



Enhancing Personalized Learning and Engagement Through Technology in Modern Education

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Abstract

This study investigates the role of technology in empowering students through personalized learning, enhanced engagement, and collaboration in educational settings. The integration of technology into education has transformed traditional learning paradigms, enabling tailored approaches that cater to individual learning styles, needs, and paces. Through adaptive learning platforms, digital tools, and interactive content, technology fosters self-directed learning and critical thinking, encouraging students to take ownership of their educational journey. Moreover, the study highlights the role of technology in facilitating collaboration through virtual classrooms, group projects, and real-time communication tools, which enhance engagement and foster a sense of community among learners. However, significant challenges persist, particularly concerning equity and access. Disparities in internet connectivity, availability of devices, and digital literacy continue to create a divide, limiting the potential of technology to empower all students. This research underscores the importance of addressing these barriers to ensure inclusivity and equitable access to technology-driven education. It concludes by advocating for policies and practices that prioritize accessibility, teacher training, and sustainable infrastructure to create an educational ecosystem where technology serves as a tool for empowerment rather than exclusion. The findings contribute to the growing body of literature on technology-enhanced learning and provide actionable insights for educators, policymakers, and stakeholders seeking to leverage technology for inclusive education.

Introduction

The introduction of new paradigms that improve learning experiences and change conventional teaching techniques have caused a revolution in a number of fields, including education. The teacher-centered method, in which the instructor served as the primary source of knowledge and pupils were viewed as passive recipients, was a major component of education in the past. But as a result of the incorporation of technology, the educational landscape has changed to become more learner-centered, encouraging chances for collaboration, personalized learning, and active involvement (Lee et al., 2021). This change is consistent with current philosophies of education, which place a strong emphasis on the value of student agency, critical thinking, and the capacity to apply information in a variety of settings.

The ability of technology to support personalized learning is one of the main ways it gives students more power. Customizing educational experiences to each student's requirements,

interests, and learning preferences is known as personalized learning (Oller, et al., 2021; Bernacki et al., 2021). Adaptive learning technologies enable this strategy by evaluating students' performance and offering resources and feedback that are specifically tailored to them. To monitor students' progress and modify task difficulty levels correspondingly, intelligent tutoring systems and learning management systems (LMS) employ data analytics (Yilmaz et al., 2022). Consequently, learners obtain assistance that is tailored to their individual learning tempo and approach, augmenting their whole academic journey.

Technology also encourages pupils to be more motivated and involved in class (Panagiotidis et al., 2023). Games, apps, and instructional software are examples of interactive tools that enhance and immerse learning. It has been demonstrated that gamification, or the integration of game aspects into educational activities, increases motivation and enhances learning results (Ansar & George, 2022). Gamification is used by websites like Kahoot! and Duolingo to create rewarding and competitive learning environments that motivate students to engage in active learning and stick with their studies (Baytekin & Avara, 2023). In a similar vein, experiential learning opportunities offered by virtual reality (VR) and augmented reality (AR) improve comprehension and memory of difficult subjects.

Technology promotes collaborative learning by offering platforms and tools that support cooperation and communication (Su & Zou, 2022; Herrera, 2021). Regardless of distance, students can collaborate on projects, exchange ideas, and gain feedback from peers and teachers using online discussion boards, collaborative documents, and video conferencing tools (Camilleri, 2022). These cooperative tools aid in the growth of vital abilities like cooperation, problem-solving, and communication all of which are necessary in today's workforce. Technology's ability to connect people globally exposes pupils to a variety of viewpoints, enhancing their educational experiences and fostering cultural understanding.

Another important advantage of technology in education is access to an abundance of tools and knowledge. Students have access to a vast amount of information on the internet, including scholarly publications, e-books, educational videos, and virtual classes. With the help of this extensive collection of materials, students can conduct independent research and study on topics outside of the classroom curriculum. Massive open online courses (MOOCs) and open educational resources (OER) provide high-quality content to a global audience at little or no cost, further democratizing education.

Technology in education has many benefits, but there are drawbacks as well that need to be considered. The digital divide, or the difference between people who have access to contemporary information and communication technologies and those who do not, is one of the main causes for concern. Access to technology is frequently influenced by socioeconomic differences, which results in unequal educational possibilities. Students from low-income families, for instance, could not have access to dependable technology, internet, or technical help, which would limit their capacity to fully engage in digital learning. Governments, academic institutions, and the commercial sector must work together to close the digital divide and guarantee that all students have fair access to technology.

One more difficulty in incorporating technology into education is resistance to change. Teachers and organizations used to old ways could be hesitant to embrace new technology because they don't know much about them or don't trust that they work. Programs for professional development and training are crucial for giving teachers the abilities and information they need to successfully use technology into their lesson plans. Creating a supportive framework that offers opportunity for continuous professional learning, access to resources, and technical help is also essential.

Concerns about security and privacy present serious obstacles to the employment of technology in the classroom (Tawalbeh et al., 2020). Concerns about data privacy and security are brought up by the way educational technology gather and store student data. It is crucial to guarantee that students' private information is safe and handled morally. Establishing strong data protection policies and procedures is essential for educational institutions in order to preserve student information and adhere to regulatory requirements.

A number of contemporary educational paradigms that further improve learning experiences have been brought about by the incorporation of technology into the classroom. A flexible and effective approach to education is provided by blended learning, which blends traditional in-person instruction with online learning (Cronje, 2022). With this paradigm, students can take use of the best features of both modalities, including the one-on-one interaction that occurs in the classroom and the easy access to online materials. Active learning and a deeper comprehension of the subject matter are encouraged by the flipped classroom model, in which students complete interactive tasks in class and study instructional information at home. Learning can be made more interesting and motivating by incorporating game design features into educational activities through gamification and game-based learning. Adaptive technologies enable personalized learning, which adjusts educational experiences to meet the needs of specific individuals and improves learning results. Lastly, distance and online learning give students the chance to receive an education from any location, removing limitations related to location and enhancing accessibility.

Method

This study employed a qualitative research design to explore how technology empowers learners within modern educational paradigms. The choice of a qualitative design was driven by the need to gain in-depth insights into participants' experiences, perspectives, and interactions with technology in educational settings. The focus was on understanding how technology integration influenced learning environments and how it empowered students in terms of autonomy, engagement, and collaborative opportunities. To capture this complexity, a case study approach was selected to explore the specific context of technology use in different educational institutions.

The participants in this study were selected from three distinct educational institutions that had implemented technology-based learning tools. A purposive sampling technique was used to ensure that participants had direct experience or knowledge about the role of technology in education. In total, 30 participants were included, comprising 15 students, 10 teachers, and 5 administrators. These participants were chosen for their involvement in various aspects of technology integration, from classroom learning to institutional planning and policy development, providing diverse perspectives on the topic.

Data collection for this study involved multiple qualitative methods, each aimed at capturing different facets of the research topic. Semi-structured interviews were conducted with students, teachers, and administrators, allowing for detailed discussions on their experiences with technology in education. Each interview lasted approximately 45-60 minutes and used an open-ended question guide, enabling flexibility in responses. Additionally, Focus Group Discussions (FGDs) were held with students and teachers to encourage collective insights and experiences regarding the empowerment of learners through technology. Each group discussion involved 6-8 participants, who engaged in free-flowing conversations guided by core topics.

To further explore the use of technology in the classroom, classroom observations were conducted in several sessions where digital tools were actively being used. These observations focused on how technology facilitated student engagement, collaboration, and interaction with

educators. Moreover, document analysis was carried out on relevant educational documents such as school policy papers, curriculum guides, and lesson plans, to understand how technology was integrated into institutional frameworks and practices. This multi-method approach ensured a comprehensive understanding of technology's impact on education.

The data collected through interviews, FGDs, classroom observations, and document analysis were analyzed using thematic analysis. This process involved coding the data, identifying recurring themes, and grouping related codes into broader categories. The analysis began with initial open coding, followed by categorizing these codes into themes, which were then reviewed and refined. To assist in managing and organizing the qualitative data, NVivo software was used. Thematic analysis allowed for a rich exploration of the participants' experiences, providing a deep understanding of how technology empowers learners within modern educational paradigms.

Result and Disucssion

Educational technology has been identified as an influential trend in learning teaching methodologies to provide innovation in teaching practices. Due to emergence of modern technological tools, contents that reflect personalized student learning environments or 'learning that adapts or is tailored to individual learners,' and virtual classrooms, teachers and institutions have the abilities to deliver better learning experiences. These innovations not only serve to meet the needs of clients whom are students but also foster voice, reflection, and engagement. The good adoption of technology in education has not come easy with some of the following challenges. Barriers include digital divide, disparities in technological connectivity, and the all-important question of faculty development. Applying the indicated issues is important in order to make technology an enabler rather than limiting factor in the learning process. Within this context, the current study attempts to explore the multifaceted uses of technology in the education system with particular emphasis to learner centered learning, motivation and learning collaboration, awareness of issues which have to be addressed further in order to enhance accessibility and utility of technology in education.

Empowerment through Personalized Learning

One of the significant themes identified in this study was empowerment through personalized learning, where technology plays a pivotal role in enabling students to take control of their learning journey. Personalized learning refers to a tailored educational experience where students can learn at their own pace, according to their individual needs, interests, and abilities. The integration of technology facilitates this by offering a range of digital tools and resources that support adaptive learning, personalized content delivery, and real-time feedback. The flexibility provided by technology allows students to engage with learning materials that best suit their learning styles, whether through interactive simulations, video tutorials, or customized assessments.

From the interviews conducted, it was evident that students felt a sense of empowerment as they were able to choose how they engaged with content. Many expressed that technology provided them with the autonomy to navigate their learning process. One student shared,

"With the online platform, I can review the lessons at my own pace. I can go back and repeat sections I didn't fully understand without feeling rushed or embarrassed in front of others".

This quote highlights how personalized learning through technology supports self-directed learning, where students take charge of their own educational progress without external

pressure. The ability to pause, rewind, and repeat content was particularly important for students who had varying levels of comprehension and needed more time with certain topics.

Moreover, educators emphasized that technology enables them to customize learning experiences for individual students. One teacher explained,

"The digital tools we use allow me to adapt assignments and projects to meet the needs of each student. I can assign extra challenges to students who are excelling and provide additional support to those who need it".

This comment reflects how technology not only empowers students but also helps teachers differentiate instruction. Personalized learning platforms allow educators to monitor student progress in real time, identify areas where students are struggling, and provide targeted interventions.

In addition, the flexibility that personalized learning offers extends to students' ability to explore topics of interest beyond the traditional curriculum. This was another aspect that emerged during the interviews, where students felt encouraged to take ownership of their learning. One student noted,

"I can follow topics I'm passionate about outside of class hours, like coding or digital art. The resources online make it easy to explore new areas, which makes learning more exciting and meaningful for me".

This experience underscores how technology helps students not only meet academic requirements but also pursue personal interests, fostering a deeper connection with their learning and increasing motivation.

The combination of autonomy, customized support, and the ability to explore areas of personal interest contributed to a greater sense of empowerment among students. Personalized learning allowed students to move away from a one-size-fits-all approach to education and embrace a model where they had more control over how and when they learned. As a result, students reported higher levels of engagement, confidence, and ownership over their educational progress. Technology was seen as a vital tool in creating an inclusive, learner-centered environment that encourages independent thinking and self-advocacy.

Overall, empowerment through personalized learning not only benefits students by providing them with the tools to learn at their own pace but also helps teachers offer more individualized attention and support. The integration of technology in personalized learning fosters a more engaging, adaptable, and student-centered approach to education, ultimately leading to greater learner empowerment.

Collaboration and Engagement

Another central theme that emerged from this study was collaboration and engagement, where technology was found to significantly enhance both student collaboration and active participation in the learning process. With the integration of digital tools and online platforms, students were able to engage with one another in new ways, breaking down traditional classroom barriers. Collaborative technologies, such as discussion forums, group project tools, and video conferencing, provided students with opportunities to work together on assignments, share resources, and solve problems collaboratively, regardless of their physical location. This shift toward more interactive and dynamic learning environments was viewed as a key factor in empowering students to take a more active role in their education.

The interviews revealed that students appreciated the collaborative nature of technology-enhanced learning. One student shared,

"Using tools like Google Docs to work on group projects is really helpful. We can all contribute at the same time, even if we're not in the same room. It feels more like teamwork than just a task" (Student 5).

This comment reflects how technology supports synchronous collaboration, allowing students to interact with their peers in real time, share ideas, and provide immediate feedback, all of which contribute to a more engaged and productive learning experience. The ability to collaborate digitally also removed geographical and time constraints, enabling students to work together outside of class hours.

Moreover, educators emphasized how technology facilitated more interactive and engaging classroom activities. One teacher remarked,

"I use interactive platforms like Kahoot and Padlet to make the class more engaging. These tools encourage students to participate actively and allow for instant feedback, which helps maintain interest and motivation".

This illustrates how technology can be used to increase student participation and create an environment where learning is not passive. Tools like Kahoot, for example, turn traditional review sessions into fun, competitive activities that engage students and make learning more enjoyable. This approach has been shown to increase motivation, as students are more likely to stay engaged when they feel their contributions are valued and when the learning process feels interactive.

In addition to enhancing collaboration among students, technology was found to foster engagement by providing a more dynamic and responsive learning environment. For instance, one student described,

"When we have live discussions through Zoom or Slack, I feel like I can ask questions in real-time and get answers right away. It's not just about reading a textbook anymore, it's a conversation".

This quote highlights the value of real-time communication tools that allow for immediate clarification and dialogue, promoting a deeper level of engagement. The ability to have instant interactions with peers and instructors in a digital space can simulate a more traditional classroom experience, even in an online or hybrid setting.

Furthermore, the sense of community and connection created through these collaborative tools was important for student engagement. One educator noted,

"The online platforms help create a sense of belonging. Students who might not speak up in a physical classroom can share their thoughts and ideas through online discussions, which encourages a broader range of voices".

This statement underscores the role of technology in fostering inclusivity, as online spaces can offer students who are shy or less confident in face-to-face settings a chance to participate more fully. It also provides a platform for more diverse viewpoints to be shared, enriching the learning experience for everyone involved.

Challenges in Access and Equity

While technology holds immense potential to empower learners, the study also revealed significant challenges in access and equity that can limit its effectiveness. Despite the widespread integration of technology in education, not all students have equal access to the necessary devices, internet connections, or digital literacy skills, creating disparities in learning opportunities. These challenges were especially pronounced in underfunded schools and rural areas, where the infrastructure needed to support technology-driven learning may be lacking.

As a result, some students were unable to fully participate in digital learning, which led to feelings of exclusion and frustration.

In the interviews, many students expressed concerns about the lack of access to necessary resources. One student explained,

"I don't have a reliable internet connection at home, so sometimes I can't participate in online classes or access assignments. It makes it harder for me to keep up with the rest of the class".

This statement highlights the issue of digital divide, where students from low-income backgrounds or rural areas often face barriers to accessing the technology required for modern education. Without consistent and reliable access to high-speed internet or devices, these students are at a disadvantage, which can impact their academic performance and engagement with the material.

In addition to issues with internet access, students also faced challenges with device availability. Several participants mentioned that they shared devices with family members, which often limited the time available for study and caused disruptions. As one teacher noted,

"I've had students tell me they have to wait for their parents to finish using the only computer at home before they can do their homework. This delays their ability to engage with the learning material in a timely manner".

This issue further compounds the difficulties that students face in accessing online learning platforms, especially during peak study hours or when assignments are due. In some cases, students were forced to rely on mobile phones to access learning materials, which are not always ideal for more complex assignments or research.

Digital literacy also emerged as a significant barrier to equitable learning experiences. Many students reported struggling to navigate the digital tools and platforms used in their courses. One student shared,

"I don't really know how to use all the features on the online learning platform, so I often miss out on important instructions or assignments".

This quote underscores the importance of not only providing students with access to technology but also ensuring that they are equipped with the skills to use it effectively. Students who lacked the necessary digital literacy skills faced difficulties in navigating educational technologies, which impacted their ability to engage with the content and complete assignments efficiently.

Educators also faced challenges in addressing these equity issues. One teacher explained,

"It's hard to ensure that every student is on the same level when some have devices and internet at home, and others don't. I try to accommodate as best as I can, but it's an ongoing struggle".

Teachers reported feeling a sense of responsibility to support all their students, but the disparities in access made it difficult to offer equal opportunities for learning. This situation required educators to find creative solutions, such as offering printed materials or scheduling alternative times for students to complete assignments, but such accommodations were often limited by time and resources.

This study aimed to explore how technology empowers learners within modern educational paradigms, focusing on personalized learning, collaboration, engagement, and challenges related to access and equity. The findings align with much of the existing literature, particularly regarding the positive impact of technology on personalized learning and student engagement,

while also addressing gaps in understanding how equity issues continue to affect the integration of technology in education.

The form of learning empowering, which this study describes, is consistent with the overall finding in the literature with regard to the enabling nature of technology and how different technological tools enhance learners' personality to be able to learn in a distinctive manner (Mutonyi et al., 2020). In this study, technology can be the solution to make classrooms encourage the students as far as a learner-centered education environment is concerned because technology allows learning in self-directing pace and provides necessary tools based on the students' needs. From the interview and FGD the respondents expounded that the implementation of personalized learning not only increases the level of students' self-organization but also students' motivation. The result found here agrees with other findings about ways that augmented learning environment enhances student performance and satisfaction (Torres et al., 2020).

That said, this research adds value to the existing body of knowledge on the effectiveness of technology-supported personalized learning by focusing on the conditions, which may pose significant barriers to the utilization of such an approach, using access and equity as demonstration areas. The course revealed that students from disadvantaged background exhibit challenges like; Unsteady internet connection, lack of a device, low digital literacy among others. These findings are similar to the current works (Azionya & Nhedzi, 2021) that examine the impact of the "digital divide" on students' academic achievements. There has always been a concern as to how different groups of learners are females disconnected from technology and digital resources hence it is shocking that even with more institutions integrating technology in their teaching and learning processes this study has revealed how much these barriers still hold (Kundu et al., 2021). The study adds to the continuing debate on how and why technology for education might still be far from being well-mapped to implement fairness principle on technological substrate.

Regarding cooperation and activation, the derived results are in line with the previous studies concerning the promotion of student interaction and participation through technology. According to Zamiri & Esmaeili (2024), we identified that the use of technologies such as group-working tools and forums, integrated live discussion, and feedback tools effective in increasing students' participation, learning and peer cooperation. This body of work builds on these studies to show that not only do these tools enhance students' contributions, but they also foster feelings of community immediacy, which is crucial for learning in nontraditional classroom formats such as synchronous hybrid or online. But I also found that the learning with technologies was not always equal for all students: Some students had more accesses, and the others could not use technologies effectively; the students with the poor accesses could not use technologies effectively; therefore, the study also identified a gap in the literature on technologies, engagement, and equality.

A third research gap filled by this study is the moderating effect of digital literacy on student's effectiveness in embracing technology in class. Although there is literature about how digital literacy is an important factor for the present-day learner (Ben et al., 2022), limited research has been carried out to determine how the lack of digital skills among different students affects the utilisation of educational technologies. This work affirms that a majority of students, particularly those from excluded communities, were unable to develop crucial information technology competencies that enabled successful learning in the homeschooling modality (Erete et al., 2021). this finding extends the research knowledge regarding the exclusion of digital literacy as the central approach to putting in place the divide between have and have nots in terms of learning in digital platforms and environments.

Conclusion

This completes the finding of this study by stressing the innovative use of technology in education with a view to encouraging empowerment through individualism and group formation, and collaboration among learners. In as much as enhanced instruction delivery, polarization of education, and adaptability of education delivery systems make technology convenient in allowing students to learn at their own pace, Self-directed learning and instructors to facilitate learning to suit different students. Nevertheless, the studies also reveal that the achievements of access and equity remain problematic, such as the poor connection to the Internet, difficulties in getting appropriate devices, lack of relevant skills, etc., which do not allow realizing full advantages of technologies. To sum up solving these barriers is necessary and inalienable for creating the student-orientated environment as for the students with learning difficulties and learning disabilities as to all students. Amid the growing and progressive use and incorporation of technology as part of education and learning systems, a more systemic approach would be vital in the efforts to cushion the weaknesses inherent in the adoption of technological systems where the primary drive is to ensure that education becomes more accessible and easier to support across the society more so with a focus on offering equal chances of getting access to equitable technology that will help in supporting the learning needs of all students.

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