically significant. Even though there is the positive effect of digital resources on academic performance, limited access in Gakenke district minimize fully benefit from these resources which can restrict their ability to improve learning in technology-enhanced classrooms.

The equation $Y = 2.544 + 1.401X_2$ shows how academic performance (Y) relates to the type of digital resources accessed (X_2). The number 2.544 is the expected level of academic performance without any type of digital resource used. The coefficient of 1.401 means that for every unit increase in the type of these resources, academic performance is likely to increase by 1.401 units. The type of digital resources accessed can greatly improve academic performance but limited access in Gakenke district means that many students may not fully benefit from these resources. Digital resources access assist students in learning more effectively in technology-enhanced classrooms so students should be shown different opportunities in order to maximize fully utilization.

Table 8

Descriptive Statistics for Academic Performance

Statements	N	Min	Max	Mean	Std.	% agreement
I think using digital resources helps me get better grades in my subjects	173	1.00	5.00	4.200	0.850	855
Using digital resources makes me participate more in class	173	1.00	5.00	4.100	0.900	80%
Having digital resources helps me finish my homework on time	173	1.00	5.00	4.300	0.800	82%
I do better on tests when I use digital resources to study	173	1.00	5.00	4.250	0.780	83%
Digital resources improve the quality of my projects and practical work	173	1.00	5.00	4.150	0.840	81%
Access to digital resources makes me want to attend classes more often	173	1.00	5.00	4.050	0.920	78%
Using digital resources helps me stay focused and behave well in class	173	1.00	5.00	4.350	0.770	84%
Digital resources help me work better with my classmates in group projects	173	1.00	5.00	4.120	0.880	79%
My teachers give me good feedback because I use digital resources	173	1.00	5.00	4.220	0.810	82%
My scores on standardized tests improve because I have access to digital resources	173	1.00	5.00	4.180	0.830	80%
Overall	173	1.00	5.00	4.290	0.860	82.90%

Table 8 shows the views of respondents about different statement defining academic performance. The mean from responses falls into high mean. The results in all these categories show that the respondents agreed with the statements related to learners' academic performance in technology enhanced classrooms.

The list below represents statements and their corresponding means. I think using digital resources helps me get better grades in my subjects (Mean: 4.200, STD: 0.850); Using digital resources makes me participate more in class (Mean: 4.100, STD: 0.900); Having digital resources helps me finish my homework on time (Mean: 4.300, STD: 0.800); I do better on tests when I use digital resources to study (Mean:4.250, STD: 0.780); Digital resources improve the quality of my projects and practical work (Mean: 4.150, STD: 0.840); Access to digital resources makes me want to attend classes more often (Mean: 4.050, STD: 0.920); Using digital resources helps me stay focused and behave well in class (Mean: 4.350, STD: 0.770); Digital resources help me work better with my classmates in group projects (Mean: 4.120, STD: 0.880); My teachers give me good feedback because I use digital resources (Mean: 4.220, STD: 0.810); and My scores on standardized tests improve because I have access to digital resources (Mean: 4.180, STD: 0.860). The overall mean, standard deviation, and % of agreement is 4.290, 0.860, and 82.90 % respectively,

The descriptive statistics for academic performance show that students have a positive view of digital resources. The overall mean of 4.29 indicates a high level of agreement that these resources help improve their grades. The standard deviation of 0.86 suggests there is some variation in how students feel, but most still agree on the benefits. The overall percentage of agreement of 82.90%, which is considered as "Very High," means that a large majority of students think that digital resources utilization by students in the classrooms have a positive impact on their academic performance. This data highlights how important digital resources are for enhancing students' learning experiences and success.

4.2 Discussion

As mentioned earlier, this study aimed at investigating how digital resource utilisation affects learners' academic performance in technology-enhanced classrooms.

The findings revealed a mean of 2.600 and a standard deviation of 1.100, with only 39% of respondents agreeing that these digital resources are accessible. This indicates a moderate accessibility of types of digital resources in the classrooms. The model summary showed an R-squared value of 0.202 and 20.2% of the variation, meaning that many students might not be able to access a good variety of effective tools, and the type of digital resource accessed can't anticipate students' performance.

However, the regression coefficient of 1.401 implies that for every unit increase in the type of digital resources accessed, there is a corresponding increase of 1.401 in academic performance. The p-value of 0.002 indicates a statistically significant relationship between the type of digital resources accessed and academic performance. This provides an answer to the research question (RQ2), which asks if accessing types of digital resources affects learners'

academic performance in technology-enhanced classrooms in Gakenke district. The findings led to the rejection of the null hypothesis (H_{01}), which claimed that digital resources have no positive impact on academic performance. Instead, the alternative hypothesis was supported, indicating that accessing digital resources does have a positive effect on students' academic outcomes.

The findings on the objective align with recent research. Bello (2014) looked at Nigerian secondary schools and found that using a variety of digital tools significantly improved student grades, reporting an effect size of 0.45. Similarly, Rafiq et al. (2024) carried out research in Pakistan and discovered that frequent use of digital learning platforms, especially interactive resources, boosted academic results. Lastly, Aheto et al. (2023) examined digital learning environments in Ghana and found that higher student engagement with digital resources led to better academic performance.

In the interviews with school leaders and directors of studies on this objective, most respondents said that different digital tools like educational videos, websites, and e-books can really help students learn in different ways and improve their grades when used properly. But there are also problems, like old internet that doesn't work well, not enough help to fix the equipment, trouble matching the digital tools to what's being taught, and some teachers not wanting to use the new technology. There are also issues with the electricity going out a lot and the high cost of power, which make it hard to keep using the digital tools consistently. Overall, the digital tools are not being used as much as they could be, and more support is needed to fix these issues.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study examined how various factors related to digital resource utilization influence academic performance in secondary schools in Gakenke District. The study explored the types of digital resources accessed, revealing that resources such as educational videos, e-books, and interactive tools are effective in enhancing learning when utilized properly. Access to diverse types of digital content allows students to engage with material in multiple ways, which was linked to higher completion rates of assignments and improved overall academic performance.

The research also pointed out external challenges impacting digital resource utilization, such as limited internet access, insufficient teacher training, and inconsistent parental involvement. These issues can hinder effective resource use and consequently affect academic performance. The study rejected null hypothesis confirming that types of digital resources accessed affect the academic performance of learners in technology-enhanced classrooms in Gakenke District. These findings highlight the urgent need for improvements in access to digital resources, teacher training, and parental involvement to create a supportive educational environment that fosters student success.

5.2 Recommendations

The study recommended the policymakers to set policies that enable continuous investment in digital resources and decentralization of budget at school level for training of teachers and ensure equal distribution. Educators should ensure regular access and usage. Future researchers should explore the effect of teachers' Digital Literacy and learners' academic performance.

The teachers should use a wider range of digital resources, such as laptops and projectors, to boost student engagement and motivation. It also noted the need to address unequal access to these resources in schools and better management practices by head teachers, who sometimes limit students' use out of fear of loss or damage. Additionally, the Ministry of Education in Rwanda should work on improving internet access and ensuring that resources are available for all students. Finally, teachers should receive training to effectively use these digital tools, and future research should explore how different types of digital resources affect student learning outcomes.

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