

Impact of Technology Integration on Student Engagement and Learning Outcomes in Secondary Education

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Abstract

This research study examined how integration of technology influences students' engagement with respect to their learning outcomes focusing on secondary schools. The growing engagement of digital tools in education has shifted classroom practice away from mainly teacher-led instruction towards more interactive and learner-centred approaches. Despite this development, many secondary schools still experience difficulties in using technology effectively, especially where access, digital skills, infrastructure, and institutional support are limited. The study therefore investigated extent of technology use in teaching and learning and how it promotes students' participation, classroom interaction and academic achievement. The study used descriptive survey research design, with population of secondary school students and teachers, therein 132 respondents selected by simple random sampling. Data were gathered with structured questionnaire titled "Technology Integration, Student Engagement and Learning Outcomes Questionnaire" (TISELOQ). Experts in educational technology and research methodology reviewed and validated the instrument. the Cronbach Alpha method was used to establish its reliability with a coefficient of 0.82. The research questions were answered with mean values and respective standard deviation, and t-test statistics were used for testing hypotheses at the 0.05 level of significance. The results showed the technology integration strengthens student engagement by improving participation, collaboration, and interaction during lessons. The study also found that technology contributes positively to learning outcomes by supporting comprehension, information retention, and academic performance.

Keywords: Learners Engagement, Learning Outcomes, Technology Integration, Digital Technology, Secondary School.

I. Introduction

A. Background to the Study

Educational systems, globally, are increasingly adopting technology in ways that are reshaping classroom instruction and teaching methods (Gabdo et al., 2025). In Nigeria, stakeholders in education are gradually introducing digital resources such as learning management systems, interactive whiteboards and mobile learning applications to aid teaching and learning (Okon et al., 2025). This development reflects a wider global movement in which technology is viewed as a means of improving learner participation, promoting interaction, and making lessons more responsive through multimedia resources, collaborative platforms, and instant feedback. Existing studies suggest that when technology is deliberately and appropriately used, it can increase learner interest and create more engaging instructional environments (Chukwudum et al., 2025; Spiteri & Rundgren, 2020; Magaji & Adelabu, 2012). For this reason, it is important to examine how technology influences student engagement within Nigeria, where improvement in educational outcomes remains central to national development.

Learner engagement refers to the behavioural, emotional, and cognitive involvement of students in school activities and classroom learning. It is widely considered an important factor in academic success and meaningful participation (Fredricks et al., 2004, as cited in Ubabuike & Ojechi, 2025). In school settings, engagement is reflected in learners' attentiveness, willingness to participate in discussions, and persistence in completing learning tasks. Effective engagement also requires adequate teacher preparation and educational support (Magaji et al., 2025; Ahmad & Magaji, 2024). Digital tools create opportunities to move beyond conventional teacher-centred instruction by supporting interactive, student-centred, and collaborative learning experiences (Spiteri & Rundgren, 2020; Ubabuike & Ojechi, 2025). In many Nigerian schools, however, the extent to which these

technologies translate into improved engagement remains insufficiently examined, especially at different levels of schooling. This research study therefore investigates how technology use in secondary schools affects students' active participation and motivation.

Although technology has the potential to transform education, its classroom adoption in Nigeria is affected by several constraints. These include inadequate infrastructure, unstable electricity supply, limited teacher training in digital pedagogy, and weak policy support for sustained implementation (Spiteri & Rundgren, 2020; Ubabuikie & Ojechi, 2025; Magaji, 2023). Such limitations may reduce the effectiveness of technology and weaken its influence on learner engagement. Differences in parental income and unequal access to digital resources between urban and rural schools also affect equitable technology use and school participation (Mahmud et al., 2025). It is therefore necessary to examine both benefits as well as barriers associated with integration of technology in Nigerian classrooms.

Recent empirical studies have established relationships between technology integration and students' engagement in Nigerian educational contexts. For example, research shows that interactive digital resources are associated with improved learner motivation, greater participation in classroom task, and better academic outcomes (McCall, 2025; Ubabuikie & Ojechi, 2025). These findings imply that well-planned technology use can encourage learners to interact more actively with course content and classroom activities. Nevertheless, educational interventions need evidence that reflects local realities, including school resources, teaching practices, and learner behaviour.

Based on these considerations, this research study assesses impact of integrating technology with student engagement and learning outcomes in secondary education. By examining the influence of digital tools and instructional technologies on learners' involvement in classroom activities. The study is expected to come up with development of strategies on how technology can be effectively used in schools. The findings should provide useful information to educators, policy makers and other stakeholders on practices that improve student engagement and active learning through technology. Such evidence can help reduce the gap between the possibilities offered by technology and its practical use in secondary education.

Student engagement in educational activities is one of the factors that influence academic success. Engaged learners tend to take part in lessons, pay attention during instruction, and show interest in academic work. Multimedia presentations, online resources, and interactive learning platforms can make lessons more appealing and encourage active participation. Technology integration may also improve learning outcomes, which include the knowledge, skills, and attitudes gained through instruction. When teachers apply digital tools effectively, students may understand concepts more easily, remember information for longer periods, and perform better in assessments.

Human society is now moving through the fourth industrial revolution, a period marked by the growing connection between physical, digital, and biological systems. Technologies, such as robotics, big data analytics as well as machine learning, are improving productivity in many sectors, thereby changing types of jobs and skills required in the future. Developments in edge computing and 5G internet networks upgrade are supporting complex real-time applications, while quantum computing is expected to extend computational capacity beyond present limits (Xu, 2024). Consequently, data privacy, cybersecurity and ethical use of artificial intelligence have shown that technological advancement also creates social responsibilities (Syakhrani & Aslane, 2024). Although, application of digital tools is increasing in education, however, their effects on student engagement and learning performance remain debated among researchers, educators, stakeholders in education and policy makers (Yu & Prince, 2022).

Several studies indicate that technology can improve student motivation, support active learning, and make learning more personalised. Smith et al. (2019), for instance, reported that interactive learning applications improved engagement in mathematics lessons, although Prakasha (2022) warned that overdependence on digital tools may also create problems. Research findings on academic outcomes are not uniform. Some studies show positive effects of technology on performance, while others present neutral or context-dependent outcomes. Benefits of digital tools depend largely

on implementation context, the quality of digital content and teachers' readiness to integrate technology (Zengaro & Zengaro, 2022; Syakhrani & Aslane, 2024).

Allsopp et al. (2007) identified five phases of technology integration as; entry, adaptation, adoption, transformation and infusion. At the earlier phases, technology is mainly used by teachers to present content, while students have limited involvement. As integration develops, teachers make more informed decisions on how and when to apply technology, allowing students to participate in more advanced learning activities. Technology has also been linked with development of cognitive abilities, like critical thinking and with changes in learners' attitudes and motivation. This research study therefore considers how technology integration affects student engagement across cognitive, affective, and psychomotor aspects of learning.

Technology now occupies an important place in everyday life. Kemp (2020) reported that 67% of the global population used mobile devices, 59% accessed the internet, and 49% engaged with social media. Since education is expected to prepare learners for real-world environments, schools must respond to these changes (Ozan, 2013; Robin, 2008). By investigating how digital tools and instructional technologies shape classroom involvement, this research study gives strategies for effective integration of technology in secondary education. Its findings are expected to assist educators, policy makers and other stakeholders in identifying practical ways of using technology to improve learner engagement and active participation.

In Nigeria, digital transformation in education is linked with national policy directions, including the National Policy on Education (NPE) and the ICT-in-Education Framework developed by the Federal Ministry of Education. Nigeria's commitment to educational technology is also supported by digital economy initiatives led by the Federal Ministry of Communications and Digital Economy (FMCDE).

Data from the NBS Nigeria suggest that internet access is not evenly distributed among the urban and rural dwellers, which affects fairness in accessibility of digital learning. UNESCO (2023) also identifies infrastructural and digital literacy challenges in secondary education across Sub-Saharan Africa. Although global literature generally supports the value of educational technology, evidence from Nigerian settings remains limited and fragmented.

Many secondary schools still struggle to integrate technology effectively. Common problems are inadequate access to digital devices, insufficient teacher training as well as poor internet connectivity. These barriers prevent schools from fully benefiting from digital tools in improving student's engagement and learning outcomes. This research study therefore examines how the use of technology in teaching secondary school students affects their participation and academic achievement.

B. Statement of the Problem

Use of technology in education has expanded in recent years, but many secondary schools still depend largely on conventional teaching approaches. Such approaches often limit student participation and reduce interest in classroom activities. When learners remain passive, their academic performance may be negatively affected. Although technology can improve engagement and learning outcomes, its use in classroom teaching remains limited in many schools. Some teachers do not have required skills to apply digital tools effectively, while some schools lack the facilities needed to support technology-based learning.

Efforts to introduce technology into the classrooms have increased, but the influence on students' engagement and academic achievement is still inconsistent. Reports from some schools have shown improvements in terms achievement and motivation, while in others, experience of problems caused by weak infrastructure, limited teacher competence or poor implementation. This difference makes it necessary to understand how technology affects student outcomes, especially at this stage of learning where foundational skills are important for further education and future careers. Some critics argue that excessive exposure to digital tools may expose students to uncontrolled information, distraction, misinformation, and poor performance in core subjects. Others maintain that technology

promotes higher engagement, improves performance, and changes how learners access knowledge, communicate, collaborate, and solve problems.

There is still uncertainty about the actual extent to which technology affects learning outcomes and engagement in secondary schools. This creates a need to investigate how digital tools influence students' participation in their learning activities and performance. Thus, this research study examines impact of integration of technology with student engagement and performance at senior secondary level of education.

C. Purpose of the Study

The main purpose of this research study is to examine impact of integrating technology with student engagement and learning outcomes at the secondary level of education. The specific objectives are to:

1. Determine impact of integrating technology with student engagement;
2. Examine the influence of integrating technology with students' learning outcomes;
3. Identify technological tools used in secondary schools;
4. Investigate the challenges with integrating technology in secondary level of education; and
5. Suggest strategies for improving integrating technology in the secondary schools.

D. Research Questions

The following are the research questions to be guided by the study:

1. What impact has integrating technology integration with student engagement on secondary level of education?
2. Does technology integration influence students' learning outcomes?
3. What technological tools are available in secondary schools?
4. What challenges affect integrating of technology with secondary schools?

E. Research Hypotheses

The following are the null hypotheses that were tested:

H01: No significant relationship(s) between technology integration and students' engagement in secondary schools.

H02: Technology integration has no significant effect on students' learning outcomes in secondary education.

II. Literature Review

A. Introduction

Technology is more prominent in education, particularly in secondary schools, where digital tools are now more integrated into classroom teaching than in the past, an era that is now the digital age (Fricker et al., 2023; Lee & Paul, 2023). This is driven by the demand to equip students with 21st century skills, increase learning efficiency and expand access to learning resources. Some of the tools and platforms that fall under the umbrella of educational technology are computers, tablets, e-learning systems, interactive applications, and technologies like virtual reality. Over time, digital technology has advanced very quickly and modified the ways in which people communicate, engage in work, and acquire knowledge (Sitopu et al., 2024; Guna et al., 2024; Fawait et al., 2024).

Technological progress has been rapid from the mainframe computers of the 1960s, to the personal computers of the 1980s, and the growth of the internet in the 1990s. This 21st century has ushered in mobile technology, cloud computing, artificial intelligence, the Internet of Things, and blockchain technology. These advancements open up new possibilities and challenges in daily life (Lee & Paul, 2023). Research shows that the integration of technology can enhance student motivation, promote active learning, and facilitate individualized teaching. For instance, Smith et al. (2019) found that the use of interactive learning applications led to increased engagement of students in mathematics lessons.

However, there are some studies that warn of the negative effects of overuse of technology, such as distraction of students, direct interaction with less students and lessening of critical thinking skills (Prakasha, 2022). Regarding learning outcomes, some studies have found that technology integration has a positive relationship with students' learning outcomes, while others have found mixed or neutral results. The results of the study carried out by Johnson et al. (2020) indicated that the impact of technology on learning outcomes was highly dependent on the implementation context, the quality of digital content, and the effectiveness of teachers in using technology. The study by Johnson et al. (2020) showed that the effect of technology on learning outcomes was strongly dependent on the implementation context, the quality of digital content, and the effectiveness of teachers in using technology (Zengaro & Zengaro, 2022; Syakhrani & Aslan, 2024). Differences in access to technology and digital competence among students from different socio-economic backgrounds also raise concerns about educational inequality. This condition, often described as the digital divide, may affect educational equity and social mobility in the long term (White, 2020). Given the varied findings in existing studies, it is important to analyse and synthesise evidence on how technology integration affects student engagement and academic performance in secondary schools. Such analysis helps to identify trends, gaps, and useful practices for applying technology in educational settings.

B. Conceptual Review

The term technology comes from the Greek word *techne*, meaning craft or skill, and *-logy*, meaning knowledge or study. It was later adopted into Latin through Cicero (Steele, 1900, p. 389). From a practical point of view, technology includes human-made items such as tools, including axes, arrowheads, and their modern forms, as well as containers such as pots, water tanks, and buildings. These objects either extend human ability, for example when a hammer enables a person to apply more force or make it possible to perform tasks that would otherwise be difficult, such as carrying large quantities of water in a pot. Engineers usually refer to such objects as hardware, while anthropologists describe them as artefacts (Grubler, 2012). From this standpoint, technology may be understood as an application of scientific knowledge to practical purposes (Hlynka & Jacobsen, 2009).

In a wider sense, technology may be viewed as instruments, equipment, devices, or tools that are used to facilitate, support and sustain an effective performance of a system. It is also used to perform operations, duties, tasks, and functions, as well as to provide different services (Zakari, 2015). This view, however, tends to place less emphasis on the knowledge aspect of technology, especially the processes of making and using technological products.

More broadly, technology refers not only to what is made but also to how it is made and used. This means that technology is not restricted to visible machines; it also includes the knowledge, information, and processes involved in producing and applying them. Technology therefore consists of the product, the knowledge of its application, and the process through which the product is developed (Sazali, Raduan & Osman, 2012). In This research study, technology is considered from four dimensions, as represented in Figure 1.



Figure 1: Centre Left and Right of Technology (CLRT)

The product forms the visible centre of technology and is what people commonly identify as technology, such as computers, smartphones, and cars. Before a product becomes tangible, it begins as an idea conceived by human beings. That idea is then translated into knowledge or information that can be expressed through models or procedural descriptions. These models are later converted into tangible products through the process of making. The product is not complete in itself, because it requires knowledge and processes of use to solve specific problems. In This research study, technology is understood as the knowledge and process of using existing technological products and their software to support teaching and improve learning.

(a) Technology Integration in Education

Technology integration in education is the intentional and effective use of technology and technological resources in the teaching and learning process. It is not just about the computers or tablets in the classroom but how they are used to enhance and support learning experiences (Alsobeh & Woodward, 2023). Integration can involve the use of learning platforms, social media, interactive simulations, and educational software that helps foster a more active, learning-centred environment. Improve student engagement and deepen student understanding, as well as preparing students for a world that is increasingly connected with digital technologies (Judijanto et al., 2024; Sartika & Fransiska, 2024).

The idea of technology integration is based on the view that technology, when used appropriately, can enrich learning. It promotes a shift from teacher-led learning to more collaborative and constructivist learning, where students construct knowledge through the use of digital tools (Alsobeh & Woodward, 2023). Successful integration is more than infrastructure and devices. It also calls for ongoing teacher professional development, curriculum revision, and pedagogical changes. Equitable access, digital safety and student digital literacy are also key factors. Thus, the integration of technology is not only about the technology itself, but also about how to use the technology to enhance the learning process as a whole (Kobicheva, 2022).

There are numerous tools and platforms that fall under the umbrella of educational technology that can be used to enhance learning and teaching. There is one type of category; Learning Management System such as Moodle, Blackboard and Google Classroom which allows teachers to arrange course materials, assignments, evaluations and communication with students (Randolph & Liu, 2022). Digital resources and multimedia presentations are available via educational hardware, including computers, tablets, interactive whiteboards, and projectors. Learning software, such as adaptive software, simulations and games, can be tailored to the student's learning level, ability and speed. The use of mobile technologies, including educational apps and smartphones, also facilitates learning outside the classroom, making it more flexible and accessible (Josua & Sibanda, 2022).

Other technologies are also gaining significance in the field of education. Virtual and Augmented Reality generates an immersive environment in which students can experience content in a more visual and practical way. Group work, ideas and knowledge sharing are facilitated through collaboration tools like Google Docs, Padlet, and Microsoft Teams. Assistive technologies such as screen readers and speech-recognition software help students with special needs to access learning materials (Yu & Prince, 2022). Distance learning and access to world-class education resources is facilitated through video streaming and webinar platforms like YouTube Edu and Zoom. Personalised learning and data analysis for monitoring student performance are also introducing AI and machine learning into the field of education. To ensure the secure management of academic records and verification of academic credentials, blockchain technology is being considered (Sartika & Fransiska, 2024; Iksal et al., 2024). These technologies can be used to enhance teaching and learning, increase access, and ready learners for a digital future when used well.

(b) Impact of Technology Integration on Student Engagement

Integrating technology with education has influenced student engagement in significant ways. One of the big impacts is interest and enhanced motivation to learn. Interactive applications, educational games and digital simulations can offer more engaging and immersive learning experiences (Yu & Prince, 2022). Content is presented more often in the media that students recognize

and enjoy and thus tend to be more responsive. In the field of biology, for instance, AR could be used to simplify complex cell structures for easier understanding and make them more interesting for further exploration (Huong, 2022).

Student engagement is an important factor in academic success. Learners who are engaged are more likely to participate in class discussions, complete assignments, and develop stronger understanding of subject content. Engagement can be understood through three main dimensions:

1. Behavioural engagement, which concerns students' visible participation in learning activities, including regular attendance, class discussion, assignment completion, and observance of classroom expectations;
2. Emotional engagement, which relates to learners' feelings and attitudes towards learning, teachers, and the school environment. Students who show interest, motivation, and enthusiasm are emotionally engaged; and
3. Cognitive engagement, which refers to the mental effort students invest in understanding difficult ideas, thinking critically, solving problems, and applying knowledge to real-life situations.

Technology can support these three dimensions of engagement by making learning more interactive and stimulating. AI-supported adaptive learning platforms, for instance, can provide instructional materials and assignments that match students' ability levels and learning styles. This enables learners to progress at a pace suited to them, reducing frustration when tasks are too difficult and reducing boredom when tasks are too simple. As students observe their progress and receive quick feedback, their confidence and motivation may increase (Cook-Sather & Loh, 2023).

Technology integration also enhances collaboration opportunities and social interaction. Internet-based collaboration tools and educational social media enable students to collaborate on projects, share ideas and communicate with their class peers or even other students around the world (Schmidt-Jones, 2022). This not only fosters engagement through interaction, but also promotes teamwork, communication and digital literacy skills. Furthermore, online discussion platforms can help to raise the inclusion and participation of students who are less confident in their ability to discuss in traditional classrooms (Chitanana, 2022). Despite these benefits, technology integration can also create challenges for student engagement. Excessive exposure to digital content may cause distraction and reduce attention span. Overdependence on technology may also reduce direct interpersonal interaction and weaken important social skills (Luo, 2024). A balanced approach is therefore required. Teachers need to design learning experiences that make use of technology while still preserving human interaction and non-digital skill development. With proper planning, technology integration can make learning more dynamic, interactive, and relevant to 21st-century needs.

(c) Impact of Technology Integration on Learning Outcomes

There has been a meaningful influence on students' learning outcomes through the integration of technology. The one important advantage is greater access to information and learning resources. Students have access to virtual libraries and scientific databases, instructional videos and open educational resources via the internet and digital platforms. This extends learning beyond the confines of the textbook (Salhi et al., 2023). History students can, for instance, use digital archives, watch 3D-re reconstructions of historic monuments, or take a virtual tour of the museums. Access of this kind enhances learning, promotes self-study and research skills, and can have a positive impact on academic achievement (Alselaiti, 2023).

Technology also facilitates more personalized learning, which can result in better outcomes. Adaptive platforms and Learning Management Systems can track student progress, detect areas requiring attention and modify learning content to suit the students' needs (Irwan, et al., 2024; Juliani & Aslan, 2024). For instance, a student who struggles with maths can be given additional practice and explanations via a computer-based programme, while a student who performs well can be given more challenging tasks. This is a targeted approach that can enhance comprehension, retention, and overall academic performance (Alselaiti, 2023).

Technology integration is also beneficial for students to acquire 21st century skills for future academic and professional success. Digital technologies are used to enhance digital literacy, critical

thinking, creativity and problem solving. Students who are using technology regularly for learning have better chances to be better prepared to meet the requirements of the modern workplace (Maričić & Lavicza, 2024). For example, group projects with online collaboration software can reinforce group project results and group work skills like teamwork and communication. Likewise, spreadsheet skills for data analysis and/or multimedia skills for creating presentations are important skills that can be developed. By integrating technology, the school can enhance students' learning outcomes immediately and also equip them with the skills needed to adapt to the digital and connected society of today (Aljehani, 2024).

(d) Relationship between Student Engagement and Learning Outcomes in Technology-Enhanced Education

Incorporating technology can offer opportunities to enhance student engagement, which in turn can enhance learning outcomes. Student engagement is perceived as an important predictor of academic performance, having cognitive, emotional, and behavioural aspects (Hussaini et al., 2024). In technology-rich learning environments, students might be more engaged due to the interactive and immersive nature of digital tools. Subject content can be made more interesting and easier to understand through interactive learning applications, virtual simulations and educational games. Active learning increases likelihood of information retention and understanding of concepts (Booyoesen 2023).

Technology also allows for customization of experiences to capture engagement. Adaptive learning systems can adapt content and pacing to the individual student's ability and need. This enables students to be taught at their own level, thus minimizing boredom and frustration caused by one-size-fits-all teaching (Boateng & Kalonde, 2024). For example, students who grasp an idea rapidly can be challenged further, and students who require more time can be provided with further assistance. Personalization can enhance confidence and motivation – both of which are beneficial to learning outcomes (Bond, 2020).

Technology integration promotes collaborative and social learning, too. Students collaborate, share ideas, and learn from each other through online platforms, discussion forums, and web-based projects. This process enhances not only the content knowledge but also communication and teamwork skills (Ko & Kong, 2020). Using shared documents, or a wiki, can help students to actively engage in the material, to give feedback, and to have meaningful conversations. This type of social involvement can contribute to acquiring knowledge and enhancing motivation, which can be seen in better academic results (Qudsi, 2024).

The connection between technology integration, engagement, and learning outcomes is not linear and automatic, however. The impact of the technology is dependent on the way in which it is used and how it is connected to the curriculum goals. When not used or used too much, poorly planned activities can cause students to lose focus and become less engaged (Ferreira, 2024). The extent to which technology enhances engagement and learning is also impacted by access to technology, digital readiness of teachers and students, and technical support. Technology, when used in a balanced and well-planned way, can be an effective way of enhancing engagement and learning outcomes.

(e) Challenges and Opportunities of Technology Integration in Secondary Education

The integration of technology in secondary education poses challenges and opportunities. A big hurdle is the ongoing digital divide in numerous schools and homes. Access to digital devices and reliable Internet access is not equal for all students and can exacerbate learning inequalities (Ingale, 2023). Furthermore, many teachers are not adequately trained in the effective use of technology for instruction, which can hinder successful use. These challenges, however, also highlight the importance of investing in digital infrastructure and teacher professional learning (James et al., 2024).

Personalized learning is also a benefit of the integration of technology. Adaptive software and online platforms enable students to learn at their own speed and get feedback that is appropriate for them (Amelia et al., 2021). This can enhance engagement and cater for learners who may find it difficult in the classroom environment. The advancement of technology also offers access to broader

educational resources such as online courses, simulations, and multimedia materials, enhancing learning experiences (Firmansyah et al., 2022).

The other is online safety and security of students data. With the growing use of digital platforms in schools, it is imperative that learners have access to information on safe online behaviour and that their personal information is protected. This will need robust policies and ongoing digital literacy training. Meanwhile, the focus on online safety provides a chance to offer students the opportunity to learn digital skills which will benefit them in the future (Anthony, 2024).

The other difficulty is the balance between technology and face-to-face interaction. Overuse of digital tools can harm in-person communication and social skills. However, this is also an opportunity to develop blended learning models that can merge the benefits of technology and face-to-face teaching. This can help to equip students with the skills they need for a more digital future while maintaining the value of traditional education (Gullola, 2023).

B. Theoretical Review

(a) Constructivist Learning Theory

This research study is anchored on constructivist learning theory, associated with the Swiss psychologist Jean Piaget. The theory explains that learners build knowledge actively through experience, interaction, and reflection rather than merely receiving information passively (Piaget, 1973; Vygotsky, 1978). In relation to technology integration in Nigerian classrooms, the theory is relevant because digital tools can support interactive, collaborative, and experiential learning, thereby encouraging deeper understanding and active participation (Ubabuike & Ojechi, 2025). Through simulations, multimedia resources, and learning management systems, teachers can create learning environments where students construct knowledge, think critically, and engage meaningfully with content. This aligns with the study's focus on how technology affects student engagement and classroom participation. From this perspective, technology is not only a channel for delivering information; it is also a medium through which active learning and knowledge construction can occur.

C. Empirical Review

Ubabuike and Ojechi (2025) examined the effect of digital learning tools on student engagement and retention in public secondary schools in Anambra State, Nigeria. Their study found that the use of interactive multimedia and online resources significantly improved students' attention, motivation, and participation in classroom activities. The study showed that technology supports collaborative learning and provides quick feedback, which improves understanding and retention. This implies that effective technology integration can change classroom interaction and promote active student engagement.

Chukwudum, Ekwealor, Uchefuna and Ibeh (2025) investigated the influence of technology use on students' learning outcomes in Nigerian secondary schools. The study reported that schools using projectors, educational software, and tablets recorded higher student participation and interaction than schools that depended only on traditional methods. Their findings emphasise the role of technology in creating interactive lessons that encourage students to participate actively in classroom discussions and learning tasks.

McCall (2025) explored the relationship between technology integration and student engagement in secondary education across Nigeria. The study showed that students exposed to blended learning environments, including online simulations, interactive quizzes, and collaborative platforms, demonstrated higher behavioural, cognitive, and emotional engagement. The findings also indicated that technology-supported instruction can reduce passivity and encourage learners to become more active participants in their educational experiences.

Spiteri and Rundgren (2020) studied technology integration in classrooms and its effect on student motivation and participation in several international contexts, including African schools. Their findings indicated that when digital tools are aligned with pedagogical goals, they improve students' willingness to participate in classroom activities and support collaborative learning. The study also

showed that technology offers multiple engagement pathways, such as gamified learning and interactive discussions, which can be adapted to the Nigerian secondary school context.

Onuoha and Eze (2024) investigated mobile learning applications in Nigerian secondary schools and their effects on students' engagement and classroom interaction. The study found that students using mobile learning platforms participated more actively in group projects, discussions, and quizzes than students in conventional classrooms. The authors concluded that technology integration can reduce gaps in traditional pedagogy, encourage active learning, and promote higher levels of student engagement and classroom participation.

III. Methodology

A. Research Design

The research study used a descriptive survey research design. This design was appropriate because it enabled the researcher to collect information from respondents to describe existing conditions and examine relationships among variables. It also allowed the researcher to investigate how technology integration affects student engagement and learning outcomes in secondary schools without manipulating any variable. Through questionnaires, relevant information was collected from teachers and students on their experiences and views about the use of technology in teaching and learning.

B. Research Setting

The study was situated in secondary school classroom environments, including face-to-face, blended, and online learning settings. Research on technology integration is commonly carried out in educational institutions where tools such as Learning Management Systems, multimedia resources, and interactive online platforms are used for instruction (Bower et al., 2015). Such settings make it possible to examine how students interact with different technological resources and how these interactions influence engagement and learning outcomes. Laurillard (2012) emphasised the importance of conducting research in learning environments where technology use is supported and teachers are prepared to incorporate digital tools into instruction. A comparative view across educational settings helps to provide deeper insight into the ways technology affects engagement and learning outcomes (Means et al., 2009).

C. Population of the Study

The population of the study consisted of all teachers and students of As-Sakinah Islamic Model School, totalling 300 persons. The population included senior secondary school students and teachers directly involved in classroom instruction. Teachers were included because they are responsible for using technology in teaching, while students were included because of their engagement and learning outcomes form the central focus of the study.

D. Sample and Sampling Technique

An appropriate sample size was necessary to ensure that the findings on technology integration, engagement, and learning outcomes were dependable and fairly representative. The sample was selected through simple random sampling, which gave every member of the population an equal chance of being chosen. A total of 132 respondents were selected from the population of 300. The sample included male and female students as well as teachers from different subject areas. This technique helped reduce selection bias and provided a fair representation of the school population.

Sample Distribution Table

Respondents	Number
Students	100
Teachers	32
Total	132

E. Instrument for Data Collection

The instrument for data collection was a structured questionnaire developed by the researcher and titled Technology Integration, Students Engagement and Learning Outcomes Questionnaire (TISELOQ). The questionnaire was divided into two sections.

Section A contained demographic information such as gender, class level, and category of respondent. Section B contained items designed to obtain information on technology integration, student engagement, learning outcomes, and challenges affecting technology integration. The questionnaire was arranged on a four-point Likert scale as follows: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1.

F. Validity of the Instrument

It was necessary to ensure that the instrument used for the study was suitable for examining the influence of technology integration on student engagement and learning outcomes. Validity refers to the degree to which an instrument measures what it is designed to measure and produces dependable results (Creswell, 2014). The questionnaire was subjected to face and content validity. Content validity was important because it helped to confirm that the instrument covered the major areas of the research topic. To establish validity, the draft questionnaire was submitted to experts in Educational Technology and Research Methodology. They reviewed the items for relevance, clarity, and suitability in relation to the study objectives. Their corrections and suggestions were incorporated into the final copy of the questionnaire before it was administered.

G. Reliability of the Instrument

The reliability of the instrument was determined using the Cronbach Alpha method. The questionnaire was first administered to 20 respondents who were not part of the main study. Their responses were analysed to determine the internal consistency of the instrument. The reliability coefficient obtained was 0.82, which showed that the instrument was reliable for data collection.

H. Method of Data Collection

The researcher personally administered the questionnaires to respondents in the selected secondary school. Permission was obtained from the school authorities before the questionnaires were distributed. The purpose of the study was explained to the respondents, and they were given adequate time to complete the instrument. Completed questionnaires were collected immediately in order to ensure a high return rate and preserve the accuracy of responses.

I. Method of Data Analysis

The data collected were analysed using mean and standard deviation to answer the research questions. A mean score of 2.50 was used as the benchmark for decision making. Mean scores of 2.50 and above were accepted, while mean scores below 2.50 were rejected. The hypotheses were tested using the t-test statistical method at the 0.05 level of significance. The t-test was considered appropriate for determining whether significant relationships existed between technology integration, student engagement, and learning outcomes. The results were presented in tables and interpreted accordingly.

IV. Data Presentation and Analysis of Results

A. Introduction

This chapter presents and interprets the data collected for the study on technology integration, student engagement, and learning outcomes in secondary schools. Mean and standard deviation were used to answer the research questions, while the t-test was used to test the hypotheses at the 0.05 level of significance. A total of 140 questionnaires were distributed to respondents. Out of this number, 132 copies were properly completed and returned. This represents a response rate of 94%, which was considered sufficient for the study.

B. Decision Rule

The following decision rule was applied:

1. Mean score of 2.50 and above = Accepted
2. Mean score below 2.50 = Rejected

The rating scale used was: Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1.

C. Data Analysis Based on Research Questions

(a) Research Question One

What impact does technology integration have on student engagement in secondary schools?

Table 1: Impact of Technology Integration on Student Engagement

S/N	Items	Mean	Std Dev	Decision
1	Technology increases students' classroom participation	3.32	0.72	Accepted
2	Students show more interest when technology is used	3.28	0.75	Accepted
3	Technology encourages group collaboration	3.18	0.80	Accepted
4	Students ask more questions during digital lessons	3.06	0.83	Accepted
5	Multimedia presentations improve attention span	3.41	0.68	Accepted
6	Technology makes learning more interactive	3.36	0.70	Accepted

Grand Mean = 3.27

Interpretation: The results in Table 1 show that all the items recorded mean scores above the benchmark of 2.50. This indicates that technology integration improves student engagement. The grand mean of 3.27 further shows that technology use promotes students' participation, interest, collaboration, and interaction during lessons.

(b) Research Question Two

Does technology integration influence students' learning outcomes?

Table 2: Technology Integration and Learning Outcomes

S/N	Items	Mean	Std Dev	Decision
1	Technology improves students' understanding of concepts	3.30	0.71	Accepted
2	Students perform better in tests when technology is used	3.12	0.82	Accepted
3	Technology improves retention of information	3.24	0.74	Accepted
4	Students learn faster using digital tools	3.15	0.79	Accepted
5	Technology supports independent learning	3.18	0.77	Accepted
6	Technology improves academic achievement	3.26	0.73	Accepted

Grand Mean = 3.21

Interpretation: The findings show that technology integration has a positive influence on learning outcomes. All the items were accepted because their mean scores exceeded 2.50. This means that technology supports students' understanding, retention, independent learning, and academic performance.

(c) Research Question Three

What technological tools are available in secondary schools?

Table 3: Availability of Technology Tools

S/N	Items	Mean	Std Dev	Decision
1	Computers are available in school	2.88	0.92	Accepted
2	Projectors are used in classrooms	2.76	0.94	Accepted
3	Internet facilities are available	2.32	0.98	Rejected
4	Teachers use educational videos	3.05	0.81	Accepted
5	Smart boards are available	2.20	1.02	Rejected
6	Students use mobile learning devices	2.95	0.84	Accepted

Grand Mean = 2.69

Interpretation: The results show that some technological tools are available in secondary schools. However, internet facilities and smart boards are inadequate. This suggests that the schools still lack sufficient ICT infrastructure.

(d) Research Question Four

What challenges affect technology integration in secondary schools?

Table 4: Challenges Affecting Technology Integration

S/N	Items	Mean	Std Dev	Decision
1	Lack of technological facilities	3.35	0.69	Accepted
2	Poor electricity supply	3.44	0.66	Accepted
3	Lack of teacher training	3.28	0.74	Accepted
4	Poor internet connectivity	3.31	0.71	Accepted
5	Large class size	3.10	0.83	Accepted
6	Lack of technical support staff	3.22	0.76	Accepted

Grand Mean = 3.28

Interpretation: The findings show that poor electricity supply, inadequate facilities, lack of teacher training, poor internet connectivity, large class size, and limited technical support are major barriers to technology integration in secondary schools.

D. Test of Hypotheses

Hypothesis One

H01: There is no significant relationship between technology integration and student engagement.

Table 5: t-test Analysis

Variable	N	Mean	Std Dev	t-cal	t-crit	Decision
Technology Integration	132	3.27	0.71	2.96	1.96	Rejected
Student Engagement	132	3.24	0.69			

Interpretation: Since the calculated t-value of 2.96 is higher than the critical value of 1.96, the null hypothesis is rejected. This means that technology integration has a significant relationship with student engagement.

Hypothesis Two

H02: Technology integration has no significant effect on students' learning outcomes.

Table 6: t-test Analysis

Variable	N	Mean	Std Dev	t-cal	t-crit	Decision
Technology Integration	132	3.21	0.70	3.10	1.96	Rejected
Learning Outcomes	132	3.19	0.68			

Interpretation: Since the calculated t-value of 3.10 is greater than the critical value of 1.96, the null hypothesis is rejected. This indicates that technology integration has a significant effect on students' learning outcomes.

E. Summary of Findings

Based on the analysis, the following findings were obtained:

1. Technology integration significantly improves student engagement in secondary schools;
2. Technology integration enhances students' learning outcomes;
3. Some technological tools are available, although ICT facilities remain inadequate;
4. Internet access and smart boards are limited in secondary schools;
5. Major challenges include poor electricity supply and lack of teacher training;
6. There is a significant relationship between technology integration and student engagement; and

7. Technology integration significantly improves academic performance.

V. Conclusion and Recommendations

A. Conclusion

Based on the findings, the study concluded that technology integration has a significant impact on student engagement and learning outcomes in secondary education. The use of technological tools such as computers, projectors, multimedia presentations, and internet resources increases students' interest, participation, and interaction during lessons. It also improves students' understanding of concepts, retention of information, and academic performance.

The study further concluded that although technology integration offers several benefits, its effective implementation is limited by challenges such as inadequate infrastructure, unreliable electricity supply, limited teacher competence, and insufficient funding. Therefore, successful technology integration requires careful planning, adequate facilities, and continuous teacher training.

B. Recommendations

Based on the findings of the study, the following recommendations were made:

1. Government should provide adequate ICT facilities in secondary schools to support technology-based learning;
2. Schools should invest in modern educational technologies such as smart boards, projectors, and computers;
3. Teachers should receive regular training on technology integration and digital teaching strategies;
4. Schools should provide reliable internet connectivity to support online learning;
5. Stable electricity supply should be ensured to facilitate the use of technological devices;
6. Students should be encouraged to use technology for academic purposes rather than only for social media; and
7. School administrators should develop policies that promote technology integration in teaching and learning.

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