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Investigating the Positive Impact of Integrating Technology into Teaching for Personalized Learning by Using Technology-Powered Tutoring Systems:" A Case Study of Selected Schools in Kalomo District

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Abstract

This study examined the integration of technology into teaching in schools in Kalomo District, Zambia. It aimed to assess the use of educational technologies, identify implementation challenges, and evaluate acceptance among teachers, learners, and administrators. Using a mixed-methods approach, data were collected through surveys, interviews, focus groups, and classroom observations.

Findings showed that while basic tools like Microsoft Office and online platforms are widely used, advanced technologies for personalized learning remain limited. Key challenges included poor digital infrastructure, limited funding, lack of teacher training, insufficient tools, and unreliable internet access. Despite these issues, participants showed strong acceptance and optimism about technology's potential to improve teaching and learning.

The study highlights the importance of technology-driven tutoring systems in supporting personalized learning through adaptive content and feedback. It recommends increased investment in infrastructure, teacher training, and partnerships to enhance technology integration and improve educational outcomes.

Keywords:

Technology Integration, Education, Digital Tools, Challenges, Infrastructure, Teacher Training, Personalized Learning, ICT, Acceptance, E-Learning, Educational Technolog

1. INTRODUCTION

Technology refers to the tools, systems, processes, and techniques that humans create to solve problems and improve life. It involves applying scientific knowledge for practical purposes (Oxford University Press, 2024). Technology includes both physical tools such as machines, computers, and medical devices, and intangible elements like software, methods, and digital systems.

Historically, technology has evolved from simple tools to complex digital and industrial systems that shape modern society . Its components include tools, technical knowledge, processes, infrastructure, and innovation. The purposes of technology are to solve problems, increase efficiency, enhance communication, and extend human capabilities

Modern types of technology include ICT, medical technology, educational technology, industrial systems, and agricultural tools. Technology plays a central role in economic development, social transformation, and global connectivity .However, it also looks ethical issues such as privacy concerns, unequal access, environmental impact, and job displacement

Building on the advantages of personalized learning, technology tutoring systems also offer scalability and flexibility that traditional teaching methods may struggle to achieve. These systems can support large numbers of learners simultaneously, transcending geographical and resource-based limitations that often hinder access to quality education. For instance, students in remote or underserved areas can benefit from Technology-driven platforms that provide instruction without requiring direct access to specialized educators or extensive resources.

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Moreover, personalized learning systems powered by technology are data-driven, continuously gathering insights about student performance, engagement, and preferences. This data can be analyzed in real-time to refine the learning process, ensuring a more dynamic and responsive educational experience.

Teachers can also leverage this information to better understand their students' progress and adjust their strategies accordingly'.

As educational institutions worldwide adopt technology-driven solutions, the potential for improving equity in education becomes increasingly evident. By addressing individual learning needs and promoting inclusivity, personalized learning systems help bridge achievement gaps among students from different socio-economic backgrounds. This aligns with broader goals of enhancing educational equity and preparing students for a future where adaptability and critical thinking are key competencies.

The approach of integrating technology ensures that every learner, regardless of their starting point, receives the support they need to succeed. For instance, technology-powered platforms can identify struggling students early and provide targeted interventions, while simultaneously challenging advanced learners with more complex material (Holmes et al., 2019). This dual capacity to remediate and accelerate learning fosters a more equitable educational landscape.

In addition, the integration of technology into class learning promotes lifelong learning by empowering individuals to acquire new skills and knowledge at their own pace. This is particularly relevant in the context of rapidly changing job markets, where continuous upskilling is essential (Luckin et al., 2016). Technology`s ability to adapt and cater to diverse learning paths makes it an invaluable tool for both formal education and informal learning environments.

However, while the benefits are promising, it is also critical to address challenges associated with technology in education, such as data privacy, ethical considerations, and the digital divide (Brynjolfsson & McAfee, 2017). Ensuring that technology systems are designed inclusively and deployed responsibly will be key to maximizing their potential and minimizing unintended consequences.

In summary, personalized learning using technology represents a significant advancement in educational sector, offering, scalable, and data-driven solutions to meet the diverse needs of learners. By complementing traditional teaching methods, these systems not only enhance individual learning experiences but also contribute to broader goals of equity,and lifelong education (Pane et al., 2017).

In Zambia, like many other developing countries, the education sector faces persistent challenges such as overcrowded classrooms, limited access to educational resources, and significant disparities in student performance (UNESCO, 2021).

In this context, the potential of tech-powered tutoring systems becomes particularly compelling, as they can help bridge these gaps and support both students and teachers in achieving better outcomes.

This research is aimed at exploring the efficacy and potential of tech powered tutoring systems within the context of selected schools in kalomo, Zambia. By evaluating the impact of these systems on student engagement, understanding, and performance, this study sought to provide insights into their feasibility and scalability within the Zambian educational landscape. Furthermore, the research contributes to the growing body of knowledge on the integration of technology in education, and offers recommendations for its effective implementation in similar contexts.

Background to the study

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According to Kasonde–Ng'andu (2013:13), the background of the study provides "a brief view of the problem the researcher aspires to study." This foundational section plays a critical role in contextualizing the research by outlining the key issues or challenges that have prompted the inquiry. It seeks to clarify the rationale behind the study, offering insights into the broader context and the specific problem the researcher wishes to address. Additionally, Kombo and Tromp (2009:24) emphasize that the background serves as an essential introduction, presenting a concise yet comprehensive overview of the problem at hand. It highlights the significance of the research, underlines its necessity, and provides the reader with a clear understanding of the researcher's perspective on the issue. The background written below sets the stage for the study, offering a framework that informs the direction and purpose of the research.

In recent years, the education sector has faced a number of challenges, including insufficient resources, teacher shortages, increasing student diversity, and significant disparities in academic performance (UNESCO, 2021). Traditional classroom environments,by rigid curricula and limited teacher-to-student interaction, have struggled to meet the unique needs of individual learners. This has resulted in gaps in comprehension, reduced engagement, and inconsistent academic outcomes (Baker & Siemens, 2014).

The advent of technology in education has opened new possibilities for addressing these persistent issues. Among the most promising applications are technology-powered tutoring systems, which are designed to deliver personalized learning experiences tTechnologylored to the specific needs, abilities, and preferences of each student (Holmes et al., 2019).

Personalized learning, as defined by Pane et al. (2017), involves educational approaches that customize teaching strategies, resources, and pacing to suit individual learners. This approach ensures that students can progress at their own speed while receiving targeted support for areas where they struggle.

Technology powered systems leverage advanced data analytics and machine learning algorithms to analyze student performance in real-time. These systems adapt instructional content dynamically, providing immediate feedback, customized tasks, and predictive guidance to optimize learning outcomes (Kulik & Fletcher, 2016). For instance, when a student exhibits difficulty with a particular concept, the system can automatically present additional practice materials, alternative explanations, or scaffolding strategies to facilitate understanding. Conversely, for high-performing students, the system can introduce more complex challenges to keep them engaged and stimulated.

By addressing the limitations of one-size-fits-all teaching methods, technology powered tutoring systems hold the potential to bridge the gaps in educational equity and enhance overall academic performance. As educational institutions increasingly explore these technologies, their integration into education continues with a transformative approach to fostering inclusive and effective learning environments.

Statement of the problem

Despite significant efforts by the Zambian government to improve the education system through the employment of teachers, provision of materials, and the facilitation of continuous professional development (CPD) meetings schools in Kalomo continued to face significant challenges in providing personalized learning experiences. The recent implementation of free education from early childhood to Grade 12 led to a sharp increase in student enrollment rates. While this policy Technologymed to make education more accessible, it inadvertently strTechnologyned existing resources, making it more difficult for teachers to offer individualized attention to students (Mulyata, 2020). This exacerbated the challenges of

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accommodating the diverse needs of learners within the confines of traditional classroom settings, where one-size-fits-all approaches to instruction are still common.

A critical barrier to providing personalized learning in these circumstances was the lack of access to technology and resources. While computers may be available in some schools, they often do not have internet access, limiting their potential as tools for enhancing personalized learning.

In addition, the policy prohibiting students from owning and using phones in school further restricted opportunities for learners to access digital learning tools, (Zambia Ministry of Education, 2021).

This policy, though intended to minimize distractions, inadvertently hinders students from utilizing their personal devices for educational purposes, including accessing technology platforms that could provide Technology tailored learning experiences. Teachers also don't have a real time experience on how to use technology to make their lessons more interesting.

Tech driven tutoring systems, however, represent a promising solution to these challenges by delivering personalized learning experiences that adapt to each student's unique needs and progress. These systems use data analytics and machine learning algorithms to provide targeted support, helping students overcome learning gaps and reinforcing areas of weakness (Pane et al., 2017). Despite the potential of technology to transform education, its integration into schools in Kalomo district.The feasibility and effectiveness of technology in addressing the current educational gaps, particularly within the context of limited access to and the existing school policies, have yet to be fully assessed. Thus, this study will investigate the potential of these systems in improving personalized learning in Kalom`s schools, while considering the challenges posed by existing educational policies and resource limitations.

Purpose of the study

The primary purpose of this research was to explore and evaluate the effectiveness and potential benefits of integrating technology in teaching in enhancing personalized learning experiences for learners in selected schools within Kalomo District. The growing emphasis on personalized learning in modern education recognizes that students have diverse learning needs, styles, and paces, and therefore require Technology tailored instructional strategies to maximize their academic potential (Johnson et al., 2016). Technology powered teaching systems offer a promising solution to address these challenges by providing real-time, adaptive learning support that adjusts content based on individual student performance and engagement (Pane et al., 2017).

This study will investigate how the implementation of technology powered systems could bridge the gaps in traditional classroom settings, where large class sizes, limited resources, and the inability of teachers to provide individualized attention often hinder students' academic progress (Mulyata, 2020). In particular, the research sought to assess whether technology systems could contribute to improving student outcomes in subjects such as mathematics, where students in Kalomo have traditionally faced difficulties (Zambia Ministry of Education, 2021).

By examining the potential benefits of these systems, the research also Technologymed to contribute to the growing body of knowledge surrounding the integration of technology in education, particularly in under-resourced contexts.

Additionally, this study sought to explore the feasibility of implementing technology teaching systems in Kalomo schools, taking into account existing barriers such as limited access to technology, lack of internet connectivity, and policies restricting the use of personal devices within schools (Zambia Ministry of Education, 2021). Understanding the challenges and opportunities associated with integrating tech tools into the local educational landscape was

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crucial in determining whether these technologies could provide, scalable solutions to enhance personalized learning experiences and improve academic performance in the region. Through this investigation, the research is aimed to offer valuable insights into how tech could transform the educational experience for learners in Kalomo District and similar contexts across Zambia.

Objectives of the Study

The main idea of this research was to investigate the potential of tech integration in enhancing personalized learning in selected schools in Kalomo. To achieve this, the study focused on the following specific objectives:

1. To find out the use of technology in selected schools of Kalomo district for personalized learning.
2. To explore the practical opportunities, challenges, and barriers to implementing technology at your school.
3. To investigate the level of acceptance and potential resistance to the adoption of technology for personalized learning by both learners and educators.

Research questions

1. Is Technology used in your teaching and learning and what types of technology powered teaching systems are currently being used for personalized learning?
2. What opportunities, challenges and barriers associated with implementing technology powered teaching systems exist at your school?
3. How do teachers and learners perceive the adoption of technology for personalized learning?

Significance of the Study

Kalomo, a town in Southern Province, Zambia, serves as one of the broader educational challenges faced across the country. As a region experiencing rapid changes in enrollment rates and increasing pressure on limited resources, Kalomo schools face difficulties in addressing diverse student learning needs.

By focusing on selected schools in this region, the study will provide valuable insights into how tech driven systems could be integrated into the local educational framework, with the potential to enhance personalized learning and improve student learning outcomes.

The significance of this study lies in its potential to inform educational policy and practice not only within Zambia but also in similar contexts globally. In many developing countries, including Zambia, traditional educational systems face numerous problems,such as overcrowded classrooms, teacher shortages, and limited access to technology (Mulyata, 2020). By exploring how tech based systems could overcome these challenges, the research has the potential to offer scalable solutions that could be applied in resource-constrainted environments. Furthermore, technologies have been increasingly recognized for their ability to provide adaptive learning experiences that are personalized to the individual needs of students, which is essential for fostering academic success (Johnson et al., 2016).

This study also holds significance for contributing to the growing body of knowledge on the applications of tech in education, particularly in sub-Saharan Africa. While much of the existing literature focuses on high-income countries, the need for personalized learning in low-resource settings is just as pressing, if not more so (Nguyen et al., 2020). By investigating the potential benefits and challenges of technology integration in the Zambian context, the research seeks to provide insights into how technology can help bridge

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educational gaps and enhance the quality of learning in schools facing systemic challenges. Additionally, the findings could guide future policy decisions, teacher training programs should invest in technology that are crucial for transforming the educational landscape in Zambia and similar regions across the globe.

Theoretical Framework

Personalized learning is an educational approach that focuses on instruction to meet the diverse needs, preferences, and learning paces of individual learners. It recognizes that each student has unique strengths, weaknesses, and ways of processing information, and thus to deliver content and support that aligns with these individual characteristics.

Technology-powered tutoring systems are instrumental in facilitating this approach by utilizing machine learning algorithms and data analytics to analyze student performance, adapt instructional content accordingly, and provide real-time feedback to ensure optimal learning outcomes (Baker & Siemens, 2014).

Several key theories underpin the importance of personalized learning and provide a theoretical foundation for understanding how technology tutoring systems can enhance educational practices. One of the most influential theories in this context is Lev Vygotsky's Zone of Proximal Development (ZPD). Vygotsky (1978) proposed that students learn best when they are provided with guidance that falls within their Zone of Proximal Development, which is the range between what they can do independently and what they can achieve with support. Technology powered tutoring systems can serve as a dynamic tool for identifying a learner's ZPD, providing scaffolded support, and adjusting instructional content to match the learner's developmental needs. By continuously analyzing data and offering personalized guidance, these systems can ensure that learners are appropriately challenged, without being overwhelmed, thus optimizing the learning experience.

Another foundational theory supporting personalized learning is Bloom's Mastery Learning (Bloom, 1968). According to Bloom, all students are capable of mastering a subject, given enough time and appropriate instructional support. Mastery Learning emphasizes that learning should not be seen as a one-time event, but as a process where students progress at their own pace, mastering one concept before moving on to the next. Tech powered tutoring systems align with this theory by offering personalized, step-by-step learning paths that allow students to master foundational concepts before advancing. Through continuous formative assessments and technology tailored feedback, technology systems can monitor students' progress and ensure they achieve mastery in each area before proceeding, thus reinforcing the concept of mastery learning in a scalable manner.

This theoretical framework will guide the analysis of technology powered tutoring systems in the context of Kalomo schools, helping to assess their potential impact on student learning outcomes.

contexts.

2. LITERATURE REVIEW

Technology refers to the application of scientific knowledge, tools, and techniques to create systems and solutions that improve human life and make tasks more efficient. It includes both physical devices such as computers and mobile phones, as well as software systems and digital platforms used in different sectors. Over the years, technology has transformed many industries, including healthcare, transportation, finance, and particularly education.

In education, technology has become a key driver of innovation and transformation. It enables more flexible, interactive, and learner-centered approaches compared to traditional

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teaching methods. One of the major advantages of technology in education is its ability to support personalized learning, where instruction is tailored to meet the needs, pace, and abilities of individual learners. This approach enhances student engagement, improves understanding, and leads to better academic outcomes.

The integration of technology into education has gained global attention due to its potential to address challenges such as overcrowded classrooms, limited teaching resources, and diverse learner needs. Technology-powered tutoring systems, in particular, have emerged as an effective solution for delivering personalized learning. These systems use advanced techniques such as machine learning, data analytics, and adaptive algorithms to provide individualized instruction and real-time feedback.

This literature review explores the concept of technology-powered tutoring systems, their effectiveness in education, and their application in personalized learning. It also examines the challenges and barriers associated with their implementation, particularly in developing countries like Zambia. By reviewing existing studies, this chapter provides a theoretical and empirical foundation for understanding how technology can enhance teaching and learning processes.

Technology-Powered Tutoring Systems

Technology-powered tutoring systems are computer-based educational platforms designed to simulate the role of a human tutor by providing guidance, feedback, and personalized learning experiences. These systems use artificial intelligence, machine learning, and interactive tools to support students in understanding academic content more effectively.

One of the key components of these systems is adaptive learning technology. Adaptive learning allows the system to adjust the content, difficulty level, and pace of instruction based on the learner's performance. For example, if a student struggles with a particular topic, the system provides additional explanations and practice exercises. On the other hand, if a student demonstrates a strong understanding, the system introduces more advanced material to maintain engagement. This ensures that learning is personalized and effective for each individual.

Another important component is natural language processing (NLP), which enables systems to understand and respond to human language. Through NLP, students can interact with the system in a conversational manner, ask questions, and receive instant feedback. This creates an interactive and engaging learning environment similar to that of a human tutor.

Data analytics also plays a critical role in technology-powered tutoring systems. These systems collect data on student performance, learning patterns, and engagement levels. This data is analyzed to identify strengths, weaknesses, and areas that require improvement. Teachers can use this information to monitor progress and make informed decisions about instructional strategies.

Overall, technology-powered tutoring systems offer a more personalized, flexible, and efficient approach to learning. They address the limitations of traditional teaching methods and provide opportunities for improving student performance and engagement

Effectiveness of Technology in Education

The effectiveness of technology in education has been widely studied, with research indicating that technology-powered systems can significantly improve learning outcomes. These systems enhance academic performance by providing personalized instruction, real-time feedback, and adaptive learning experiences.

One of the key benefits of technology in education is the ability to provide immediate feedback. In traditional classrooms, students may have to wait for teachers to review their

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work before receiving feedback. However, technology systems can instantly identify errors and provide corrective guidance, allowing students to learn from their mistakes quickly. This improves understanding and retention of knowledge.

Technology also increases student engagement and motivation. Interactive learning environments, multimedia content, and adaptive challenges make learning more interesting and enjoyable. When students are actively engaged, they are more likely to participate and perform better academically.

In addition, technology supports self-paced learning, allowing students to progress according to their individual abilities. This is particularly beneficial in subjects such as mathematics and science, where students often require step-by-step guidance. By providing structured support and personalized instruction, technology helps students develop problem-solving skills and deeper understanding.

Effectiveness in Europe.

In Europe, technology integration in education is highly advanced due to strong infrastructure, supportive policies, and significant investments. Countries such as the United Kingdom, Germany, and Finland have successfully incorporated technology into their education systems.

Technology-powered tools in Europe include intelligent tutoring systems, learning management systems, and adaptive learning platforms. These tools are widely used to enhance personalized learning and improve educational outcomes. Studies show that students using adaptive learning technologies in Europe demonstrate higher levels of achievement and satisfaction compared to traditional methods.

Furthermore, technology has improved administrative efficiency in European schools. Tasks such as grading, attendance tracking, and resource management are automated, allowing teachers to focus more on teaching. However, challenges such as data privacy concerns and unequal access still exist and require careful management.

Effectiveness in Africa

In Africa, the adoption of technology in education is still developing, but there has been significant progress in recent years. Countries like Kenya, Nigeria, and South Africa have introduced pilot programs aimed at integrating technology into education.

One example is the M-Shule program in Kenya, which uses mobile technology to deliver personalized learning content through SMS. This approach is particularly effective in areas with limited access to advanced infrastructure. Studies have shown improvements in literacy and numeracy among students using such systems.

Despite these successes, challenges remain. Limited infrastructure, high costs, and low digital literacy levels hinder widespread adoption. Additionally, many technology tools are not adapted to local languages and contexts, reducing their effectiveness.

Technology Effectiveness in Zambia

In Zambia, the use of technology in education is still at an early stage. Most initiatives are concentrated in urban areas where access to infrastructure is better. Platforms such as Moodle and Google Classroom are gradually being introduced in schools.

During the COVID-19 pandemic, these platforms played a crucial role in ensuring continuity of learning. They allowed students to access educational materials and participate in remote learning. However, their effectiveness is limited by poor internet connectivity, lack of devices, and insufficient teacher training.

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Technology has the potential to address key challenges in Zambia, such as teacher shortages and unequal access to education. However, achieving this requires significant investment in infrastructure, training, and policy development.

Comparative Analysis

A comparison between Europe and Africa highlights significant differences in technology adoption. Europe benefits from advanced infrastructure, strong policies, and high levels of digital literacy, enabling effective integration of technology in education.

In contrast, African countries, including Zambia, face challenges such as limited internet access, inadequate funding, and lack of policy frameworks. These factors hinder the implementation and scalability of technology solutions.

Despite these differences, both regions demonstrate the potential of technology to improve education. With proper investment and strategic planning, developing countries can leverage technology to bridge educational gaps and enhance learning outcomes.

Applications of Technology in Personalized Learning

Technology-powered tutoring systems have been successfully applied in various educational contexts to support personalized learning. These systems provide individualized instruction, adaptive learning paths, and real-time feedback.Case studies such as ASSISTments and Cognitive Tutor demonstrate how technology can improve student performance, particularly in mathematics. These systems adjust content based on student responses, ensuring that learners receive appropriate support.

Adaptive Learning Algorithms

Adaptive learning algorithms are the core of personalized learning systems. They analyze student data and adjust instructional content accordingly. This ensures that learners receive targeted support based on their needs.

Research shows that adaptive learning improves engagement, retention, and academic performance. By continuously adapting to the learner, these systems create a more effective learning experience.

Challenges and Barriers of Technology Integration

The integration of technology in education faces several challenges, particularly in developing regions. These include technical, financial, and policy-related barriers that limit effective implementation.

Technical Challenges

Technical challenges include inadequate infrastructure, lack of reliable internet, and data privacy concerns. These issues hinder the effective use of technology systems in schools.

Resource Constraint

Limited funding, lack of devices, and insufficient technical support are major barriers in resource-constrained settings like Kalomo. These challenges make it difficult to implement technology solutions.

Teacher Resistance to technology

Teacher resistance is another key challenge. Many educators lack confidence in using technology or fear it may replace traditional teaching. Training and support are essential to address this issue.

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Enhanced Learning Experiences
Technology enhances learning by making it more interactive, engaging, and personalized. It helps students understand concepts better and improves academic performance.

Scalability and Accessibility

Technology enables scalable learning solutions that can reach large numbers of students, including those in remote areas.

Continuous Improvement
Technology systems continuously evolve, improving their ability to provide personalized learning experiences.

Opportunities for Zambia
Zambia has opportunities to leverage technology through improved infrastructure, partnerships, and teacher training programs.

Research Gap
There is limited research on the implementation of technology in resource-constrained settings like Kalomo. This study aims to fill this gap.

3. METHODOLOGY

This study investigates the potential of technology-powered tutoring systems in enhancing personalized learning in selected schools in Kalomo District, Zambia. The purpose of this chapter is to describe the methods and procedures that were used to collect and analyze data. It explains the research design, data collection methods, and data analysis techniques employed in the study.
The increasing demand for personalized learning has highlighted the need for innovative teaching approaches that can address diverse learner needs. Technology-powered tutoring systems offer a promising solution by providing adaptive and individualized learning experiences. However, their effectiveness and feasibility in resource-constrained environments such as Kalomo remain unclear. Therefore, this study adopts a systematic methodology to explore how these systems are used, the challenges involved, and the level of acceptance among stakeholders.
This chapter outlines how data was gathered from teachers, learners, and administrators, and how the findings were analyzed to achieve the research objectives. The methodology was carefully designed to ensure reliability, validity, and a comprehensive understanding of the research problem.

Research Design
Research design refers to the overall plan or structure used to conduct a study and answer research questions. It provides a framework for data collection, analysis, and interpretation. This study adopted a mixed-methods research design, which combines both quantitative and qualitative approaches.
The mixed-methods approach was chosen because it allows for a more comprehensive understanding of the research problem. Quantitative data provides measurable evidence of trends, patterns, and relationships, while qualitative data offers deeper insights into

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participants' experiences, opinions, and perceptions. By combining both methods, the study captures both numerical and descriptive information.
The research design was implemented in three phases, each aligned with the study objectives:

Phase 1: Assessment of Technology Use in Schools
This phase focused on identifying the types of technology tools used in schools and how they support personalized learning. Surveys were used to collect quantitative data on the frequency and purpose of technology use.

Phase 2: Exploration of Opportunities, Challenges, and Barriers
This phase examined the practical challenges and opportunities associated with implementing technology-powered tutoring systems. Interviews and focus group discussions were conducted to gather qualitative insights from teachers, learners, and administrators.

Phase 3: Analysis of Acceptance and Resistance
This phase assessed how stakeholders perceive technology integration. It explored factors influencing acceptance or resistance, such as ease of use, perceived usefulness, and confidence in using technology.
The mixed-methods design ensured a balanced and detailed analysis of the research topic, providing both statistical evidence and contextual understanding.

Data Collection Methods
Data collection methods refer to the techniques used to gather information from participants. In this study, multiple methods were used to ensure comprehensive data collection. These included surveys, interviews, and focus group discussions. Using different methods helped to capture diverse perspectives and improve the reliability of the findings.

Surveys
Surveys were used to collect data from a large number of participants, including learners, teachers, and administrators. The surveys included both closed-ended and open-ended questions.
Closed-ended questions provided quantitative data that could be analyzed statistically. These questions focused on areas such as the use of technology tools, frequency of use, and perceived effectiveness. Open-ended questions allowed participants to express their opinions and experiences in their own words, providing qualitative insights.
The main advantage of surveys is that they allow data to be collected from many respondents within a short time. They also make it easier to identify patterns and trends. However, surveys may not capture detailed explanations, and responses may sometimes be influenced by social desirability bias.
Despite these limitations, surveys were an effective method for gathering broad information about technology use and perceptions in schools.

Interviews
Semi-structured interviews were conducted with selected teachers, learners, and administrators. These interviews allowed participants to share their experiences and views in detail.
The semi-structured format provided flexibility, enabling the researcher to ask follow-up questions and explore issues more deeply. Interviews focused on topics such as challenges in

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using technology, benefits of technology-powered tutoring systems, and attitudes toward technology integration.

Interviews provided rich, detailed data that helped to explain the findings from surveys. They also allowed the researcher to understand the context and experiences of participants.

However, interviews require time for data collection and analysis, and responses may sometimes be subjective. Despite these challenges, interviews were valuable for gaining in-depth insights into the research problem.

Focus Group Discussions

Focus group discussions were conducted with groups of learners and teachers to explore shared experiences and opinions about technology in education. These discussions encouraged interaction among participants, allowing them to build on each other's ideas.

Focus groups provided a deeper understanding of common challenges, benefits, and suggestions for improvement. They also helped identify patterns in opinions and attitudes.

One advantage of focus groups is that they generate rich data through group interaction. However, some participants may dominate discussions, while others may hesitate to speak. To address this, the researcher ensured that all participants had an opportunity to contribute.

Data Analysis Procedures

Data analysis involves organizing and interpreting collected data to answer research questions. In this study, both quantitative and qualitative data were analyzed.

Quantitative data from surveys were analyzed using descriptive statistics, such as percentages and frequencies. This helped identify trends and patterns in technology use and acceptance.

Qualitative data from interviews and focus groups were analyzed using thematic analysis. Responses were grouped into themes based on common ideas and patterns. This helped to interpret participants' experiences and perspectives.

The combination of quantitative and qualitative analysis provided a comprehensive understanding of the research findings.

Ethical Considerations

Ethical considerations were carefully observed throughout the study. Participants were informed about the purpose of the research and their consent was obtained before data collection.

Confidentiality was maintained by ensuring that participants' identities were not disclosed. Participation was voluntary, and participants were allowed to withdraw at any time.

The study also ensured that data was used only for academic purposes and handled responsibly. Ethical practices helped build trust and ensured the credibility of the research.

Study Population

The study population consisted of learners, teachers, and administrators from selected schools in Kalomo District. These groups were chosen because they are directly involved in teaching and learning processes.

Including different stakeholders ensured a comprehensive understanding of technology use and its impact on education.

Sampling Method

A purposive sampling method was used to select participants. This method involves selecting individuals who have relevant knowledge and experience related to the study.

Teachers, learners, and administrators who were familiar with technology use in schools were chosen. This ensured that the data collected was relevant and informative.

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Sample Size

The sample size included 30 learners, 6 teachers, and 3 administrators from selected schools. This sample was considered sufficient to provide meaningful insights while remaining manageable for data collection and analysis.

4. CONCLUSION

This study examined the integration of technology into teaching to enhance personalized learning in selected schools in Kalomo District. The findings revealed that while basic digital tools are being used, the adoption of advanced technology-powered tutoring systems remains limited due to challenges such as inadequate infrastructure, lack of resources, limited teacher training, and poor internet access.

Despite these challenges, there is a high level of acceptance among teachers, learners, and administrators, who recognize the potential of technology to improve teaching and learning outcomes. The study concludes that technology-powered systems can significantly enhance personalized learning by providing adaptive content, real-time feedback, and individualized support.

Therefore, increased investment in infrastructure, teacher capacity building, and supportive policies is essential to ensure effective integration of technology in education and to improve overall academic performance.

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