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Revolutionizing Learning: An Exploratory Study on The Impact of Technology-Enhanced Learning Using Digital Learning Platforms and AI Tools on The Study Habits of University Students Through Focus Group Discussions

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A B S T R A C T

This study investigates the revolutionizing learning: an exploratory study on the impact of technology-enhanced learning using digital learning platforms and AI tools on the study habits of university students through focus group discussions. Nineteen participants were divided into groups of 4-5 members each, and the discussions were thematically analysed. Eight key themes emerged from the analysis, including changing study habits, advantages, and drawbacks of technology in education, challenges in technology-enhanced learning, benefits and limitations of conventional teaching methods, concerns surrounding technology use, and the impact of AI on education. While the findings largely align with existing literature, certain negative effects of technology use were identified, such as a decline in creativity, reduced cognitive functioning, decreased retention and memorization, and lower productivity. These findings highlight the importance of adopting a balanced approach to integrating technology in education, considering both the benefits and potential drawbacks.

Keywords: Technology-enabled learning, Digital learning platforms, AI tools, Study habits, and University students.

Introduction

At higher education institutions, the utilization of technology-enhanced learning, such as digital learning platforms and AI tools, has recently gained popularity. Technology is enabling personalised learning experiences that can be tailored according to the need of each student (Haleem, Javaid, Qadri, & Suman, 2022). AI-based learning platforms have changed how students' study. These systems allow students learn anytime (Essel, Vlachopoulos, Menson, Johnson, & Baah, 2022).Virtual teaching assistants and various AI-based chatbots have been developed to improve academic performance of the students (Essel, Vlachopoulos, Menson, Johnson, & Baah, 2022). These teaching assistant chatbots can interest students as they become more familiar with these platforms (Essel, Vlachopoulos, Menson, Johnson, & Baah, 2022). Digital learning platforms give students access to instructional resources and learning activities anytime, anywhere (Sousa, Cruz, & Martins, 2017). Chatbots, virtual assistants, and personalised learning algorithms can give students personalised feedback and help them learn better (Sousa, Cruz, & Martins, 2017). Digital learning platforms offer interesting and interactive learning (Sousa, Cruz, & Martins, 2017). Higher-education students had to switch to remote learning overnight in March 2020 because to the COVID-19 pandemic (Brasca, et al., 2022). Education professionals employed hybrid online-offline learning approaches to improve interactivity, supplement video lectures, and engage students in virtual classrooms. These tools changed instruction, evaluation, and learning even after the COVID-19 pandemic (Brasca, et al., 2022). The AI in Education (AI Ed) group is studying how AI-based tools affect online learning (Brasca, et al., 2022; Ayoub, 2020; Seo, Tang, Roll, Fels, & Yoon, 2021). AI-based solutions for learning and teaching can automate teachers' everyday tasks, student instruction is individualized, and AI based assessments can be used. It's crucial to examine how professors and students see the influence of AI-based systems in online learning environment.AI based technologies have the potential to change formal education by educational institutions (Seo, Tang, Roll, Fels, & Yoon, 2021). Despite the benefits of technology-enhanced learning, there are various concerns regarding how it has changed study habits (Harris, Al-Bataineh, & Al-Bataineh, 2016) (Carstens, Mallon, Al-Bataineh, & Al-Bataineh, 2021). Overuse of technology can produce fragmented attention, which prevents students from completing their work. Adaptive learning technology boosts student participation. More teacher and student training are needed to implement technology in the classroom (Carstens, Mallon, Al-Bataineh, & Al-Bataineh, 2021).

Technology-enhanced learning (TEL)

Technology-enhanced learning (TEL) is an educational approach that uses the digital technology including computers, mobile devices, the internet, and multimedia to improve and help in teaching and learning activities. TEL can have many different forms, which includes online learning modules, digital textbooks, educational simulations and games, virtual and improved reality contexts, and collaborative online tools. TEL is designed to improve engagement among student, to encourage individualised learning and active learning, and give students more flexibility and accessibility to learning resources (Sen & Leong, 2019). There are different models of Technology enhanced learning; the flipped classroom model; In the flipped classroom model, students watch lectures or finish reading outside of class, then return to class to do activities that help them remember what they learned. The goal is to maximise instructors' limited face-to-face time by focusing on activities that require communication, teamwork, and problem-solving (Cosculluela, Suárez, Quiroga, Sierra, & Blasco, 2021). Blended Learning model; The blended learning model includes in-person interaction, peer collaboration, access to digital resources including e-libraries and virtual laboratories, online examinations, and educational blogs. Also, it provides educators with a various responsibilities and options that are adaptable. This model improves students' digital fluency, communication, life skills, and professionalism (Lalima & Dangwal, 2017), Adaptive Learning Model; Adaptive Learning Model personalises student learning through analytics and data. Individualised learning paths that meet students' needs, interests, and learning styles are the goal. Adaptive learning helps K–12, postsecondary, and business education (Li R., 2019), Gamification model; Gamification engages and motivates students using game design principles. The goal is to provide a unique learning experience that encourages students to experiment, explore, and learn from their mistakes. Gamification can improve language, STEM, and soft skills learning (Toimah, Maulana, & Fajar, 2021), Mobile Learning Model; Tablets and smartphones provide instructional resources and tasks in mobile learning. This model's goal is 24/7 learning resource access. Mobile learning includes SMS, mobile-friendly websites, and smartphone apps (Maketo, 2020).

Digital learning platforms

Digital platforms integrate offline and online education. Digital technology integrates learning principles and frameworks. Digital learning platforms encourages user connection, communication, and knowledge sharing (Faustmann et al., 2019). There are different models of digital learning platforms; Learning management system (LMS) is a software that assists with managing e-learning courses, create and upload course materials, administer online assessments in descriptive and multiple-choice question (MCQ) formats, provide prompt feedback, and other functions (Chahal & Patel, 2021). Learning Content Management System LCMSs create, store, and deliver tailored e-learning content. All LCMS products share common components. These include a repository for learning objects, an authoring tool/assembly for creating them, an engine for providing dynamic content to learners, and a management tool that performs basic management activities without a learning management system (Alhrrah & Qwaider, 2013). MOOCs are available worldwide. Video lectures, quizzes, discussion forums, and peer assessment are common MOOC components (Pant, Lohani, & Pande, 2021). Gamification in education incorporates game design elements and such experiences into instructional processes. This model promotes learning and related attitudes, behaviours, and activities in various situations and disciplines. These include participatory approaches, collaborative learning, self-directed study, task completion, streamlined assessment processes, exploratory learning methods, and student creativity and retention (Dichev & Dicheva, 2017).

AI tools in education

AI tools use NLP, ML, and deep learning. These tools seek to improve education. These systems have the potential to automate administrative activities, customise and personalise learning, and examine enormous amounts of data to improve educational outcomes. Artificial intelligence techniques in education include chatbots, data analytics, intelligent teaching systems, and predictive modelling. The tools can revolutionise the pedagogical landscape, enabling new opportunities for personalised, simplified, and proficient instruction (Lee, 2021). There are different models of AI Tools in education; Student, domain, pedagogical, and inference engines make up the ITS model. The student's model includes background knowledge, learning style, and comprehension level. The domain model represents instructional knowledge and abilities. It is often described as a database or set of rules. The pedagogical model determines the best way to present material to learners, which the inference engine uses to provide customised feedback and recommendations. (Almasri, 2019), Adaptive Learning Systems has continuous evaluation, feedback, and adjustments to guarantee that every learner is actively involved, stimulated, and accomplishing their learning goals. Student, domain, pedagogical, and inference engines make up the ALS model. Student models include prior knowledge, preferred learning style, as well as current level of understanding (Khosravi, Sadiq, & Gasevic, 2020).

Study habits

Study habits are how people learn new things. This facilitates efficient acquisition of knowledge, such as the practise of recording information, allocation of time, attentive participation, and methods for retaining information. Effective study habits help students understand and retain course knowledge, improve academic performance, and prepare for assessments (Khalaf, Bin Abdulrahman, Bin Abbas, & Alanazi, 2021). Study habits are a person's consistent pattern and behaviour during learning. Study habits are a student's routines. Poor study habits may hinder learning. Students learn effective study methods during school. College students are thought to study well. Compared to school, college requires better study habits (Kumar, 2015).

Literature review

Technology-enhanced learning (TEL) has undergone significant advancements in recent years, which are transforming the educational landscape (Goh, 2016). These developments consist of a variety of technological innovations, such as artificial intelligence (AI) (Hogan et al., 2021), virtual reality (VR)(Hogan et al., 2021), adaptive learning systems (Vesin et al., 2018), and collaborative platform(Garbin et al., 2021). The integration of artificial intelligence (AI) in education has promoted the provision of personalized or tailored tutoring (Troussas et al., 2020), real-time support (AlGhamdi, 2022), and real-time feedback(Banihashem et al., 2018), Virtual Reality (VR) and Augmented reality (AR) technologies provide learners with immersive educational experiences(Papanastasiou et al., 2018), whereas adaptive learning systems personalise educational content to cater to individual requirements(Soler Costa et al., 2021). Through the use of collaborative platforms, individuals involved in the learning process can share knowledge(Ansari & Khan, 2020) (Baanqud et al., 2020)and reflect on how students are building their knowledge(Baanqud et al., 2020). These advancements exhibit considerable potential for improving engagement(Haleem et al., 2022), knowledge retention(McGuinness, 2016), and critical thinking skills (van Laar et al., 2020) that are essential for the contemporary digital era.

The field of education has undergone a significant transformation with the emergence of artificial intelligence (AI) (Chaudhry & Kazim, 2021) and digital learning platforms(Haleem et al., 2022), which have facilitated customised and interactive learning experiences. The use of chatbots that are based on artificial intelligence provide learners with personalised and quick assistance (Okonkwo & Ade-Ibijola, 2021), which in turn improves their engagement(Seo et al., 2021) and enables flexibility(Friese & Rother, 2013). The use of AI algorithms in adaptive learning systems enables the customization of instruction according to the specific needs of each individual(Dilmurod & Fazliddin, 2021), ultimately resulting in enhanced academic performance(Ciolacu & Beer, 2016). Intelligent content recommendation systems use artificial intelligence methodologies to provide tailored educational resources that align with the preferences and objectives of individual learners(Zhang et al., 2020). The use of AI-powered data-driven learning analytics allows educators to extract valuable insights from learner data(Bystrova et al., 2018), which can be utilised to inform instructional strategies and facilitate continuous improvement. (Troussas et al., 2019) The advancements that have been made in technology have had a substantial impact on education(See et al., 2021), resulting in improved learner involvement(McDonald et al., 2014), acquisition of knowledge(Al-Emran & Teo, 2019), and academic achievements in the era of digitalization(Adi et al., 2022).

The integration of technology in education has led to significant advancements in study habits, like, transforming how students learn(Ammade et al., 2018). The contemporary era of technology-enhanced education has witnessed notable advancements in study habits, which encompass the use of digital note-taking tools(Belson et al., 2013), interactive study aids(Halwani, 2017), self-directed learning(Adi et al., 2022), and online collaborative environments(Esposito De Falco et al., 2017). while online collaborative environments foster collaboration and peer interaction(Mahmud & Wong, 2018). These advancements have improved engagement and learning outcomes(McDonald et al., 2014) and a number of other aspects in the digital age.

Methodology

Participants

To achieve the aims and objectives of the present research study, a sample of 19 participants was selected and distributed among 4 to 5 separate groups. The sample of the study comprised of individuals who are between 17 and 26 years who were residing in India. Also, the participants were currently enrolled in a higher education programme for a period exceeding one year, and also use artificial intelligence (AI) tools and digital learning platforms as a component of their studies.

Sampling method

Purposive sampling was employed for intentional selection of the participants to best suit the objective of the study.

Tools

The present research study aims to look at the impact of technology-enhanced learning using digital learning platforms and AI based tools on the study habits of university students, In the present study, a discussion guide, a recording equipment , observation sheet and demographic sheet were used for the process of data collection.

Research Design

The present study is exploratory in nature, it aims to explore the research question and does not intend to give final or conclusive solutions to prevailing problems.

Procedure

The formulation of a discussion guide marked the start of the research study. Purposive sampling was used to choose potential participants, who were then separated into four-five groups according to their availability. Their voluntary consent to engage in the study was obtained through verbal consent, which was collected prior to introducing the topic and the discussion. The individuals who contributed were appreciated for their contributions. Later thematic analysis was used to uncover key findings.
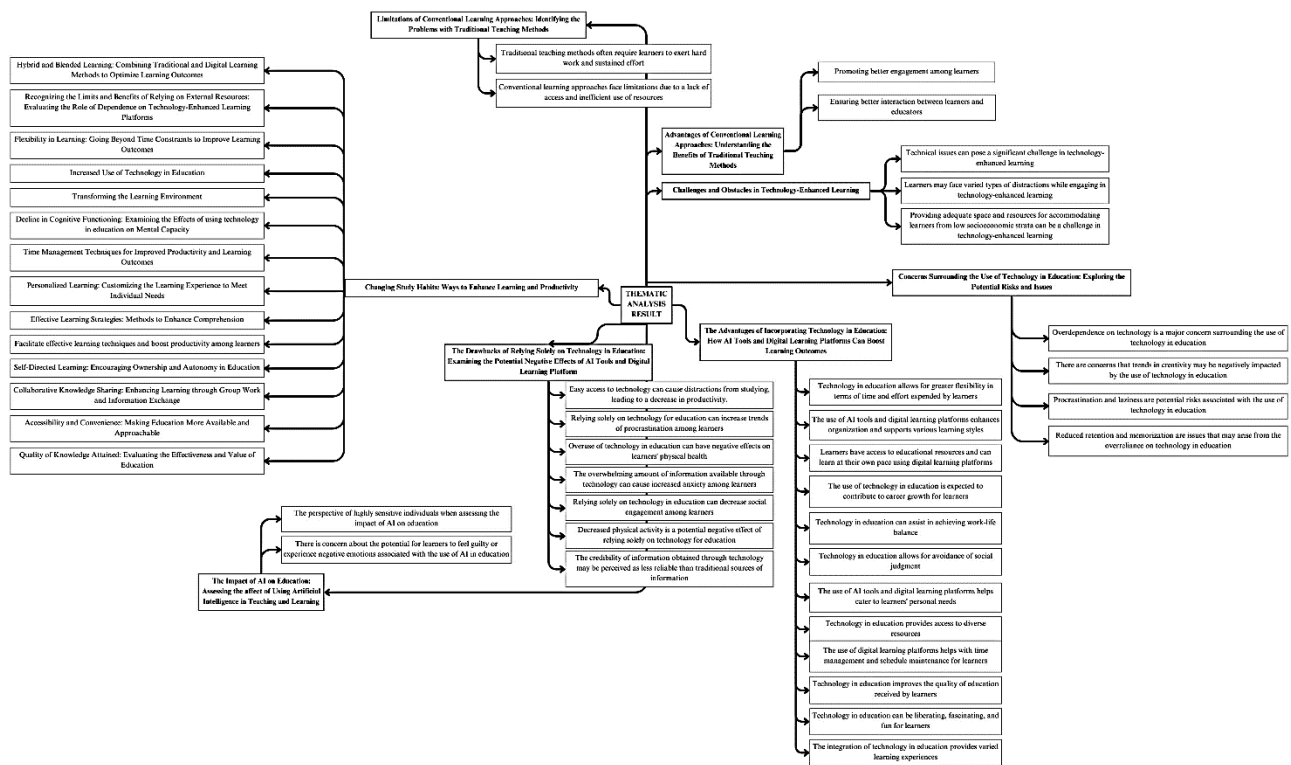
Result

Fig. 1 Thematic Analysis Result

Discussion of Results

University students are increasingly utilizing AI tools and digital learning platforms to enhance their education. This approach aims to create a more engaging and interactive classroom environment, potentially revolutionizing the field of education. but the impact of such tools on learning processes of students remains a subject of debate. To shed light on this issue, a study was conducted involving 19 participants selected through purposive sampling for a focus group discussion. The study has seven objectives: understanding the impact of AI tools and digital learning platforms on university students' study habits, assessing the extent of change in study habits, identifying specific ways these tools affect study habits, evaluating effectiveness based on learning styles, determining influencing factors for success, identifying implementation challenges and limitations, examining students' attitudes and acceptance, and comparing the effectiveness of these tools with traditional learning methods. Thematic analysis was employed to analyze the collected data, systematically identifying recurring themes and patterns, followed by coding and rigorous analysis to draw meaningful interpretations.

The theme that emerged emphasised changing study habits; ways to enhance learning and productivity encompasses a comprehensive set of codes that contribute to the understanding and implementation of effective study habits. Personalized Learning (Ifenthaler et al., 2018) involves customizing the learning experience to meet individual needs. Time management (Miertschin et al., n.d.) Techniques are employed to improve productivity and learning outcomes. Effective Learning strategies are the methods to enhance comprehension (Biwer et al., 2020). Decline in Cognitive Functioning; Examining the Effects of using technology in education on Mental Capacity according to the data there is a decline in cognitive functioning this finding does not align with the existing literature as the studies states that technology in education enhances cognitive functioning such as attention, memory, and creativity(Wang & Hitch, 2017) (Adedokun, 2020). It facilitates effective learning techniques(Chodzirin, 2016) and boost productivity among learners(Hannula & Lonnqvist, 2011). Transforming the Learning Environment (Price, 2015) aims to create an engaging and supportive space for learning. Self-Directed Learning (Lalitha & Sreeja, 2020) encourages ownership and autonomy in education. Increased Use of Technology in Education opens up new possibilities for learning. Collaborative Knowledge Sharing (Bouton et al., 2021)(Nik Md Salleh et al., 2022) enhances learning through group work and information exchange. Flexibility in Learning goes beyond time constraints to improve learning outcomes(Nik Md Salleh et al., 2022). Accessibility(Fovet, 2022) and Convenience(Jang, 2015) make education more available and approachable. Recognizing the Limits and Benefits of Relying on External Resources; Evaluating the Role of Dependence on Technology-Enhanced Learning Platforms.(Narayanan , 2020) Quality of Knowledge Attained and Evaluating the Effectiveness and Value of Education (Welsh, 2021). Hybrid and Blended Learning combines traditional and digital methods to optimize learning outcomes(Mbaka & Mwenda, 2021). By considering these codes, individuals can embrace transformative study habits that enhance learning and productivity in a dynamic educational landscape.

The second theme that emerged examined the advantages of incorporating technology in education: how ai tools and digital learning platforms can boost learning outcomes encompasses a set of codes that highlight the numerous benefits of integrating technology into the educational setting. Technology in education offers learners greater flexibility allowing them to manage their time and efforts more effectively(Nik Md Salleh et al., 2022). The use of AI tools and digital learning platforms enhances organization and accommodates various learning styles(Schoeb et al., 2020). Learners gain access to educational resources and have the freedom to learn at their own pace through digital platforms(Pan, 2022). Moreover, technology in education is expected to contribute to learners' career growth(González-Sanmamed et al., 2017) and help achieve a work-life balance(Berry & Hughes, 2019). It also provides a means to avoid social judgment(Wilkinson et al., 2018) and promotes personalization to cater to individual needs(Ifenthaler et al., 2018). Technology offers access to diverse resources(Jamil & Kusmaladewi, 2022), helps in time management and schedule maintenance (Haleem et al., 2022), and improves the overall quality of education received by learners(Daineko et al., 2016). Additionally, the integration of technology in education provides a range of varied and engaging learning experiences that are liberating, fascinating, and enjoyable for learners(Raja & Nagasubramani, 2018).

The third theme emphasises on the drawbacks of relying solely on technology in education; examining the potential negative effects of ai tools and digital learning platforms encompasses a series of codes that shed light on the potential drawbacks associated with relying heavily on technology in the educational context. Easy access to technology can lead to distractions(Chen et al., 2020), diverting learners' attention from studying and resulting in decreased productivity the finding is at odds with the existing body of literature(Hannula & Lonnqvist, 2011). Relying solely on technology for education can increase trends of procrastination among learners(Türel & Dokumaci, 2022). Additionally, the overuse of technology can have adverse effects on learners' physical health(Halupa, 2016). The vast amount of information available through technology can contribute to increased anxiety levels among learners(Shi et al., 2020). Relying solely on technology may also lead to decreased social engagement(Bergdahl et al., 2019) and reduced physical activity(Alotaibi et al., 2020). Furthermore, the credibility of information obtained through technology may be perceived as less reliable as compared to traditional sources (Cukurova et al., 2019). It is important to acknowledge these potential negative effects as part of a comprehensive examination of the role of AI tools and digital learning platforms in education.

The fourth theme addressed the challenges and obstacles in technology-enhanced learning encompasses several codes that highlight the difficulties faced in the implementation of technology-enhanced learning. Technical issues can pose a significant challenge, impacting the seamless integration and functioning of technology in the learning process(Sackstein et al., 2019). Learners may face varied types of distractions while engaging in technology-enhanced learning(Chen et al., 2020). Additionally, providing adequate space and resources to accommodate learners from low socioeconomic backgrounds can be a challenge, ensuring that they have equal access to technology-enhanced learning opportunities, to combat the digital divide (Oulmaati et al., 2017). Such challenges need to be acknowledged and addressed to create an effective and inclusive learning environment for students.

The fifth theme highlights the advantages of conventional learning approaches; understanding the benefits of traditional teaching methods encompasses two codes that highlight the benefits associated with traditional teaching methods. Conventional learning approaches ensure better interaction between learners and educators(Mendini & Peter, 2018), fostering meaningful and dynamic exchanges that promote effective learning(Yusuf et al., 2020)(Bylieva et al., 2019). Additionally, these approaches promote better engagement among learners, facilitating active participation and deeper comprehension of the subject matter(Bylieva et al., 2019)(Gómez-Ejerique & López-Cantos, 2019). Recognizing these advantages provides insights into the value of traditional teaching methods in creating engaging and interactive learning environments.

The sixth theme addressed limitations of conventional learning approaches; identifying the problems with traditional teaching methods includes two codes that highlight the drawbacks associated with traditional teaching methods. One limitation is that traditional teaching methods often demand learners to exert significant hard work and sustained effort to grasp and retain information(Kirk-Johnson et al., 2019). Additionally, conventional learning approaches face limitations due to a lack of access to resources and inefficient utilization of available resources, which can hinder the overall effectiveness of the learning process(Aldowah et al., 2015). Recognizing these limitations sheds light on the challenges and areas for improvement within traditional teaching methods.

The seventh theme emphasised on concerns surrounding the use of technology in education; exploring the potential risks and issues encompasses several codes that highlight the potential drawbacks and risks associated with the integration of technology in education. Overdependence on technology(Deniz & Geyik, 2015) emerges as a major concern, as it may hinder learners' ability to develop crucial skills and knowledge independently. There are concerns that the use of technology in education may negatively impact creativity, potentially limiting innovative thinking and problem-solving abilities the finding that is at odds with the existing body of literature(Daher & Anabousy, 2018). Additionally, risks such as procrastination and laziness can arise from the easy accessibility and distractions presented by technology(Türel & Dokumaci, 2022). Moreover, overreliance on technology may lead to reduced retention and memorization of information, findings that is at odds with the existing body of literature (Price & Kadi-Hanifi, 2011). Understanding these concerns is essential for implementing technology in education responsibly and mitigating any potential risks.

Finally, the eighth theme examined theme the impact of AI on education; assessing the effect of using artificial intelligence in teaching and learning explores the influence of artificial intelligence on education and encompasses two specific codes. One area of concern involves the potential for learners to experience guilt or negative emotions in relation to the use of AI in education This finding is consistent with existing literature that has identified potential ethical concerns related to the use of AI in education, such as concerns about privacy, accountability, and bias(Zhai et al., 2021). Focusing on the emotional impact on students is crucial in maintaining their well-being and promoting a positive learning environment. Additionally, the perspective of highly sensitive individuals is considered when assessing the overall impact of AI on education(Seo et al., 2021). Recognizing and addressing their unique needs is important for creating inclusive and supportive learning experiences. By considering these aspects, educators and researchers can gain insights into the effects of AI in education and develop strategies to optimize its implementation.

The above findings focus on the need to combine traditional teaching methods with technology-enhanced learning to give students a well-rounded education.

Conclusion

Overall, this research paper explored the impact of technology-enhanced learning using digital platforms and AI tools on university students' study habits through focus group discussions. Thematic analysis revealed eight key themes, including changing study habits, advantages, and drawbacks of technology in education, challenges in technology-enhanced learning, benefits and limitations of conventional teaching methods, concerns surrounding technology use, and the impact of AI on education. The findings largely align with existing literature, except for certain negative effects associated with technology use. These include a decline in creativity, reduced cognitive functioning, decreased retention and memorization, and lower productivity. It is crucial to consider these findings when integrating technology in education, aiming for a balanced approach that maximizes benefits while addressing potential drawbacks.

Limitations

Limitations of this research include a small sample size of 19 participants, potential bias in thematic analysis, limited exploration of certain themes, reliance on focus group discussions, and the contextual and temporal constraints that may affect the generalizability and relevance of the findings.

Implications

The study's implications suggest a balanced integration of technology in education, acknowledging changing study habits, addressing challenges in technology-enhanced learning, and considering concerns about technology use. Educators should adapt teaching methods, provide support, and promote digital literacy. Future research should explore strategies to mitigate negative effects and investigate the long-term impact of AI on education.

Direction for future research

Future research should focus on exploring the long-term effects of technology-enhanced learning, investigating strategies to mitigate negative effects, conducting comparative studies to evaluate different educational approaches, exploring the specific impact of AI tools, examining student perspectives, and studying the effectiveness of teacher training and support programs.

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