Artificial Intelligence-Driven Instruction and Classroom Technology Utilization in Relation to Learners' Engagement

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DOI: https://doi.org/10.47772/IJRISS.2026.100600157

Received: 17 May 2026; Accepted: 22 May 2026; Published: 19 June 2026

ABSTRACT

Learners' engagement, AI-driven instruction, and classroom technology utilization are increasingly recognized as essential components of modern teaching and learning that influence how effectively students participate, interact, and achieve learning outcomes. This study examined the relationships among these variables in selected elementary schools in the Oroquieta City. A descriptive-correlational research design was employed, involving 120 elementary school teachers selected through purposive sampling based on specific inclusion criteria, including teaching level, experience with AI or technology use, and willingness to participate. Three validated, reliability-tested researcher-made questionnaires were used to gather data, with Cronbach's alpha indicating acceptable internal consistency. Data were analyzed using descriptive statistics, and Pearson's r correlation to determine relationships and predictive effects among variables. Findings revealed that both AI-driven instruction and classroom technology utilization were implemented at a high level, while learners were highly engaged across behavioral, emotional, cognitive, and social dimensions. However, correlation analysis showed that most relationships between AI-driven instruction and learners' engagement, as well as classroom technology utilization and learners' engagement, were not statistically significant, except for a weak significant relationship between automated feedback and emotional engagement. The study suggests that while technology and AI are highly implemented in classrooms, their direct impact on learner engagement may depend more on pedagogical application than mere usage.

Keywords: adaptive learning; AI-driven instruction; classroom technology utilization; elementary education; learners' engagement.

INTRODUCTION

Rationale of the Study

Traditional classroom instruction has long relied on teacher-centered approaches in which educators deliver lessons through lectures, printed materials, and direct classroom activities. In elementary education, teachers traditionally serve as the primary source of knowledge, guiding learners through structured discussions, drills, and classroom exercises designed to develop foundational literacy, numeracy, and critical thinking skills. While these conventional instructional approaches remain valuable, they often present limitations in addressing diverse learning needs, varying student abilities, and individual learning paces within the classroom. As educational systems continue to evolve in the digital age, schools are increasingly integrating technological innovations to create more interactive, learner-centered, and engaging instructional environments.

The emergence of artificial intelligence (AI) has significantly transformed educational practices by enhancing instructional delivery and expanding opportunities for personalized learning. AI-driven instruction utilizes technologies such as adaptive learning platforms, intelligent tutoring systems, automated assessments, and AI-assisted feedback mechanisms to support teaching and learning processes (Marcos, 2026). These technologies enable educators to provide individualized learning experiences by tailoring instructional content, pacing, and feedback according to learners' needs more efficiently than traditional instructional approaches (Garzón et al.,

2025). Research further suggests that the thoughtful integration of AI into instruction may improve learners' academic performance, motivation, and participation in classroom activities (Marcos, 2026). As educational institutions continue to embrace digital transformation, AI is increasingly recognized as a significant component of 21st-century educational reform and innovation (Garzón et al., 2025).

Despite its potential benefits, the rapid integration of AI-driven instruction presents several challenges for educators and schools, particularly in classroom implementation and instructional management. Teachers often struggle to distinguish between student-generated work and outputs produced by AI tools, raising concerns about academic integrity and authentic learning assessment (Salih et al., 2025). Educational institutions also face challenges in establishing clear policies and ethical guidelines governing the responsible use of AI technologies in classroom instruction (Salih et al., 2025). Researchers emphasize that inadequate teacher preparation, limited professional training, and insufficient policy frameworks contribute to the gap between AI adoption and its effective instructional application (Griffin, 2025). Moreover, disparities in access to technology and digital resources further complicate the implementation of AI-driven instruction, particularly in elementary school settings where learners have varying levels of technological familiarity and support (Salih et al., 2025).

In addition to AI-driven instruction, the use of classroom technology has become an increasingly important factor in enhancing contemporary teaching and learning. Classroom technology utilization refers to the effective integration and use of digital tools, multimedia resources, interactive devices, online learning platforms, and communication technologies to facilitate instruction and support student learning. Technologies such as tablets, interactive whiteboards, educational applications, video-based instruction, and learning management systems provide teachers with opportunities to create more engaging and interactive learning experiences. Effective technology use enables educators to diversify instructional strategies, encourage collaboration, improve access to learning materials, and support differentiated instruction based on learners' abilities and preferences (Garzón et al., 2025). Furthermore, classroom technology can enhance learners' opportunities for participation, creativity, and independent exploration of content, thereby contributing to more meaningful learning experiences.

However, the effectiveness of classroom technology use depends largely on how it is integrated into instructional practices. Improper or excessive use of technology may distract learners, reduce meaningful interaction, or create dependence on digital tools rather than promoting active learning. Researchers note that many schools continue to encounter barriers such as inadequate infrastructure, limited teacher competence, insufficient training opportunities, and unequal access to digital resources, which hinder the successful implementation of classroom technologies (Griffin, 2025). In elementary school contexts, these challenges become more pronounced because younger learners require closer supervision, guided instruction, and age-appropriate technological integration to maximize educational benefits. Consequently, effective utilization of classroom technology requires careful planning, appropriate pedagogical strategies, and sustained institutional support to ensure that technology contributes positively to teaching and learning outcomes.

Learners' engagement is widely recognized as a critical factor influencing academic achievement, classroom participation, and overall educational success. Learner engagement encompasses behavioral, emotional, and cognitive dimensions that reflect students' active involvement, interest, motivation, and commitment to learning activities. Behavioral engagement refers to students' participation in classroom tasks and academic activities; emotional engagement relates to learners' feelings of interest, enjoyment, and connection to learning; and cognitive engagement involves learners' investment in understanding complex concepts and applying higher-order thinking skills. In elementary education, learner engagement is particularly important because it supports the development of foundational academic skills, positive learning attitudes, and long-term educational motivation. Studies indicate that instructional environments that encourage interaction, participation, and meaningful learning experiences significantly contribute to higher levels of learner engagement (Marcos, 2026).

AI-driven instruction and the use of classroom technology may significantly influence learners' engagement when integrated with effective pedagogical strategies. AI technologies can support differentiated instruction by allowing learners to engage with content at their own pace, according to their learning preferences and individual academic needs (Garzón et al., 2025). Similarly, classroom technologies can facilitate collaborative activities, multimedia learning experiences, interactive discussions, and immediate feedback, all of which may enhance

learners' behavioral, emotional, and cognitive engagement (Griffin, 2025). Through these approaches, teachers can move beyond traditional teacher-centered instruction toward more learner-centered and participatory classroom environments. In elementary classrooms, where sustaining attention and motivation is essential, integrating AI-driven instruction and classroom technology may offer innovative opportunities to deepen student participation and interest in learning activities.

Several recent studies have examined various dimensions of AI integration, educational technology, and learner engagement in school settings. Research on K–12 AI literacy emphasizes both the opportunities and challenges of AI-supported learning, particularly the need for adaptive technologies that foster creativity, critical thinking, and problem-solving skills among learners (Li et al., 2024). Quantitative studies further reveal that teachers' familiarity and competence with AI technologies strongly influence instructional effectiveness and the quality of student learning experiences (Springer, 2025). Systematic reviews likewise report generally positive outcomes regarding learner achievement and engagement when AI technologies are intentionally integrated into classroom instruction, although persistent barriers related to implementation and teacher preparedness remain evident (Marcos, 2026). Similarly, studies on the utilization of classroom technology highlight its potential to support interactive instruction, collaborative learning, and increased student participation across diverse educational contexts (Garzón et al., 2025).

Despite these developments, a significant research gap remains regarding the combined influence of AI-driven instruction and classroom technology utilization on learners' engagement, particularly within elementary school contexts. Existing studies largely focus on teacher perceptions, AI literacy, or isolated aspects of educational technology rather than examining how these variables collectively influence learners' behavioral, emotional, and cognitive engagement in authentic classroom settings (Li et al., 2024). Furthermore, limited empirical investigations have specifically explored these relationships among elementary learners, despite the importance of engagement during the foundational stages of learning and development (Springer, 2025). Research also remains limited in providing quantifiable evidence on how AI-driven instruction and the use of classroom technology jointly contribute to sustained learner participation, motivation, and cognitive involvement in elementary classrooms. Consequently, there is a need for more context-specific, empirical studies examining how these instructional innovations affect learner engagement in elementary education.

The primary objective of this quantitative study is to determine the relationship between AI-driven instruction, classroom technology utilization, and learners' engagement among elementary students. Specifically, the study aims to examine the extent to which AI-driven instructional practices and the utilization of classroom technology relate to the behavioral, emotional, and cognitive dimensions of learner engagement. It also seeks to determine whether higher levels of AI integration and more effective classroom technology utilization are associated with increased student participation, motivation, and involvement in learning activities. Additionally, the study intends to explore how these relationships vary across classroom instructional practices and learning environments. Through this investigation, the study aims to provide evidence-based insights that may guide educators, school administrators, and policymakers in developing effective strategies for integrating AI and classroom technologies into elementary education.

This study is significant because it contributes to the growing body of literature on AI-driven instruction, classroom technology utilization, and learner engagement, particularly within the elementary school context. The findings may help educators better understand how AI technologies and classroom digital tools can be effectively utilized to enhance student engagement and improve learning experiences.

The study may also assist school leaders and policymakers in designing professional development programs that strengthen teachers' competence and confidence in implementing AI-supported instruction and educational technologies. Furthermore, the findings may support the development of policies and guidelines promoting the responsible, ethical, and effective integration of AI and classroom technologies in elementary schools. By addressing an existing research gap, this study may provide valuable empirical evidence to support improved instructional practices and learner-centered educational environments that combine human teaching expertise with emerging technological innovations.

THEORETICAL FRAMEWORK

The study was anchored in the Technology Acceptance Model (Davis, 1989) & Engagement Theory (Kearsley & Shneiderman, 1998).

The study is anchored on the Technology Acceptance Model (TAM) and Engagement Theory, which collectively provide a comprehensive theoretical foundation for explaining the relationships among AI-driven instruction, classroom technology utilization, and learners' engagement. The Technology Acceptance Model primarily supports the variables of AI-driven instruction and classroom technology utilization by explaining how users accept and utilize technological systems, while Engagement Theory provides the theoretical basis for understanding learners' engagement in technology-supported learning environments. Together, these theories establish an integrated framework that explains how perceptions of educational technologies influence their use and how meaningful technology integration promotes learner engagement.

The Technology Acceptance Model (TAM), introduced by Fred D. Davis in 1989, provides a foundational framework for understanding how individuals accept and use technological systems (Davis, 1989; Lin & Yu, 2023). According to TAM, technology adoption is primarily influenced by two key constructs: perceived usefulness (PU), which refers to the extent to which users believe that a technology enhances their performance, and perceived ease of use (PEOU), which refers to the degree to which the technology is considered easy to understand and operate (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). These constructs shape users' attitudes toward technology, which subsequently influence behavioral intentions and actual technology usage (Lin & Yu, 2023; Saflor, 2025). TAM has been extensively applied in educational research to explain teachers' and students' acceptance of digital learning systems, AI-supported instruction, and classroom technologies. Studies consistently demonstrate that when educational technologies are perceived as useful and easy to use, users are more likely to adopt and integrate them into teaching and learning processes (Lin & Yu, 2023; Lai & Ho, 2025).

In this study, TAM serves as the theoretical foundation for the variables AI-driven instruction and classroom technology utilization. AI-driven instruction uses intelligent systems, such as adaptive learning platforms, automated feedback systems, and AI-assisted instructional tools, to support teaching and learning. Classroom technology utilization, on the other hand, refers to the effective integration and use of digital technologies, multimedia resources, and instructional devices within classroom instruction. TAM explains that teachers and learners are more likely to use AI-driven instructional systems and classroom technologies when they perceive these tools as beneficial for improving instructional effectiveness and manageable in terms of effort and usability (Lin & Yu, 2023; Saflor, 2025). Conversely, technologies perceived as difficult to use or lacking instructional value may discourage adoption despite their availability (Lai & Ho, 2025). Thus, TAM provides a logical explanation for how perceptions of usefulness and ease of use influence the integration of AI-driven instruction and classroom technologies in educational settings.

Several studies support the application of TAM in educational technology research. Lin and Yu (2023) utilized an extended TAM framework to examine students' acceptance of digital academic reading tools and found that perceived usefulness, perceived ease of use, and instructor support significantly influenced learners' intentions to use the technology. Similarly, Lai and Ho (2025) applied TAM in investigating nursing students' acceptance of educational chatbots and reported that perceived usefulness and ease of use positively affected attitudes and behavioral intentions toward technology use. Saflor (2025) likewise found that students' acceptance of AI technologies was strongly predicted by perceived usefulness and perceived ease of use. These findings reinforce the suitability of TAM as the theoretical basis for explaining AI-driven instruction and the utilization of classroom technology in the present study.

The significance of TAM in this research lies in its ability to explain and predict technology adoption behavior within educational environments. By focusing on users' perceptions of usefulness and ease of use, the theory provides insight into the factors that encourage or hinder the integration of AI-driven instructional systems and classroom technologies. The theory also highlights the importance of teacher readiness, training, and institutional support in promoting effective technology integration. In the context of this study, TAM supports the assumption

that positive perceptions of AI-driven instruction and the use of classroom technology contribute to greater acceptance and use of educational technologies, which may subsequently influence learners' engagement.

The study is further anchored on Engagement Theory, proposed by Kearsley and Shneiderman in 1998, which provides the theoretical foundation for the variable learners' engagement (Kearsley & Shneiderman, 1998; Robinson et al., 2023). Engagement Theory posits that meaningful learning occurs when learners are actively involved in collaborative, authentic, and purposeful learning activities. The theory is built upon three major principles: relate, create, and donate. The "relate" principle emphasizes collaboration and social interaction among learners, the "create" principle focuses on creative and meaningful problem-solving activities, while the "donate" principle highlights the importance of producing outcomes that have value beyond the classroom context (Kearsley & Shneiderman, 1998; Aldowah et al., 2023). Through these principles, the theory promotes learner-centered instruction where students actively participate in constructing knowledge rather than passively receiving information.

Engagement Theory strongly aligns with the variable learners' engagement because it explains how instructional environments and technology-supported learning experiences influence students' behavioral, emotional, and cognitive involvement in learning activities. Behavioral engagement is reflected through active participation and collaboration in classroom tasks, emotional engagement is strengthened when learners perceive activities as meaningful and enjoyable, while cognitive engagement develops through authentic problem-solving and creative learning experiences. The theory further suggests that technology can serve as a medium for collaboration, interaction, and authentic learning experiences rather than merely as a delivery tool for information (Robinson et al., 2023; Aldowah et al., 2023). In the context of AI-driven instruction and classroom technology utilization, Engagement Theory explains how technology-enhanced learning environments may foster greater learner participation, motivation, and sustained involvement in educational activities.

Recent studies further support the relevance of Engagement Theory in technology-supported learning environments. Robinson et al. (2023) found that collaborative online learning environments significantly enhanced learner participation and interaction when students engaged in meaningful group tasks, supporting the "relate" principle of the theory. Similarly, Aldowah et al. (2023) reported that students in blended learning environments demonstrated higher motivation and engagement when instructional activities involved authentic tasks and technology-supported project creation, consistent with the "create" and "donate" principles of Engagement Theory. These findings affirm that learner engagement increases when educational technologies are integrated into collaborative and meaningful learning experiences.

The significance of Engagement Theory in this study lies in its emphasis on authentic, collaborative, and learner-centered educational experiences as foundations for meaningful engagement. The theory supports the idea that AI-driven instruction and classroom technology utilization should not only improve instructional efficiency but also create interactive learning environments that encourage participation, creativity, and cognitive involvement. By emphasizing active engagement through collaboration and authentic learning activities, Engagement Theory provides a strong basis for explaining how educational technologies can positively influence learners' behavioral, emotional, and cognitive engagement.

Collectively, the Technology Acceptance Model and Engagement Theory provide an integrated theoretical framework for the study. TAM explains the acceptance and utilization of AI-driven instructional systems and classroom technologies, while Engagement Theory explains how these technologies contribute to meaningful learner engagement when integrated into collaborative and authentic instructional practices. Together, these theories support the assumption that effective acceptance and utilization of AI-driven instruction and classroom technology may positively influence learners' engagement in elementary classroom settings.

CONCEPTUAL FRAMEWORK

The study involved three variables, such as AI-Driven Instruction, having four constructs, namely: AI integration, adaptive learning, automated feedback, and personalized instruction. The classroom technology utilization variable comprises four constructs, namely: digital tools, instructional technology, technology access,

and technology frequency. Furthermore, the learners' engagement variable comprises the following constructs: behavioral, emotional, cognitive, and social engagement.

AI-Driven Instruction

AI-Driven Instruction refers to the deliberate integration of artificial intelligence technologies, such as adaptive platforms, intelligent tutoring systems, and generative tools, into the teaching and learning process to enhance instructional delivery, personalization, and classroom efficiency. Research indicates that AI can support teachers by automating routine tasks such as lesson planning and feedback, thereby enabling educators to devote more time to high-impact instructional interactions (Shi et al., 2024). Systematic reviews further highlight that AI-powered tools have the potential to transform curricula by fostering real-world problem-solving and critical thinking when integrated into learner-centered practices (Kum Yoke et al., 2024). Studies of K-12 teachers' experiences also indicate that educators are adopting AI tools to enhance instructional practices, although challenges such as shifting pedagogical beliefs and digital competencies persist (Tripathi et al., 2025). Moreover, evidence suggests that AI integration in classroom instruction can improve differentiated instruction and learner outcomes, though its effectiveness depends on thoughtful implementation and professional support (Lara et al., 2025).

AI Integration. AI integration in education involves embedding artificial intelligence technologies into teaching and learning processes to enhance instructional effectiveness and learner experiences. Research shows that integrating AI tools, such as adaptive learning systems, intelligent tutors, and AI-assisted feedback mechanisms, facilitates personalized learning pathways tailored to individual students' needs, thereby promoting differentiated instruction (Kum Yoke et al., 2024). This integration has been associated with improved classroom efficiency, as AI can automate administrative tasks such as grading and content sequencing, thereby allowing teachers to focus on higher-order instructional activities (Shi et al., 2024). Moreover, AI integration across curricula supports real-time assessment and formative feedback, enabling learners to adjust their learning strategies in real time (Lara et al., 2025). Studies also indicate that teacher readiness, digital competence, and institutional support are critical factors influencing successful AI integration in classrooms (Tripathi et al., 2025). Collectively, these findings suggest that AI integration is more than a technological upgrade it represents a shift toward learner-centered, data-informed educational practices.

Despite the potential benefits, effective AI integration requires careful alignment with pedagogical goals and with educators' professional development. Research highlights that without adequate training, teachers may underutilize AI tools or apply them superficially, limiting their potential to support meaningful learning (Tripathi et al., 2025). Furthermore, studies on AI integration emphasize the importance of ethical considerations, such as ensuring data privacy, minimizing algorithmic bias, and maintaining transparency in AI-based decision-making (Kum Yoke et al., 2024). Evidence also suggests that equitable access to AI technologies remains a persistent challenge, especially in under-resourced schools where infrastructure and connectivity issues hinder implementation (Lara et al., 2025). Therefore, successful AI integration entails not only access to cutting-edge tools but also strategic planning, curriculum alignment, and ongoing support for both teachers and learners. As schools continue to adopt AI innovations, research underscores the need for frameworks that balance technological capabilities with sound pedagogical design to maximize educational impact.

Adaptive Learning. Adaptive learning refers to instructional systems that use data-driven algorithms to tailor content and pacing to individual learners' needs in real time, enhancing personalization and responsiveness in education. Research shows that adaptive learning technologies leverage ongoing learner data such as performance trends, response times, and mastery levels to adjust instructional pathways and provide personalized scaffolding (Zhang et al., 2024). This individualized approach has been linked to improvements in academic performance, self-paced learning, and learner motivation, particularly in subjects like mathematics and science where competency levels vary widely (Suárez & García, 2025). Studies also find that adaptive systems can support differentiated instruction by highlighting learning gaps and recommending customized remediation or enrichment activities for students (Almalki et al., 2025). Moreover, adaptive learning is increasingly integrated with AI tools that enhance predictive analytics and formative feedback, resulting in more efficient and effective learning experiences (Feng et al., 2025).

Despite their promising contributions, the effectiveness of adaptive learning systems depends heavily on the quality of input data, algorithm design, and alignment with pedagogical goals. Research indicates that poorly calibrated adaptive algorithms may reinforce misconceptions or provide unsuitable learning paths if learner data is incomplete or biased (Zhang et al., 2024). Additionally, the success of adaptive learning technologies relies on teacher competencies in interpreting system feedback and integrating adaptive recommendations into instructional planning (Suárez & García, 2025). Studies also emphasize that adaptive learning must be purposefully embedded within curricula rather than used as a standalone tool to ensure coherence with instructional objectives and learning outcomes (Almalki et al., 2025). Moreover, equitable access to adaptive platforms remains a challenge in under-resourced settings, where limited technology infrastructure and connectivity hinder implementation (Feng et al., 2025). Therefore, adaptive learning must be supported by thoughtful design, teacher support, and systemic planning to fully realize its potential to personalize and improve learning experiences.

Automated Feedback. Automated feedback refers to responses generated by digital systems, often powered by artificial intelligence or algorithmic analytics, that provide learners with immediate, tailored information about their performance on tasks and assessments. Research shows that automated feedback enhances learning by providing timely, specific guidance that helps learners recognize errors, adjust strategies, and refine understanding without waiting for instructor input (Shute & Rahimi, 2024). Studies in K-12 and higher education contexts indicate that when learners receive instant feedback, they demonstrate higher motivation, greater persistence on tasks, and improved mastery of targeted skills (Li et al., 2025). Moreover, automated feedback systems can support instructors by reducing grading time and highlighting common learner errors, thereby enabling more focused instruction (Nouri & Baki, 2025). Evidence also suggests that adaptive feedback informed by learner responses and performance patterns can be particularly effective in supporting differentiated instruction and addressing individual learning needs (Shute & Rahimi, 2024).

Despite its advantages, the effectiveness of automated feedback depends on the quality, relevance, and clarity of the messages, as well as their integration into instructional workflows. Research highlights that poorly designed automated feedback can confuse learners or reinforce misconceptions if feedback lacks specificity or fails to align with learning objectives (Shute & Rahimi, 2024). Studies also emphasize that automated feedback should complement, not replace, meaningful teacher-learner interactions, as human guidance often provides contextual understanding and affective support that technology alone cannot (Li et al., 2025). In classroom settings, combining teacher-led feedback with automated feedback mechanisms has been shown to yield stronger learning outcomes than relying solely on teacher-led feedback (Nouri & Baki, 2025). Furthermore, educators' perceptions of automated feedback tools, particularly their ease of use and usefulness, can influence the extent to which these tools are adopted and effectively leveraged in instruction (Shute & Rahimi, 2024). Therefore, successful implementation of automated feedback requires thoughtful design, professional support for teachers, and alignment with curriculum goals to maximize learner engagement and achievement.

Personalized Instruction. Personalized instruction refers to educational approaches that tailor learning experiences, content, pacing, and support to meet each learner's individual needs, preferences, and readiness levels. Research indicates that personalized instruction is associated with higher motivation, greater self-efficacy, and improved academic outcomes than one-size-fits-all teaching methods (Kennedy et al., 2025). In technology-enhanced classrooms, personalized instruction is increasingly enabled by adaptive systems and AI-driven tools that analyze learner data and dynamically adjust content to address gaps or accelerate learning (Wang & Hannafin, 2024). Studies show that personalized learning environments promote deeper student engagement because learners can interact with materials at their appropriate challenge level and receive targeted feedback that supports mastery (Lee et al., 2025). Moreover, personalized instruction has been linked to greater learner autonomy and ownership of learning, which research identifies as key predictors of long-term academic success (Li et al., 2025).

Despite its promise, effective implementation of personalized instruction depends on teacher capacity, the quality of data analytics, and alignment with curricular goals. Research highlights that personalized learning requires robust professional development so teachers can interpret data insights and adjust instruction in meaningful ways (Kennedy et al., 2025). Some studies caution that without careful design, personalized systems may inadvertently

narrow learning experiences or fail to address social and collaborative dimensions of learning (Wang & Hannafin, 2024). Furthermore, equitable access to technology tools that enable personalization remains a concern, especially in under-resourced educational settings (Lee et al., 2025). Educators also emphasize that personalized instruction should complement, rather than replace, teachers' pedagogical judgment and relational support, ensuring that technology enhances rather than isolates learners (Li et al., 2025). Therefore, the effective realization of personalized instruction relies on thoughtful integration of technology, teacher support, and learner engagement strategies.

Classroom Technology Utilization

Classroom technology utilization refers to the purposeful and strategic use of digital tools, devices, and platforms by teachers and learners to support instructional processes, enhance learning experiences, and facilitate active engagement. Research shows that the effective integration of technologies such as learning management systems, educational apps, interactive whiteboards, and digital simulations can improve student participation, foster collaboration, and support differentiated instruction (Zhao et al., 2025). Teachers' ability to leverage technology meaningfully is influenced by their level of digital pedagogical competence, access to reliable infrastructure, and alignment of technology with lesson objectives (Rodriguez & Thompson, 2024). Studies also reveal that when classroom technology utilization is supported by ongoing professional development and school leadership initiatives, students demonstrate higher levels of motivation, self-directed learning, and academic performance (Nguyen et al., 2025). However, disparities in access to devices and digital literacy continue to shape utilization patterns, especially in under-resourced contexts, highlighting the need for equitable technology implementation strategies (Rodriguez & Thompson, 2024). Therefore, understanding how classroom technology is utilized, not just whether it is available, is essential for maximizing its educational impact.

Digital Tools. Digital tools encompass a wide range of technologies, including educational apps, interactive software, virtual simulations, collaborative platforms, and multimedia resources, that support teaching and learning in modern classrooms. Research shows that the purposeful use of digital tools can enhance instructional delivery by making learning more interactive, accessible, and aligned with diverse learner needs (Sailer et al., 2024). When digital tools are integrated into instructional design, they provide multiple pathways for students to engage with content, practice skills, and demonstrate understanding, which is particularly beneficial for differentiated and learner-centered instruction (Li & Ma, 2025). Studies also indicate that students who regularly interact with digital tools report higher levels of motivation and cognitive engagement than those in traditional, lecture-centered classrooms (Nguyen et al., 2025). Moreover, digital tools have been shown to facilitate real-time feedback and adaptive learning sequences that help learners adjust strategies and improve achievement outcomes (Pan & Zhang, 2024).

Despite the benefits, effective use of digital tools depends on teachers' digital literacy, pedagogical intent, and access to adequate infrastructure. Research highlights that when digital tools are used passively, for example, simply replacing textbooks with screens, there is minimal impact on student engagement or learning outcomes (Sailer et al., 2024). Conversely, when teachers design activities that leverage digital tools for collaboration, problem solving, or creative expression, students demonstrate deeper behavioral and social engagement (Li & Ma, 2025). Studies also emphasize the importance of professional development opportunities that build teachers' confidence and competence in selecting and integrating digital tools meaningfully into lessons (Nguyen et al., 2025). Additionally, inequities in access to devices and reliable internet continue to limit the potential of digital tools in under-resourced schools, underscoring the need for policies that promote equitable technology deployment (Pan & Zhang, 2024). Therefore, maximizing the impact of digital tools in education requires not just the availability of technology but teacher readiness, instructional alignment, and supportive learning environments.

Instructional Technology. Instructional technology refers to the systematic use of digital tools, software, and media to design, deliver, and evaluate learning experiences that support instructional goals (Reiser & Dempsey, 2024). It includes a broad range of resources such as learning management systems, multimedia presentations, educational software, and interactive platforms that enhance the teaching–learning process (Kozma, 2023). Research shows that instructional technology can improve learning effectiveness by supporting differentiated

instruction, facilitating active learning, and providing timely feedback (Tondeur et al., 2024). When instructional technology is intentionally integrated into lesson design, it can create more engaging and interactive learning environments that promote student participation and collaboration (Bates, 2023). Overall, instructional technology is not merely about using devices but about strategically applying technology to improve teaching quality and learner outcomes (Reiser & Dempsey, 2024).

However, effective utilization of instructional technology depends on teachers' digital competence, pedagogical knowledge, and institutional support. Studies indicate that teachers often face challenges such as limited training, inadequate infrastructure, and insufficient time to design technology-enhanced lessons, which can hinder meaningful integration (Tondeur et al., 2024; Tripathi et al., 2025). Research also suggests that technology integration is most effective when it aligns with curriculum goals and is supported by ongoing professional development and leadership support (Bates, 2023). Additionally, equity issues such as unequal access to devices and internet connectivity continue to affect the quality of instructional technology implementation in many contexts (Kozma, 2023). Therefore, maximizing the impact of instructional technology requires not only the availability of tools but also capacity building, planning, and supportive policies that enable teachers to use technology effectively in the classroom.

Technology Access. Technology access refers to learners' and teachers' ability to obtain and use digital devices, reliable internet connectivity, and learning platforms necessary for effective technology-based instruction (Tripathi et al., 2025). Research shows that equitable access to technology is critical to ensuring that all learners benefit from digital learning opportunities, especially in under-resourced and rural school settings (Bates, 2023). Studies indicate that limited access to devices and connectivity can widen the learning gap, reduce student participation, and negatively impact academic outcomes (Tondeur et al., 2024). Additionally, access to technology is not only about availability but also about the quality and consistency of use, including access to technical support and age-appropriate digital resources (Bates, 2023). Therefore, improving access to technology is essential to enabling meaningful classroom technology use and promoting inclusive learning environments.

However, access to technology remains a persistent challenge in many countries due to socioeconomic disparities, infrastructure limitations, and unequal distribution of digital resources (Tondeur et al., 2024). Research indicates that students from low-income families and remote areas often experience intermittent internet connectivity, shared devices, or no access to the internet, which impairs their ability to engage in digital learning activities (Bates, 2023). These disparities also affect teachers, as educators in under-resourced schools may lack the tools and support needed to implement technology-enhanced instruction (Tripathi et al., 2025). Studies emphasize that addressing access to technology requires coordinated policies that provide devices, improve infrastructure, and support digital equity initiatives (Cozma, 2023). As educational systems continue to integrate technology, ensuring universal and equitable access becomes a foundational step toward effective technology utilization and learner engagement.

Technology Frequency. Technology frequency refers to the extent to which teachers and learners use digital tools and devices in instructional activities, including daily, weekly, or monthly usage patterns (Cozma, 2023; Mouza et al., 2024). Research indicates that greater frequency of technology use is associated with increased opportunities for interactive learning, immediate feedback, and learner participation, particularly when the technology is used purposefully to support lesson objectives (Mouza et al., 2024). Studies also show that regular technology use supports the development of digital skills and strengthens learners' confidence in using digital tools for academic tasks (Cozma, 2023; Mouza et al., 2024). However, the frequency of technology use alone does not guarantee improved learning outcomes; it must be combined with meaningful instructional strategies and teacher guidance (Mouza et al., 2024). Therefore, measuring the frequency of technology use helps researchers understand the extent to which technology is embedded in classroom routines and its potential relationship with learner engagement.

Despite the benefits of frequent technology use, research also highlights that high frequency can lead to digital fatigue or superficial learning if not balanced with pedagogically sound practices (Cozma, 2023; Mouza et al., 2024). Teachers may also face challenges in maintaining consistent use of technology due to limited infrastructure, device sharing, or insufficient training, which can disrupt the regular integration of digital tools

(Cozma, 2023; Mouza et al., 2024). Additionally, studies show that unequal access to devices can create uneven technology frequency among students, which may widen engagement gaps and learning disparities (Cozma, 2023). Research emphasizes that schools need supportive policies and professional development to ensure that technology is used regularly and effectively rather than sporadically or as an add-on (Mouza et al., 2024). Overall, technology frequency should be understood as both a quantitative measure of usage and a reflection of the extent to which technology is integrated into teaching and learning practices.

Learners' Engagement

Learners' engagement refers to the degree of students' active involvement, interest, and emotional investment in learning activities, which strongly predicts academic success and persistence (Fredricks et al., 2024). Engagement is commonly conceptualized through three dimensions: behavioral engagement (participation, effort, on-task behavior), emotional engagement (interest, enjoyment, belonging), and cognitive engagement (deep learning strategies, self-regulation, critical thinking) (Fredricks et al., 2024; Reschly & Christenson, 2024). Research shows that higher engagement is associated with improved academic outcomes, lower dropout rates, and stronger motivation, particularly when learning experiences are meaningful and student-centered (Wang & Eccles, 2024). Studies also indicate that technology-enhanced instruction can support engagement when tools are used to promote interaction, collaboration, and personalized learning, but engagement increases most when technology is integrated with sound pedagogy and teacher support (Fredricks et al., 2024). Therefore, understanding learners' engagement requires examining not only the frequency of technology use but also the quality of instructional design and learner experiences (Reschly & Christenson, 2024; Wang & Eccles, 2024).

Behavioral Engagement. Behavioral engagement refers to students' observable actions and participation in learning activities, such as attending class, completing tasks, following rules, and actively participating in discussions (Fredricks et al., 2024). It is considered the most visible dimension of engagement and is often measured through classroom behavior, attendance, task completion, and active involvement in learning activities (Reschly & Christenson, 2024). Research indicates that behavioral engagement strongly predicts academic achievement and school retention because it reflects students' consistent participation and effort in learning (Wang & Eccles, 2024). In technology-enhanced classrooms, behavioral engagement increases when digital tools support interactive learning, collaborative tasks, and real-time feedback, which motivate students to participate more actively (Cozma, 2023; Mouza et al., 2024). Therefore, behavioral engagement is crucial for understanding how learners respond to instructional strategies, especially when technology and AI-driven instruction are integrated into the classroom.

However, behavioral engagement can be influenced by factors such as teacher-student relationships, classroom management, instructional quality, and access to technology resources (Reschly & Christenson, 2024). Studies show that even when technology is available, students may remain behaviorally disengaged if learning activities are not meaningful or if they lack teacher support (Fredricks et al., 2024). Additionally, unequal access to devices and inconsistent use of technology can reduce behavioral engagement, particularly in under-resourced contexts where learners cannot consistently participate in digital activities. Research also suggests that teacher facilitation is essential to translate technology use into actual student participation, as teachers play a key role in designing tasks that encourage active involvement and sustained effort (Wang & Eccles, 2024). Overall, behavioral engagement is not only a product of student motivation but also a reflection of the quality of instructional design and the learning environment.

Emotional Engagement. Emotional engagement refers to learners' affective reactions in the classroom, including feelings of interest, enjoyment, belonging, and emotional connection to learning activities and school (Furrer & Skinner, 2024). It reflects students' perceptions of their learning environment, peers, and teachers and influences motivation and willingness to participate (Wang et al., 2024). Research shows that positive emotional engagement is associated with higher academic achievement and lower dropout rates, as students who feel valued and emotionally supported are more likely to persist with learning tasks (Meyer et al., 2024). In technology-enhanced classrooms, emotional engagement increases when digital tools are used to create interactive and meaningful experiences, such as collaborative projects, gamified learning, and multimedia content that appeals to learners' interests (Baker et al., 2024). Therefore, emotional engagement plays a crucial role in how learners

respond emotionally to AI-driven instruction and classroom technology.

However, emotional engagement can decline when students experience anxiety, frustration, or boredom due to technical difficulties, unclear instructions, or irrelevant learning activities (Meyer et al., 2024). Studies indicate that poorly designed digital learning environments may reduce students' sense of belonging and increase disengagement if learners feel isolated or overwhelmed by technology (Baker et al., 2024). Emotional engagement is also influenced by teacher support, classroom climate, and peer interactions, which can either strengthen or weaken learners' emotional connection to learning (Furrer & Skinner, 2024). Furthermore, unequal access to technology can foster feelings of exclusion among learners who cannot fully participate in digital activities, thereby affecting their emotional engagement (Wang et al., 2024). Overall, promoting emotional engagement requires not only innovative technology but also supportive teacher practices, inclusive learning environments, and meaningful instructional design.

Cognitive Engagement. Cognitive engagement refers to learners' mental investment in learning, including their use of deep learning strategies, critical thinking, self-regulation, and willingness to exert effort to understand complex concepts (Newmann et al., 2024). It reflects the extent to which students are intellectually involved in tasks, such as planning, monitoring, and evaluating their own learning (Pintrich, 2024). Research indicates that cognitive engagement is a strong predictor of academic achievement because it involves meaningful processing of information and persistence in challenging tasks (Zimmerman, 2024). In technology-enhanced classrooms, cognitive engagement increases when learners use digital tools to explore, analyze, and create, especially when tasks require problem-solving, inquiry, and higher-order thinking (Mayer, 2024). Therefore, cognitive engagement is critical for understanding how AI-driven instruction and classroom technology influence learners' deeper learning processes.

However, cognitive engagement can be limited when technology use focuses only on rote or passive activities, such as watching videos or completing repetitive drills without deeper processing (Mayer, 2024). Studies show that learners may appear engaged but may not be cognitively invested if tasks do not challenge them or if they rely heavily on AI tools to complete work without reflection (Newmann et al., 2024). Additionally, cognitive engagement is influenced by learners' metacognitive skills and the quality of instructional support, including teacher feedback and scaffolding (Pintrich, 2024). Research also emphasizes that cognitive engagement is strengthened when learners are encouraged to set goals, self-monitor, and reflect on their learning progress, a process that can be supported by AI-driven adaptive systems and digital tools (Zimmerman, 2024). Overall, promoting cognitive engagement requires purposeful task design, meaningful use of technology, and teacher facilitation that encourages deeper thinking and self-regulation.

Social Engagement. Social engagement refers to learners' participation in collaborative and interactive learning activities that involve communication, teamwork, and social interaction with peers and teachers (Dooly & O'Dowd, 2024). It involves behaviors such as group discussion, cooperative problem-solving, peer feedback, and shared meaning-making, which support learning through social interaction (Vygotsky, 2024). Research indicates that social engagement strengthens learning outcomes because students construct knowledge through dialogue, collaboration, and social support (Barkley et al., 2024). In technology-enhanced classrooms, social engagement is fostered through digital tools such as discussion forums, collaborative documents, videoconferencing, and interactive platforms that enable learners to connect and collaborate (Kearney et al., 2024). Therefore, social engagement is essential for understanding how AI-driven instruction and technology use affect learners' collaborative participation and peer interactions.

However, social engagement can be negatively affected by factors such as limited access to technology, poor classroom climate, and lack of structured collaborative tasks (Dooly & O'Dowd, 2024). Studies show that when digital tools are used mainly for individual tasks rather than collaboration, learners may miss opportunities for meaningful social interaction, leading to lower engagement and weaker learning outcomes (Kearney et al., 2024). Additionally, students may experience social isolation or reduced participation if they lack confidence or digital communication skills, especially in online or blended learning environments (Barkley et al., 2024). Research also highlights that teacher facilitation is crucial for promoting productive social engagement, as teachers must design collaborative activities, set norms, and guide peer interactions (Vygotsky, 2024). Overall, enhancing

social engagement requires intentional instructional design, supportive technology tools, and a classroom culture that values collaboration and peer learning.

Figure 1 presents the schematic diagram of the study showing the variables involved and its constructs.

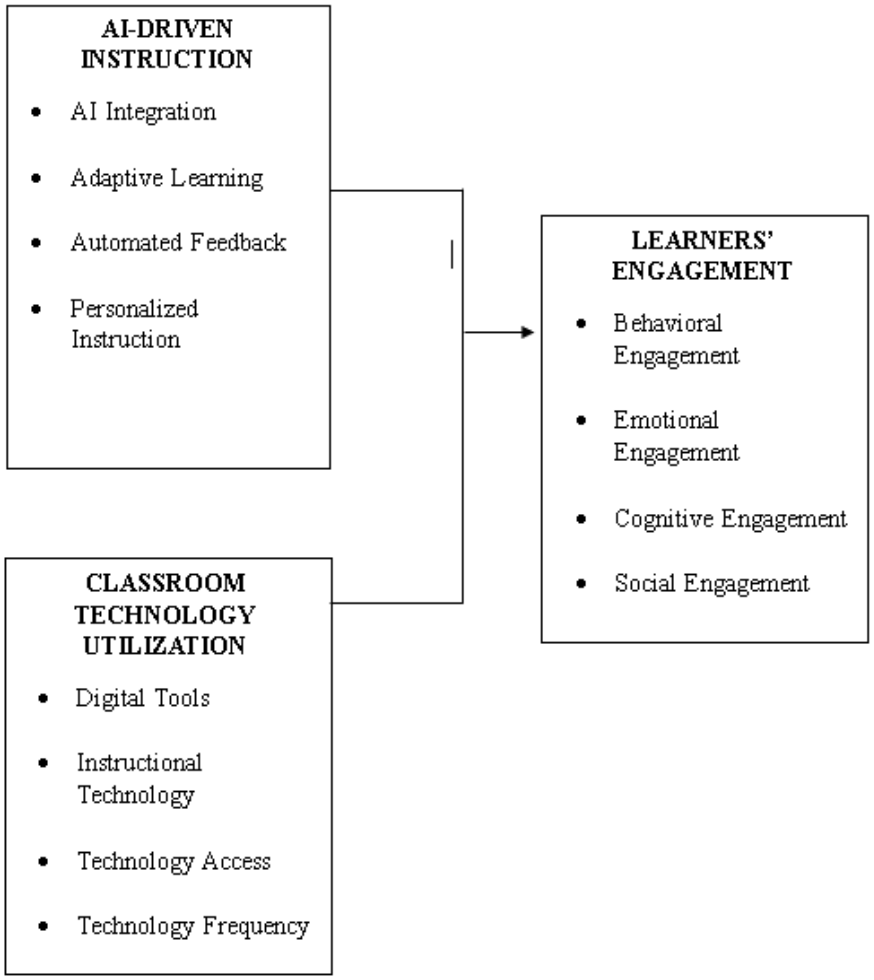


Figure 1 Schematic Diagram of the Study

Statement of the Problem

This study examined the correlations between learners' engagement with AI-driven instruction and classroom technology utilization in the Oroquieta City.

Specifically, the study answered the following research questions:

1. What is the level of implementation of AI-driven Instruction of teachers in terms of AI integration, adaptive learning, automated feedback, and personalized instruction?
2. What is the level of implementation of classroom technology utilization among the teachers in terms of digital tools, instructional technology, technology access, and technology frequency?
3. What is the level of engagement of learners in terms of behavioral engagement, emotional engagement, cognitive engagement, and social engagement?
4. Is there a significant correlation between the level of implementation of AI-driven instruction by teachers and the level of engagement of learners?
5. Is there a significant correlation between the level of implementation of classroom technology utilization among the teachers and the level of engagement of learners?

Hypotheses

HO_1: There is no significant correlation between the level of implementation of AI-driven instruction by teachers and the level of engagement of learners.
HO_2: There is no significant correlation between the level of implementation of classroom technology utilization among the teachers and the level of engagement of learners.

RESEARCH METHODOLOGY

Design

This study employed a descriptive-correlational research design. A descriptive-correlational design is a quantitative approach that aimed to describe variables and examine the relationships among them without manipulating any conditions, allowing researchers to determine the strength and direction of associations (Creswell & Creswell, 2023). This design was appropriate for the study because it enabled the researcher to systematically investigate how AI-driven instruction and the utilization of classroom technology were related to learners' engagement, specifically across behavioral, emotional, cognitive, and social dimensions in real classroom settings, thereby providing empirical evidence based on actual teaching and learning experiences.

Setting

The study was conducted in selected elementary schools in the Oroquieta City Division, Philippines, where AI-driven instructional practices and classroom technologies were utilized in teaching and learning. This setting provided an appropriate context for examining the relationships among AI-driven instruction, classroom technology utilization, and learners' engagement. Data were gathered from teachers and learners through surveys to assess levels of AI integration, technology use, and learners' behavioral, emotional, cognitive, and social engagement. The setting enabled an authentic examination of how technology-enhanced instruction influenced learner engagement in real classroom environments.

Respondents

The study included 120 elementary school teachers from selected schools in the Oroquieta City Division, Philippines. The respondents were selected through purposive sampling technique. The inclusion criteria for participant selection were as follows: (1) currently teaching at the elementary level, (2) aged 18 years or older, (3) had at least six months of teaching experience using AI-driven instructional tools and/or classroom technologies, and (4) were willing to participate in the study by responding to the survey instrument. This selection ensured that participants could provide relevant and informed data on the extent of AI-driven instruction and classroom technology utilization, and on their relationship to learners' engagement.

Instrument

This study used three researcher-developed questionnaires to collect data on AI-driven instruction, classroom technology use, and learner engagement. Each questionnaire contained carefully constructed items designed to elicit teachers' perceptions of their instructional practices and learners' engagement in the classroom. The AI-driven instruction questionnaire assessed the extent of AI integration, adaptive learning, automated feedback, and personalized instruction. The classroom technology utilization questionnaire focused on the use of digital tools, instructional technology, access to technology, and frequency of technology use. The learners' engagement questionnaire measured teachers' perceptions of learners' behavioral, emotional, cognitive, and social engagement. All research instruments underwent expert validation to ensure content relevance and clarity, and a pilot test was conducted to establish reliability prior to actual data collection.

AI-Driven Instruction Questionnaire

This part of the questionnaire was designed to gather teachers' perspectives on the extent to which AI-driven instructional practices were implemented and how these practices influenced learners' engagement. It focused

on key dimensions such as AI integration, adaptive learning, automated feedback, and personalized instruction, with items capturing teachers' self-assessment of their use of AI-supported tools, their adaptability in addressing learners' needs through technology, and the perceived effectiveness of these practices in promoting behavioral, emotional, cognitive, and social engagement. To ensure the instrument's quality, content validity was established through expert review by specialists in educational technology and research, while construct validity was examined through pilot testing and item analysis. Reliability was assessed using Cronbach's Alpha, yielding a value of 0.85, indicating good internal consistency for use in the study.

To guide respondents in completing the AI-driven instruction questionnaire, a Likert-type continuum was used, allowing teachers to indicate the frequency of their use of each AI-related practice, ranging from "Never" to "Always," with clear descriptors provided for each level to ensure accurate and meaningful responses.

Scale	Range	Response	Interpretation
4	3.28 – 4.0	Always	Excellent Use of AI-Driven Instruction
3	2.52 – 3.27	Sometimes	Moderate Use of AI-Driven Instruction
2	1.76 – 2.51	Rarely	Poor Use of AI-Driven Instruction
1	1.00 – 1.75	Never	Very Poor of AI-Driven Instruction

Classroom Technology Utilization Questionnaire. This section of the questionnaire was designed to elicit teachers' perspectives on their preparedness to integrate classroom technology and how this readiness influenced learners' engagement. It focused on key dimensions, including teachers' digital knowledge, instructional technology skills, ability to select and use appropriate digital tools, classroom management in technology-based settings, and access to necessary devices and resources, with items capturing teachers' self-assessments of their readiness, confidence in using technology for instruction, and their capacity to support learners' behavioral, emotional, cognitive, and social engagement through technology-enhanced learning. To ensure the instrument's quality, content validity was established through expert review by professionals in educational technology and research, while construct validity was examined through pilot testing and item analysis. Reliability was assessed using Cronbach's Alpha, yielding 0.87, indicating good internal consistency for the study.

To guide respondents in completing the classroom technology utilization questionnaire, a Likert-type continuum was used, with teachers indicating the frequency and consistency of their technology-related practices, ranging from "Never" to "Always," and clear descriptors for each level to ensure accurate and meaningful responses.

Scale	Range	Response	Interpretation
4	3.28 – 4.00	Always	Very Prepared
3	2.52 – 3.27	Sometimes	Prepared
2	1.76 – 2.51	Rarely	Less Prepared
1	1.00 – 1.75	Never	Not Prepared

Learner's Engagement Questionnaire. This section of the questionnaire was designed to elicit teachers' perspectives on learners' engagement in technology-enhanced learning environments and on how AI-driven instruction and classroom technology use influenced learners' participation, motivation, and learning behaviors. It focused on key dimensions of engagement, including behavioral engagement (attention, participation, and task completion), emotional engagement (interest, enjoyment, and sense of belonging), cognitive engagement (critical thinking, problem-solving, and effort), and social engagement (collaboration, communication, and peer interaction), with items capturing teachers' observations of learners' consistency, involvement, and responsiveness during technology-based activities. The responses provided valuable insights into how AI and classroom technology impacted learners' engagement and academic outcomes. To ensure the instrument's quality, content validity was established through expert review by specialists in education and research, and construct validity was examined through pilot testing and item analysis. Reliability was assessed using Cronbach's Alpha, yielding a value of 0.86, indicating good internal consistency for use in the study.

To guide respondents in completing the learners' engagement questionnaire, a Likert-type continuum was used, allowing teachers to indicate the frequency and consistency of learners' engagement, ranging from "Never" to "Always," with clear descriptors for each level to ensure accurate and meaningful responses.

Scale	Range	Response	Interpretation
4	3.28 – 4.00	Always	Highly Engaged
3	2.52 – 3.27	Sometimes	Moderately Engaged
2	1.76 – 2.51	Rarely	Less Engaged
1	1.00 – 1.75	Never	Not Engaged

Data-Gathering Procedure

Before the commencement of data collection, the researcher secured formal approval from the Dean of the Graduate School and obtained permission from the principals of selected elementary schools in the Oroquieta City Division. These authorities were provided with a comprehensive explanation of the study's purpose, scope, participant selection, and research procedures to ensure transparency and adherence to institutional policies. The primary respondents of the study were elementary school teachers who met the inclusion criteria and were currently utilizing AI-driven instructional tools and classroom technologies. Each participant was fully informed about the objectives of the study, the nature of their involvement through survey questionnaires, and the ethical principles governing the research. Informed consent was obtained prior to participation, emphasizing that involvement was entirely voluntary and that respondents had the right to withdraw at any stage without any consequences.

Furthermore, the research proposal was submitted to the appropriate ethics review body to ensure full compliance with established ethical standards for research involving human participants. To safeguard the preservation and confidentiality of the collected data, the researcher implemented strict data management protocols. All completed questionnaires were coded to remove personally identifiable information, ensuring anonymity. Physical copies of the data were stored in a secure, locked location accessible only to the researcher, while digital data were kept in password-protected files and encrypted storage devices. Data were used solely for academic and research purposes and were not shared with unauthorized individuals. In accordance with the Data Privacy Act of 2012 (Republic Act No. 10173), all information was handled with the highest level of confidentiality and integrity. Upon completion of the study, data were retained only for the required period and thereafter securely disposed of through appropriate means, such as shredding physical documents and permanently deleting electronic files, to prevent any potential breach or misuse.

Ethical Considerations

In recognition of the critical role of ethics in research, this study implemented stringent measures to protect the dignity, privacy, and well-being of all participants. Before data collection, the research proposal underwent a thorough review and approval by the Misamis University Research Ethics Committee to ensure full compliance with established ethical standards. All participating teachers received an Informed Consent Form outlining the study's purpose, procedures, voluntary nature, and their right to withdraw from participation at any point without consequences. They were also assured that their identities would remain confidential and that the data gathered would be used solely for academic purposes.

Questionnaires were administered at a time convenient for each teacher to respect their schedules and minimize disruption to instructional activities. Respondents also received a token of appreciation to acknowledge their time, effort, and valuable contribution to the study. Completed questionnaires were securely stored, and all personal identifiers were kept confidential to uphold participant privacy. Ethical conduct was strictly observed throughout the research process to foster a respectful environment where teachers could share their perspectives freely and without fear of judgment.

Confidentiality of all data was rigorously maintained. The researcher complied with all ethical documentation

requirements and procedural standards to ensure the highest ethical standards. In accordance with the Data Privacy Act of 2012 (Republic Act No. 10173), all personal and sensitive information collected during the study was handled with strict confidentiality, securely stored, and protected from unauthorized access. These ethical safeguards upheld the rights, privacy, and welfare of all participants while respecting their time and convenience.

Data Analysis

The following statistical tools were used to analyze the data collected from participating teachers. Descriptive statistics were first employed to summarize and present the data. Measures such as mean, standard deviation, frequency, and percentage were used to provide an overview of the levels of AI-driven instruction, classroom technology utilization, and learners' engagement within the sample.

To determine the strength and direction of relationships between variables, Pearson's correlation coefficient was applied. This analysis examined how AI-driven instruction and classroom technology use were related to learner engagement, and whether greater technology integration was associated with higher or lower engagement.

RESULTS AND DISCUSSIONS

Implementation of AI-Driven Instruction of Teachers

The implementation of AI-driven instruction among teachers reflects the growing integration of artificial intelligence tools in contemporary educational practices. AI-driven instruction encompasses the use of intelligent systems and digital technologies that support teaching through adaptive learning environments, automated feedback mechanisms, and personalized instructional strategies. These components work together to enhance instructional efficiency, improve responsiveness to learner needs, and promote more student-centered learning experiences. As education systems continue to evolve in response to technological advancement, AI-driven instruction plays a critical role in transforming traditional classroom practices into more dynamic, data-informed, and interactive learning environments.

Table 1 presents the level of implementation of AI-driven instruction among teachers across AI integration, adaptive learning, automated feedback, and personalized instruction. The results show that all indicators had very high mean scores, ranging from 3.64 to 3.65, with an overall mean of 3.65 (SD = 0.05), which is described as "Excellent Use of AI-Driven Instruction." Among the indicators, AI-integration and personalized instruction both recorded the highest mean of 3.65, while adaptive learning and automated feedback obtained slightly lower but still comparable means of 3.64. The very small standard deviations indicate a highly consistent level of responses among teachers, suggesting that AI-driven instructional practices are uniformly implemented across the sample.

These findings are supported by studies emphasizing that AI integration in education enhances instructional delivery by enabling real-time feedback, adaptive pathways, and personalized learning experiences tailored to students' needs (Kum Yoke et al., 2024; Shi et al., 2024). Research further highlights that adaptive learning systems and AI-powered feedback mechanisms improve instructional efficiency and learner performance by providing immediate, data-driven support that helps teachers address individual learning gaps (Lara et al., 2025; Shute & Rahimi, 2024). Moreover, findings from Kennedy et al. (2025) and Wang and Hannafin (2024) confirm that personalized instruction supported by AI tools increases learner motivation and academic engagement, reinforcing AI's role in enhancing differentiated instruction. These studies collectively align with the current results, which demonstrate a consistently high level of AI-driven instructional implementation among teachers.

The implications of these findings suggest that teachers are already effectively integrating AI-driven tools into their instructional practices, indicating a strong readiness for technology-enhanced education. This high level of implementation implies that schools may benefit from sustaining and further strengthening professional development programs focused on advanced AI pedagogies to maximize instructional effectiveness. Additionally, the consistent use of AI-driven strategies suggests that learners are likely to experience more personalized, responsive, and engaging learning environments. However, continuous support in terms of

infrastructure, ethical use guidelines, and pedagogical training remains essential to ensure that AI integration remains meaningful, equitable, and aligned with learning outcomes.

Table 1: Level of Implementation of AI-Driven Instruction of Teachers

Constructs	M	SD	Descriptive Level
AI-Integration	3.65	0.19	Excellent Use of AI-Driven Instruction
Adaptive Learning	3.64	0.20	Excellent Use of AI-Driven Instruction
Automated Feedback	3.64	0.19	Excellent Use of AI-Driven Instruction
Personalized Instruction	3.65	0.20	Excellent Use of AI-Driven Instruction
Overall Level of Implementation	3.65	0.05	Excellent Use of AI-Driven Instruction

Scale: 3.28-4.00(Excellent Use of AI-Driven Instruction); 2.52-3.27(Moderate Use of AI-Driven Instruction);1.76- 2.51(Poor Use of AI-Driven Instruction); 1.0-1.75 (Poor Use of AI-Driven Instruction)

Implementation of Classroom Technology Utilization among the Teachers

Classroom technology utilization plays a crucial role in modern education as it reflects how effectively teachers integrate digital resources into instructional processes. It involves the purposeful use of digital tools, instructional technologies, and learning platforms to enhance teaching delivery, improve access to information, and support interactive and engaging learning experiences. Through consistent use of technology in the classroom, teachers can facilitate more dynamic instruction, support differentiated learning needs, and promote greater learner participation. As education becomes increasingly digital, the use of classroom technology serves as a foundation for creating more responsive and student-centered learning environments.

Table 2 presents the level of implementation of classroom technology utilization among teachers in terms of digital tools, instructional technology, technology access, and technology frequency. The results reveal that all indicators obtained very high mean scores ranging from 3.64 to 3.65, with an overall mean of 3.65 (SD = 0.20), described as “Very Prepared.” Instructional technology and technology frequency both recorded the highest mean of 3.65, while digital tools and technology access obtained slightly lower but still comparable means of 3.64. The relatively small standard deviations indicate that responses are closely clustered, suggesting a consistent level of preparedness among teachers in utilizing classroom technologies across different instructional dimensions.

These findings are supported by studies indicating that effective use of classroom technology enhances instructional quality, learner engagement, and collaborative learning opportunities (Zhao et al., 2025; Rodriguez & Thompson, 2024). Research further emphasizes that instructional technology, when properly integrated into lesson design, promotes active learning and improves student participation and achievement outcomes (Tondeur et al., 2024; Bates, 2023). In addition, access to technology and frequency of use are critical determinants of successful integration, as equitable access and consistent utilization enable more meaningful engagement with digital learning tools (OECD, 2023; UNESCO, 2024). These studies align with the present findings, which demonstrate a consistently high level of classroom technology utilization among teachers, indicating strong readiness and capacity to implement technology-supported instruction.

The implications of these findings suggest that teachers are well prepared to integrate digital tools and instructional technologies into their teaching practices, thereby contributing to more engaging and interactive learning environments. This high level of preparedness indicates that schools are likely to benefit from sustained

investment in digital infrastructure, continuous professional development, and ongoing technical support to further strengthen technology integration. However, maintaining equitable access and ensuring consistent use of technology remain essential to maximizing its impact on teaching and learning outcomes. Strengthening these areas will help ensure that classroom technology continues to effectively support learner engagement and academic success.

Table 2: Level of Implementation of Classroom Technology Utilization among the Teachers

Constructs	M	SD	Descriptive Level
Digital Tools	3.64	0.20	Very Prepared
Instructional Technology	3.65	0.19	Very Prepared
Technology Access	3.64	0.19	Very Prepared
Technology Frequency	3.65	0.20	Very Prepared
Overall Implementation	3.65	0.20	Very Prepared

Scale: 3.28-4.00(Very Prepared); 2.52-3.27(Prepared);1.76- 2.51(Less Prepared) ; 1.0-1.75 (Prepared)

Level of Engagement of Learners

Learners' engagement is a critical indicator of effective teaching and learning, as it reflects the extent to which students actively participate, emotionally invest, and cognitively commit to learning activities. It encompasses behavioral participation in classroom tasks, emotional connection to learning experiences, cognitive investment in understanding concepts, and social interaction with peers and teachers. In technology-enhanced learning environments, engagement becomes even more essential as digital and AI-driven tools are expected to stimulate interest, sustain attention, and promote deeper learning. Thus, examining learners' engagement provides valuable insight into the effectiveness of instructional strategies and technology integration in the classroom.

Table 3 presents learners' levels of engagement in behavioral, emotional, cognitive, and social engagement. The results reveal that all indicators obtained very high mean scores, ranging from 3.63 to 3.65, with an overall mean of 3.64 (SD = 0.02), which is described as "Highly Engaged." Among the indicators, emotional engagement had the highest mean of 3.65, while social engagement had the lowest mean of 3.63, both still within the same descriptive level. The very small standard deviation indicates highly consistent responses, suggesting that teachers uniformly perceive learners as highly engaged across all dimensions of engagement.

These findings are supported by research emphasizing that technology-enhanced and AI-supported instruction significantly promotes learner engagement across behavioral, emotional, cognitive, and social domains (Fredricks et al., 2024; Wang & Eccles, 2024). Studies indicate that interactive digital tools, personalized instruction, and timely feedback increase students' participation, motivation, and emotional connection to learning activities (OECD, 2023; Baker et al., 2024). Furthermore, cognitive engagement is strengthened when learners are exposed to adaptive and problem-based learning environments that encourage critical thinking and self-regulation (Zimmerman, 2024; Mayer, 2024). Social engagement is also enhanced through collaborative digital platforms that promote communication and peer interaction, consistent with findings from Kearney et al. (2024) and Dooly & O'Dowd (2024). These studies align with the present results, which show that learners are highly engaged across all dimensions in technology-rich classrooms.

The implications of these findings suggest that integrating AI-driven instruction and classroom technology effectively fosters high levels of learner engagement in classroom settings. This indicates that students are not only actively participating but also emotionally and cognitively invested in their learning experiences. To sustain and further enhance this high level of engagement, teachers should continue to implement interactive,

collaborative, and personalized instructional strategies supported by technology. Additionally, school administrators should ensure continuous professional development and adequate technological support to maintain engaging and inclusive learning environments that promote sustained academic success.

Table 3: Level of Engagement of Learners

Constructs	M	SD	Descriptive Level
Behavioral Engagement of Learners	3.64	0.22	Highly Engaged
Emotional Engagement of Learners	3.65	0.19	Highly Engaged
Cognitive Enagement of Learners	3.64	0.19	Highly Engaged
Social Engagement of Learners	3.63	0.23	Highly Engaged
Overall Implementation	3.64	0.02	Highly Engaged

Scale: 3.28-4.00(Highly Engaged); 2.52-3.27(Moderately Engaged);1.76- 2.51(Less Engaged) ; 1.0-1.75 (Not Engaged)

Test of Relationship between the Level of Implementation of AI-driven Instruction by Teachers and the Level of Engagement of Learners

The relationship between AI-driven instruction and learners' engagement is grounded in the idea that technology-enhanced teaching practices can influence how students participate, feel, and think during learning activities. AI-driven instruction, through its components such as AI-integration, adaptive learning, automated feedback, and personalized instruction, is expected to support more responsive and engaging learning environments. By providing timely feedback, adjusting instructional pathways, and tailoring learning experiences to individual needs, AI-based instructional approaches are theorized to enhance learner motivation and active participation. Thus, examining the relationship between these variables is essential in understanding whether AI-supported teaching practices translate into measurable improvements in learners' engagement.

Table 4 presents the results of the test of the relationship between teachers' implementation of AI-driven instruction and learners' behavioral, emotional, cognitive, and social engagement. The results show that most relationships are not statistically significant, as evidenced by p-values greater than 0.05 across AI-integration, adaptive learning, and personalized instruction for all engagement domains. However, a significant relationship was found between automated feedback and emotional engagement ($r_s = 0.198$, $p = 0.031$), indicating a weak but statistically significant positive correlation. This suggests that among the components of AI-driven instruction, automated feedback is the only dimension that shows a meaningful association with learners' emotional engagement in learning activities, whereas all other relationships are negligible and not significant.

These findings can be interpreted through the lens of the Technology Acceptance Model (TAM) by Davis (1989), which explains that the effectiveness of technological tools in educational settings is largely influenced by users' perceptions of usefulness and ease of use. In this context, automated feedback may be perceived by learners as more immediately useful and responsive compared to other AI-driven components, as it directly addresses their performance and provides instant corrective guidance. This immediate response can enhance learners' emotional engagement by increasing feelings of support, satisfaction, and reduced frustration, which aligns with prior research indicating that timely feedback improves learner motivation and affective involvement (Shute & Rahimi, 2024; Li et al., 2025). Conversely, the lack of significant relationships for other AI-driven components may suggest that perceived usefulness and actual impact on engagement are not yet fully realized or consistently experienced in classroom practice (Lai & Ho, 2025; Saflor, 2025).
The implications of these findings suggest that while AI-driven instruction is highly implemented, its impact on learner engagement, particularly behavioral, cognitive, and social dimensions, may still depend on how

effectively these tools are perceived and utilized in actual classroom contexts. The significant link between automated feedback and emotional engagement highlights the importance of designing AI systems that provide immediate, meaningful, and supportive responses to learners. Educators and school leaders should therefore focus on strengthening the pedagogical use of AI tools rather than merely increasing their availability. Additionally, professional development programs should emphasize how teachers can maximize the potential of AI features to engage learners, particularly those that directly influence learners' emotional experiences in the learning process.

Table 4: Test of relationship between the level of implementation of AI-driven instruction by teachers and the level of engagement of Learners

Variables		**Behavioral Engagement**	**Emotional Engagement**	**Cognitive Engagement**	**Social Engagement**
AI-Integration	r_s	0.018	0.009	0.014	-0.011
	p	0.842	0.921	0.883	0.905
Adaptive Learning	r_s	0.032	0.055	0.041	-0.028
	p	0.724	0.551	0.657	0.764
Automated Feedback	r_s	0.071	0.198	0.046	0.063
	p	0.442	0.031*	0.618	0.496
Personalized Instruction	r_s	-0.039	-0.022	0.058	0.047
	p	0.673	0.812	0.530	0.612

Note. Ho: There is no significant correlation between the level of implementation of AI-driven instruction by teachers and the level of engagement of learners

Test of Relationship between the Level of Implementation of Classroom Technology Utilization by Teachers and the Level of Engagement of Learners

The utilization of classroom technology plays an important role in shaping how learners engage with instructional activities. Classroom technology utilization refers to the intentional integration of digital tools, instructional technologies, and access systems to support teaching and learning. When implemented effectively, these technologies are expected to enhance learners' participation, emotional connection, cognitive engagement, and social interaction by making learning more interactive, accessible, and collaborative. In this context, examining the relationship between classroom technology utilization and learners' engagement provides valuable insight into whether the presence and use of technology in classrooms translate into meaningful student involvement.

Table 5 presents the test of relationship between the level of implementation of classroom technology utilization by teachers and the level of learners' engagement in terms of behavioral, emotional, cognitive, and social dimensions. The results show that all computed correlation coefficients (rs) are very weak and not statistically significant, as indicated by p-values greater than 0.05 across all indicators.

Specifically, digital tools, instructional technology, technology access, and technology frequency all showed negligible relationships with behavioral, emotional, cognitive, and social engagement. This suggests that although classroom technology is widely used by teachers, its presence alone does not significantly correlate with variations in learners' engagement levels across all measured domains.

These findings can be interpreted using Engagement Theory (Kearsley & Shneiderman, 1998), which emphasizes that meaningful engagement is not produced by technology itself but by how it is used to support

collaborative, authentic, and purposeful learning tasks. The theory highlights the principles of relate, create, and donate, suggesting that learners become engaged when technology is integrated into activities that promote collaboration, creativity, and real-world relevance. In this context, the non-significant relationships observed may indicate that classroom technologies are being used more as supportive tools rather than as drivers of authentic, interactive learning experiences. Prior studies support this interpretation, noting that technology alone does not guarantee engagement unless it is embedded in well-designed instructional activities that promote collaboration and higher-order thinking (Robinson et al., 2023; Aldowah et al., 2023). Similarly, research shows that passive or routine use of digital tools has a limited impact on student engagement compared to active, learner-centered applications of technology (Li & Ma, 2025; Sailer et al., 2024).

The implications of these findings suggest that while teachers demonstrate a high level of classroom technology utilization, its effectiveness in enhancing learner engagement may depend more on instructional design than on frequency or availability of use. Schools should therefore focus on strengthening pedagogical strategies that integrate technology into collaborative, problem-based, and interactive learning experiences. Professional development programs should emphasize not only technical skills, but also instructional strategies aligned with Engagement Theory to maximize the educational value of technology. Ultimately, improving learner engagement requires moving beyond technology use alone toward purposeful, meaningful, and student-centered application of digital tools in the classroom.

Table 5: Test of relationship between the level of implementation of classroom technology utilization by teachers and the level of engagement of learners

Variables		Behavioral Engagement	Emotional Engagement	Cognitive Engagement	Social Engagement
Digital Tools	r_s	0.021	0.034	0.017	-0.028
	p	0.821	0.712	0.856	0.763
Instructional Technology	r_s	0.046	0.089	0.052	0.041
	p	0.618	0.331	0.571	0.654
Technology Access	r_s	0.012	0.063	0.029	-0.019
	p	0.896	0.497	0.752	0.839
Technology Frequency	r_s	0.058	0.101	0.066	0.044
	p	0.530	0.270	0.473	0.631

Note. Ho: There is no significant correlation between the level of implementation of classroom technology utilization by teachers and the level of engagement of learners.

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study examined the correlations among learners' engagement, AI-driven instruction, and the utilization of classroom technology in the Oroquieta City. Specifically, it sought to answer the following research questions: (1) What is the level of implementation of AI-driven instruction of teachers in terms of AI-integration, adaptive learning, automated feedback, and personalized instruction? (2) What is the level of implementation of classroom technology utilization among teachers in terms of digital tools, instructional technology, technology access, and technology frequency? (3) What is the level of engagement of learners in terms of behavioral, emotional, cognitive, and social engagement? (4) Is there a significant correlation between the level of implementation of AI-driven instruction by teachers and the level of engagement of learners? and (5) Is there a significant

correlation between the level of implementation of classroom technology utilization among teachers and the level of engagement of learners?

This study employed a descriptive-correlational research design to describe the variables and determine the relationships among AI-driven instruction, classroom technology utilization, and learners' engagement without manipulating any conditions. The study was conducted in selected elementary schools in the Oroquieta City Division, Philippines, where AI-driven instructional practices and classroom technologies are actively used in teaching and learning. The respondents were 120 elementary school teachers who met the inclusion criteria of being currently teaching at the elementary level, aged 18 years and above, having at least six months of experience using AI-driven instruction or classroom technologies, and willing to participate in the study.

Three researcher-developed questionnaires were used to gather data on AI-driven instruction, classroom technology utilization, and learners' engagement, all of which were validated by experts and tested for reliability using Cronbach's alpha to ensure instrument consistency and accuracy. Data collection was conducted after securing permissions and ethical clearance, ensuring informed consent, voluntary participation, confidentiality, and strict compliance with the Data Privacy Act of 2012 throughout the entire research process. Data were analyzed using descriptive statistics (mean, standard deviation, frequency, and percentage) to describe the variables, Pearson's r to assess relationships among variables, and multiple regression analysis to examine the combined predictive effect of AI-driven instruction and classroom technology utilization on learners' engagement.

Findings

The following are the findings of the study:

1. Teachers demonstrated an excellent and highly consistent level of implementation of AI-driven instruction across AI-integration, adaptive learning, automated feedback, and personalized instruction.
2. Teachers showed a very high and consistent level of preparedness in classroom technology utilization across digital tools, instructional technology, technology access, and technology frequency.
3. Learners were consistently perceived as highly engaged across behavioral, emotional, cognitive, and social engagement dimensions.
4. There was no significant relationship between AI-driven instruction and learners' engagement, except for a weak but significant positive correlation between automated feedback and emotional engagement.
5. There was no significant relationship between classroom technology utilization and learners' engagement across all engagement dimensions.

Conclusions

The following are the conclusions of the study:

1. Teachers demonstrated an excellent level of AI-driven instruction implementation across all indicators, indicating strong competence and consistent integration of AI-supported practices in classroom instruction.
2. Teachers were highly prepared and effective in classroom technology utilization, reflecting strong technological readiness and the ability to integrate digital tools into teaching and learning processes.
3. Learners showed consistently high behavioral, emotional, cognitive, and social engagement, suggesting active participation and positive involvement in classroom learning activities.
4. AI-driven instruction showed no significant relationship with learners' engagement, except for a weak but significant relationship between automated feedback and emotional engagement, implying that personalized feedback may positively influence learners' motivation and emotional involvement.
5. Classroom technology utilization had no significant relationship with learners' engagement, indicating that technology use alone does not guarantee engagement unless supported by meaningful pedagogical integration and learner-centered instructional practices.

Recommendations

The following are the recommendations of the study based on the findings and conclusions:

1 School administrators and teachers should sustain and strengthen AI-driven instruction by providing continuous professional development, expanding access to AI tools, and reinforcing clear ethical and pedagogical frameworks that promote meaningful and responsible classroom integration.

2 School heads and policymakers should enhance classroom technology utilization through strategic investment in digital infrastructure, ensuring equitable access to devices and connectivity, and providing sustained training that focuses on purposeful and learner-centered technology integration.

3 Teachers and school leaders should continue to foster high levels of learner engagement by designing interactive, collaborative, and student-centered learning experiences that meaningfully integrate technology to support active participation and deeper learning.

4 Teachers and instructional leaders should maximize the limited impact of AI-driven instruction on engagement by intentionally embedding automated feedback within formative, reflective, and engagement-focused instructional activities that strengthen learner motivation and emotional involvement.

5 Teachers and curriculum planners should shift classroom technology use from routine application to transformative, purposeful integration by designing problem-based, collaborative, and inquiry-driven learning tasks that actively engage learners in meaningful experiences.

6 Future researchers are encouraged to conduct learner-centered, mixed-method, and experimental studies that further examine how AI-driven instruction and classroom technology utilization influence engagement across diverse educational contexts, with particular attention to stu lived experiences, learning processes, and contextual factors shaping technology effectiveness.

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Appendix A

Ai-Driven Instruction Questionnaire

This questionnaire aims to gather your perspectives on the AI-driven instructional practices used in your classroom and how these practices affect your engagement, learning, and overall development. Your responses will provide valuable insights to improve the use of AI tools, teaching strategies, and technology-supported learning experiences.

Please read each statement carefully and select the response that best reflects your experience. Use the scale below to guide your answers:

Scale:
4 – Always
3 – Sometimes
2 – Rarely
1 – Never

Statement	4	3	2	1
AI Integration				
1. I integrate AI-powered tools (e.g., adaptive learning platforms, chatbots, or AI tutors) into my lesson plans.				
2. I use AI applications to personalize learning tasks based on individual student needs.				
3. I incorporate AI-generated resources (e.g., quizzes, learning modules, summaries) in classroom instruction.				
4. I use AI tools to monitor student progress and adjust instruction accordingly.				
5. I regularly include AI-based activities that promote critical thinking and problem-solving.				
Adaptive Learning				
1. I use AI-driven platforms that adjust learning content based on each student's performance.				
2. AI tools in my classroom provide personalized learning paths for students according to their strengths and weaknesses.				
3. I allow students to learn at their own pace using AI-adaptive activities and lessons.				
4. AI systems help me identify learning gaps and recommend appropriate remediation or enrichment for students.				

5. I adjust my teaching strategies based on the adaptive feedback and data provided by AI learning systems.				
Automated Feedback 1. I use AI tools to provide students with immediate feedback on their performance.				
2. AI-generated feedback helps students understand their mistakes and how to improve.				
3. I rely on automated feedback systems to track student progress and learning outcomes.				
4. AI feedback is integrated into my lesson activities to support students' learning in real time.				
5. Students receive personalized feedback from AI tools based on their individual responses.				
Personalized Instruction 1. I use AI tools to tailor learning activities based on each student's learning needs and interests.				
2. AI systems help me create individualized learning goals and plans for my students.				
3. I adjust instruction and learning tasks based on AI-generated student profiles and performance data.				
4. AI tools support differentiated learning by providing varied learning materials for students.				
5. I use AI to offer personalized support and guidance to students who need extra help.				

Appendix B

Classroom Technology Utilization Questionnaire

This questionnaire aims to gather your perspectives on your preparedness to use classroom technology in planning, delivering, and adapting instruction, and how this affects learners' engagement, learning, and overall development. Your responses will provide valuable insights to improve professional development, instructional planning, and technology-based strategies to promote effective and meaningful learning experiences.

Please read each statement carefully and select the response that best reflects your experience. Use the scale below to guide your answers:

Scale:
4 – Always
3 – Sometimes
2 – Rarely
1 – Never

Statement	4	3	2	1
Digital Tools				
1. I use educational apps and software to support classroom instruction.				
2. I integrate interactive digital tools (e.g., videos, simulations, quizzes) into my lessons.				
3. I use online platforms for students to practice skills and reinforce learning.				
4. I incorporate digital tools that promote student collaboration and group work.				
5. I use multimedia resources (audio, images, and videos) to make lessons more engaging.				
Instructional Technology				
1. I use learning management systems (LMS) or digital platforms to organize and deliver lessons.				
2. I use technology tools to design and present interactive lessons (e.g., slides, videos, digital whiteboards).				
3. I use instructional software to assess students' learning progress and performance.				
4. I use technology to facilitate collaborative learning activities and group projects.				
5. I integrate digital tools into lesson planning to enhance teaching effectiveness and learning outcomes.				

Technology Access 1. Students have reliable access to digital devices (e.g., tablets, laptops, or computers) during class.				
2. My classroom has stable internet connectivity for using online learning tools.				
3. Students can easily access the learning platforms or digital resources required for lessons.				
4. There are sufficient technological resources available to support classroom activities.				
5. Technical support (e.g., IT assistance or troubleshooting) is available when needed.				
Technology Frequency 1. I use digital tools and technology in my lessons on a daily basis.				
2. Students regularly use technology to complete classroom tasks and activities.				
3. I integrate technology in most of my lesson plans each week.				
4. Students frequently use digital platforms for learning and practice.				
5. Technology is consistently used for assessment and feedback during lessons.				

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue VI May 2026

Appendix C

Learners' Engagement Questionnaire

This questionnaire aims to elicit your perspectives on how your preparedness as a teacher influences learners' academic engagement, including their participation, motivation, and learning behaviors. Your responses will provide valuable insights to improve professional development, instructional planning, and classroom strategies that promote active participation and meaningful learning experiences for all students.

Please read each statement carefully and select the response that best reflects your experience. Use the scale below to guide your answers:

Scale:
4 – Always
3 – Sometimes
2 – Rarely
1 – Never

Statement	4	3	2	1
Behavioral Engagement				
1. Students actively participate in classroom activities and discussions.				
2. Students complete their assignments and tasks on time.				
3. Students remain focused and attentive during lessons.				
4. Students follow classroom rules and routines consistently.				
5. Students show persistence and effort when faced with challenging tasks.				
Emotional Engagement				
1. Students show interest and excitement during classroom activities.				
2. Students appear happy and motivated when learning with technology or AI tools.				
3. Students feel a sense of belonging and connection in the classroom.				
4. Students express positive emotions when they understand the lesson.				
5. Students show confidence and willingness to participate in class.				
Cognitive Engagement				

1. Students demonstrate effort and persistence when solving challenging tasks.				
2. Students apply critical thinking skills during classroom activities.				
3. Students use problem-solving strategies to complete assignments.				
4. Students make meaningful connections between new concepts and prior knowledge.				
5. Students actively reflect on their learning and seek to improve.				
Social Engagement 1. Students actively participate in group activities and collaborative tasks.				
2. Students communicate and share ideas with classmates during learning activities.				
3. Students show respect and support for their peers during classroom interactions.				
4. Students work well in teams and contribute to group goals.				
5. Students engage in meaningful discussions and peer feedback during lessons.				