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Student Perceptions of Emerging Educational Technologies: Effects on Engagement, Motivation, and Learning Experiences in Private Schools of Karachi

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ABSTRACT

The rapid integration of emerging educational technologies has transformed school learning environments by creating interactive, personalized, and student-centered learning experiences. The present study explored the perceptions of students regarding emerging technologies and its effect on engagement, motivation, satisfaction and learning experiences in private schools of Karachi. The design of the study was quantitative cross sectional with 210 students who were taken as samples using the convenience sampling technique. Data were collected by using a structured questionnaire and analyzed by SPSS which consisted of descriptive statistics, reliability analysis, correlation, t-test and regression analysis. The results indicated positive attitudes among students with regard to the use of various educational technologies such as artificial intelligence, augmented reality, virtual reality, simulations, and gamification. There were significant positive relationships between technology perception, engagement, motivation and learning experiences. Technology satisfaction was the most significant predictor of better learning experiences. The study highlights the importance of meaningful, student-centered technology integration in improving educational practices.

Introduction

Background of the Study

Digital technologies have rapidly evolved and shifted the landscape of education; impacting the way teaching and learning is designed and experienced. In the recent years, educational technologies such as Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), educational simulations, and gamification have been introduced into schools to make learning more interactive and centered on the student. Technology-supported learning environments promote students' active engagement in learning, exploration, collaboration with others, and the building of knowledge in meaningful ways, rather than in teacher-led classrooms. The potential of Artificial Intelligence-based systems to assist personalized learning and adapt content based on students' needs, combined with the possibilities of immersive technologies such as AR and VR for visualization and experiential learning (Baltezarević & Baltezarević, 2024; Wang et al., 2024) can be mentioned. These tools can be used to enhance conceptual understanding by delivering challenging concepts in interactive models and simulations. But the successful integration of technology is not only a matter of availability of technology, but it is also related to students' acceptance, attitudes and

perceptions towards the use of these innovations. Students' experience is therefore crucial for the effective application of these new technologies in the field of school education.

Emerging Educational Technologies in School Education

In recent years, new educational technologies have been entering the school environment to improve learning quality and student engagement. Augmented Reality (AR) – the ability to attach digital information and 3D objects to the real world can help students to visualize abstract concepts and interact with learning materials. Previous studies have shown that AR can facilitate conceptual understanding, inquiry-based learning, and collaboration, as it can provide visual representations that can be difficult to achieve with traditional learning methods (Vidak et al., 2023). Virtual Reality (VR), however, provides immersive digital environments, enabling students to immerse themselves in simulated situations, virtual field trips, and experiential learning activities. In such learning environments, learners can learn complex concepts by interacting with them rather than just observing them (Radianti et al., 2020; Pellas et al., 2023). Through educational simulations students are given opportunities to apply their problem-solving skills in a safe environment where they can try, decide and learn about real life processes. Likewise, gamification uses game-like features, like points, challenges, rewards, and competition, to boost student engagement and motivation. There are recent studies that show that the use of gamification learning strategies can positively affect the involvement and willingness of students in learning activities (Sailer & Homner, 2020; Zainuddin et al., 2024).

Students' Perceptions of Educational Technologies

Student perceptions are important to the success or failure of education technology to produce the desired results. Factors that impact on the acceptance and effective use of digital learning tools include perceived usefulness, ease of use, enjoyment and satisfaction. Davis (1989) has presented the Technology Acceptance Model (TAM) in which people tend to use a technology when they think that it enhances their performance and usage is easy. In school environments, students who view technology as a positive and fun experience will be more likely to use and actively utilize the technology-based learning platforms. Recent studies have shown that while students are generally aware of the potential of AI tools for education, there are also concerns about the accuracy, privacy, and excessive reliance on AI in learning (Wang et al., 2024). Likewise, studies on the use of AI in education emphasize that student attitudes towards its acceptance depend on its usefulness and the value it provides to aid, but never supplant, current teaching methods (Mulaudzi & Hamilton, 2024). Thus, analysing students' perceptions can offer important insight into effective integration of emerging technologies into school learning environments.

Emerging Technologies and Student Engagement

More and more, the application of educational technologies has been correlated with the improvement of various aspects of student engagement such as behavioral, emotional, and cognitive engagement. Behavioral engagement is related to the students' participation and involvement in learning activities while emotional engagement is related to the students' interest and positive attitudes, and cognitive engagement is related to the students' willingness to invest effort in understanding complex concepts. Students are actively engaged in learning with the interactive digital tools, they don't just hear information. Students can, for instance, go through learning situations as a VR experience, increasing their curiosity, attention and emotional involvement (Grewe & Gie, 2023). Likewise, AR applications and educational simulations allow students to engage with learning contents, encouraging students to explore and collaborate. According to Ghanbaripour et al. (2024), a systematic review of emerging technologies revealed that immersive technologies and gamification methods can boost student engagement by fostering active and meaningful learning experiences. Thus, the technology-based classroom can transform learning from a passive receipt to an active process and construction of knowledge.

Technology and Learning Motivation

Emerging educational technologies also influence students' motivation by increasing interest, curiosity, and willingness to participate in learning activities. When students enjoy learning, have some choice in what they do, and feel like it is relevant to them, they are intrinsically motivated. Gamification, interactive simulations, and immersive environments can enhance students' learning opportunities and motivate them to explore and challenge. Gamified learning environments involve the implementation of systems of achievement and reward, and are interactive in nature, which encourages students to persist and participate. Sailer and Homner (2020) conducted a systematic review on gamification and its impact on motivation and learning behaviors,

concluding that gamification could have a positive effect when it is properly aligned with learning goals. Likewise, VR can facilitate experiential learning by enabling students to engage with real-world scenarios, fostering a more immersive learning experience. The experiences can motivate self-directed learning, allowing students to take more responsibility to explore and solve information problems on their own. Technology-based learning environments can therefore enhance students' motivation to learn by creating meaningful and interesting learning experiences.

Technology-Enhanced Learning Experiences

Technology enhanced learning has helped to create student-centred learning spaces in which students are active contributors to the creation of knowledge. Digital technologies enable personalised learning by enabling students to access resources in response to their own learning speed, preferences and capabilities. AI systems can help evaluate students' work and offer tailored suggestions, while interactive platforms can offer real-time feedback for learners to reflect on, suggesting strengths and areas for improvement (Baltezarević & Baltezarević, 2024). Moreover, simulations and immersive technologies foster creativity, critical thinking, and problem-solving by enabling students to explore various solutions in a more realistic setting. These strategies are not based on memorization but rather on the deeper understanding. The effect of the use of technology for learning, however, is dependent on the way the students are experiencing the use of the technology and engaging with it. Thus, it is important to examine what students think about technology-supported learning experiences to determine if these new technologies are actually enhancing students' learning.

Problem Statement

Despite substantial growth in research on educational technology, prevailing research literature has been on issues related to teachers' readiness and professional development as well as adoption problems with technology. Few studies have focused on student views of the impact of new educational technologies on their engagement, motivation, and overall learning experiences. As the main users of technology-based learning environments, students' perceptions are the ones that influence the acceptance and utilization of technology innovation. There is very limited empirical evidence about the experiences of students with the new technologies including AI, AR, VR, simulations, and gamified learning platforms in Pakistan, especially in private schools of Karachi. As digital technologies are increasingly being integrated into the classroom in private schools, little research has examined student perceptions of their usefulness, enjoyment and supportive nature for learning. This misconception necessitates more research into the perceptions and experiences of students in order to make sure that technology is being appropriately integrated into school education.

Research Gap

The research on the educational uses of technology has primarily addressed issues of technology acceptance, student achievement, teacher readiness, and implementation barriers. While these studies offer important perspectives, researches on student satisfaction, technology preference, engagement, motivation and learning experiences have not received much attention especially in the private school setting of Pakistan. International studies have shown that educational technologies have the potential to create an interactive, collaborative, and learner-centered education environment, leading to increased student engagement and motivation (Bedenlier et al., 2020; Kowitlawakul et al., 2022). The results of educational technology, however, can be different under different cultural conditions, institutional conditions and technological conditions. While there is some evidence from private schools in Pakistan that digital tools can help to facilitate learning improvement and student participation (Hussain et al., 2021), there is little research investigating students' understandings of new technologies like AI, AR, VR, simulations and gamification. Hence, the gap in this study is to explore students' perception of emerging educational technologies and their impact on their engagement, motivation, and learning experiences in private schools of Karachi.

Research Objectives

1. To examine students’ perceptions of AR, VR, simulations, and gamification in classroom learning.
2. To investigate the impact of emerging technologies on student engagement and motivation.
3. To explore the perceived benefits and challenges of technology-enhanced learning from students’ perspectives.

Research Questions

RQ1: What are students' perceptions regarding the use of AR, VR, simulations, and gamification in classroom learning?

RQ2: How do emerging educational technologies influence students' engagement and learning motivation?

RQ3: What benefits and challenges do students experience through technology-enhanced learning?

Emerging Educational Technologies and School Learning

The implementation of new education technologies has revolutionized the educational environment in schools, bringing in new approaches to learning, which are more interactive, adaptive and learner-centred. Learning systems based on Artificial Intelligence (AI) have been attracting a lot of interest because they can capture students' learning behaviors, give them personalized advice and assist in adaptive teaching. AI's potential in creating adaptive learning paths has been shown in recent studies, which reveal that AI-driven systems have the ability to tailor learning content to learner needs and progress (Almasri, 2024). Moreover, new technology-based motivational strategies have shown that AI, adaptive systems, and digital learning tools can also help to improve students' motivation by offering personalised and engaging learning experiences (Alé & Arancibia, 2025).

Likewise, Augmented Reality (AR) and Virtual Reality (VR) technologies have opened up opportunities for students to experience learning in an immersive setting, enabling them to see abstract concepts and engage in experiential learning. Radianti et al. (2020) emphasized that VR applications can be used to create deep engagement by providing students with opportunities to interact with realistic virtual environments. Use of digital simulations further enriches learning through the provision of opportunities for practical problem-solving and experimentation. Furthermore, the gamified learning approaches focus on promoting the engagement and motivation of learners through gamification elements, such as reward, challenge, and feedback mechanisms (Sailer & Homner, 2020). Recent evidence further indicated that educational technology innovations have a beneficial impact on students' motivation and learning outcomes as long as they are able to provide interactive and supportive learning environments (Mustamin et al., 2025). These technologies all play a role in enhancing conceptual understanding and in providing meaningful learning experiences.

Technology Acceptance among Students

Successful technology integration in schools is partially dependent on students' acceptance of educational technologies. Davis (1989) developed the Technology Acceptance Model (TAM) that states the perceived usefulness and perceived ease of use are the main factors that influence the adoption of technology. TAM says the higher the students' perceived impact on their learning and the easier the tools are to use, the more likely they are to use digital learning resources. In an educational environment, perceived usefulness is defined as students' evaluations of the usefulness of technology to enhance understanding, achievement, and learning efficiency, while perceived ease of use is defined as the ease and accessibility of technology.

Additionally, students' attitudes toward technology and their behavioral intention to use digital platforms are also important predictors of technology use. Research on AI and Digital Learning Environments indicates that students' attitudes towards educational technologies are influenced by their perceived value, ease of use, trust in the technology, and its learning benefits (Almasri, 2024). Thus, it is crucial to understand students' acceptance of emerging technology for effective technology-supported learning environment and that positive technology perception plays an important role in students' further participation and satisfaction with digital learning materials (Pandita & Kiran, 2023).

Student Engagement using Educational Technologies

It is believed that the use of educational technologies has been widely linked to the improvement of students' engagement, through their interaction, participation, collaboration and attention during the learning process. Interactive online platforms enable students to immerse themselves in learning content rather than simply being fed it to them. Recent research shows that students feel positive about the value of technology-supported learning in the classroom when it enhances classroom interactions, participation, and engagement (Heilporn et al., 2025).

In a way, AR and VR environments stimulate students' action in experiential activities that can lead to strengthening of cognitive involvement and the emotional involvement of the students in learning activities (Radianti et al., 2020). Digital simulations enable students to engage in collaborative problem solving and to apply knowledge through simulations of real-life situations. Likewise, gamified learning settings can stimulate participation by incorporating more complex and interactive learning activities, which help capture students' attention and interest. When game elements align with educational goals, Sailer and Homner (2020) noted that gamification is able to positively affect motivational and behavioral outcomes. Research findings support these results, demonstrating that educational technologies have a positive impact on student engagement by fostering active learning, interaction, and meaningful experiences in learning (Godsk & Møller, 2024). Furthermore, evidence from the private school context in Karachi also shows that technology can play a positive role in maximizing student engagement by supporting and stimulating interaction and digitally based learning practices (Jawed et al., 2025). Therefore, the emergence of technologies helps to engage students in learning through active, participatory and meaningful learning experiences.

Learning Motivation and Digital Technologies

Digital technologies have an impact on students' motivation as they make learning activities more interactive, fun and meaningful. One of the most widely researched strategies for motivating through rewards, achievement systems, some challenges and the immediate feedback is gamification. These features can support them to be actively involved and sustain their learning activities. Sailer and Homner (2020) reported that the gamified learning method can improve motivational results in order to meet the needs of students for achievement and competence.

More recent research has also shown that digital educational games can enhance students' motivation through engagement and offer fun learning opportunities (Li et al., 2024). Likewise, AI-driven gamification strategies have proven to boost student participation and performance in learning, through the use of tailored feedback and dynamic learning features (Dahri et al., 2025). Furthermore, interactive content, simulations and immersive technologies give students opportunities to investigate concepts on their own and build self-directed learning behaviors. If students are able to learn with technology as an independent and enjoyable experience, they might become more intrinsic motivated. It is therefore expected that digital learning environments can enhance pupils' interest, perseverance and desire to engage in school activities.

Learning Experiences and Technology Satisfaction

Technology-supportive learning experiences are becoming more personalized, fun, satisfying, and knowledge-constructive. AI-based systems can offer personalized learning experiences by analyzing individual student performance and suggesting appropriate learning materials, thereby adapting support to students' strengths and weaknesses (Almasri, 2024). Interactive technologies allow students immediate feedback to show progress and enhance understanding as well.

VR and simulation-based environments can facilitate knowledge construction because students can construct knowledge by inquisitively exploring and experiencing the learning environment instead of memorizing knowledge from others (Radianti et al., 2020). Recent studies indicate that the positive interface of technology has a positive impact on students' satisfaction by enhancing interaction, access, and learning value (Pandita & Kiran, 2023). Students' satisfaction depends on the usability, engagement, perceived learning benefits and enjoyment of educational technologies. Technology acceptance and use can be fostered by positive learning experiences.

Technology Preferences and Student Choices

The learning technologies students prefer come from several factors; ease of use, accessibility, entertainment value, and perceived learning effectiveness. Students are more likely to prefer technologies that are simple, engaging, and have a benefit in terms of meaningful learning. The integration of technology-based learning approaches could be enhanced by digital platforms that include interactive elements and personalized support.

However, students cannot be compelled to use technologies that they find hard to access, complicated to use, or ineffective in learning. Therefore, understanding student preferences is important for schools when selecting and implementing educational technologies because students' perceptions and choices directly influence successful technology adoption and sustained engagement.

Challenges of Technology-Enhanced Learning

Although there are advantages to using educational technologies, there are some potential pitfalls that might hinder their successful use in the school environment. However, there is still a technological infrastructure that is limited, internet connections that are not reliable, no technical support and lack of access to digital resources, especially in educational context. Also, reliance on digital tools can cause distraction and affect students' concentration on learning activities.

Students' attitudes towards the adoption of emerging technologies could also be affected by privacy concerns, ethical considerations, and technological challenges (Almasri, 2024). Thus, the integration of technology needs to be supported by infrastructure, teacher support, student guidance, and institutional planning. Implementing this successfully requires technological innovation, along with suitable pedagogical practices and institutional readiness (Heilporn et al., 2025).

Conceptual Framework

The conceptual framework of this study depicts the link between the emerging technologies in education and the learning experiences of the private school students of Karachi. The framework assumes that the use of emerging technologies such as Augmented Reality (AR), Virtual Reality (VR), learning simulations and gamification will positively affect students' learning results through the increase of their involvement, motivation and satisfaction level in the technology-supported learning environments. The emerging educational technologies are recognized as the independent variable; as they offer interactive, personalized and immersive learning opportunities that can change the way students learn in the classroom (Radianti et al., 2020; Sailer & Homner, 2020; Alé & Arancibia, 2025).

Influencing variables are proposed to be student engagement, student learning motivation, and student satisfaction with technology. Interactive technologies foster active participation, collaboration, curiosity and boost in cognitive engagement, thus leading to increased engagement (Godsk & Møller, 2024; Heilporn et al., 2025). Likewise, gamification, immersivity, and customization of digital materials can boost the intrinsic motivation and readiness of students to engage in learning activities (Sailer & Homner, 2020; Li et al., 2024). The principles of Technology Acceptance Model (T. A. Davis, 1989) are adopted to identify other factors affecting students' acceptance and further engagement with educational technologies, which include technology satisfaction as a result of perceived usefulness, ease of use and enjoyment.

The framework outcome variable is students' learning experience, which is manifested as knowledge construction, conceptual understanding, creativity, and satisfaction with the learning process. Recent studies have suggested that technology-augmented learning spaces can enhance the learning environment by creating opportunities for personalized, interactive, and experiential learning (Almasri, 2024; Mustamin et al., 2025).

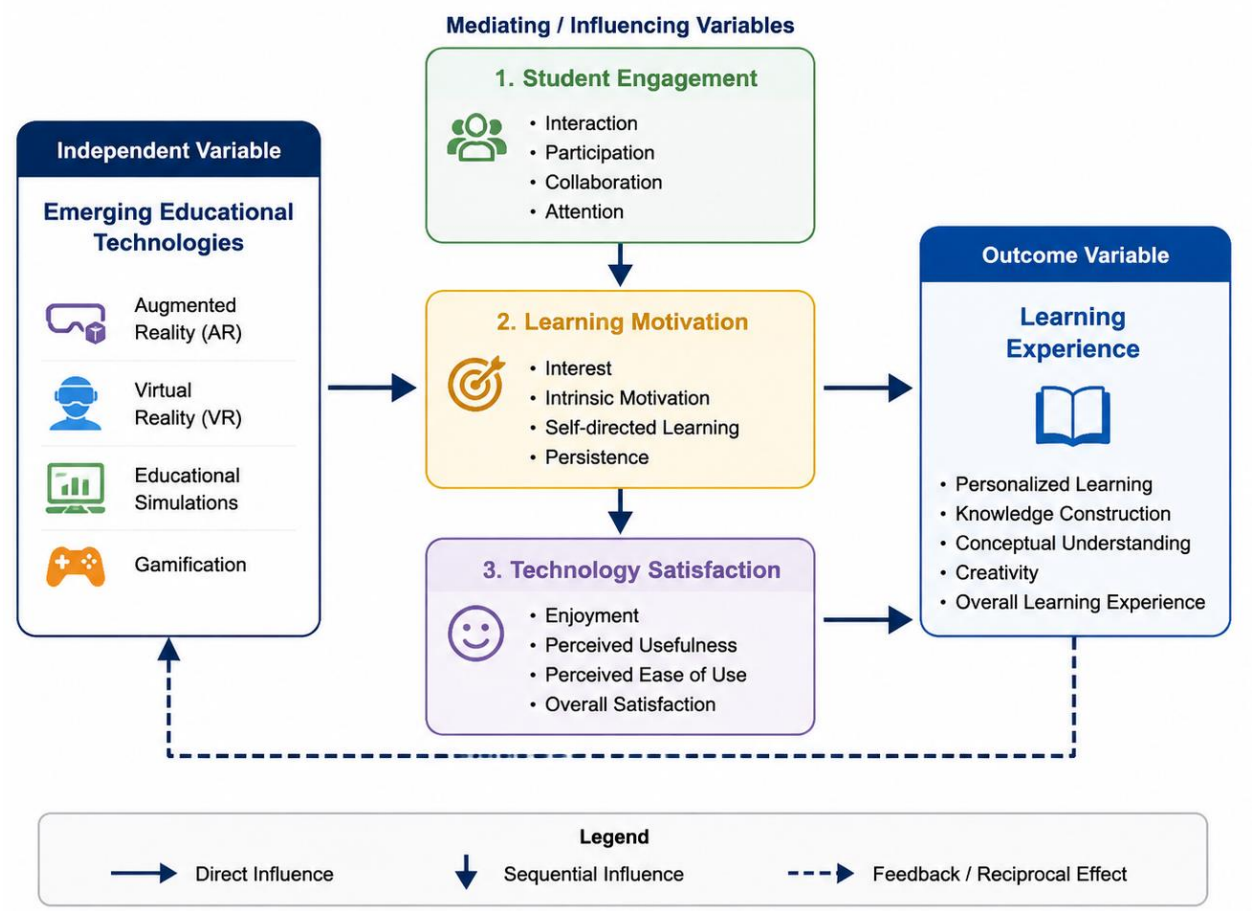

Figure 1. Conceptual Framework of the Study

Methodology

Research Design

This study adopted a quantitative research approach using a cross-sectional survey design. The quantitative approach was chosen because the study was to measure students' perceptions of emerging education technologies and explore the relationship among the students' perceptions, engagement, motivation, technology satisfaction, and learning experiences with statistical analysis. A cross-sectional design was used because the data was gathered at one specific time to uncover any patterns and relationships between the variables of the study. Survey research designs are commonly used in educational research to investigate attitudes, perceptions and behavioral factors in large populations of people (Creswell & Creswell, 2017).

Research Philosophy

The research philosophy that was used in the study was the positivist. The positivist theory holds that social phenomena are measurable, systematically observed and treated quantitatively. This philosophy was suitable because the study aimed at measuring the students' perception and examines the relationship between the variables in the study by applying statistical techniques.

Research Approach

This study used the deductive approach of research. The deductive approach enabled the researchers to test theoretically grounded relationships between new educational technologies, student engagement, learning motivation, student satisfaction

with the technologies, and students' learning experiences. The conceptual model was derived from literature review and Technology Acceptance Model (TAM) developed by Davis (1989) while hypotheses were investigated based on empirical data.

Population

The population of the study comprised the students of the private schools of Karachi, Pakistan. The population was selected due to the increased use of digital learning resources and technology based teaching methods in private schools environments in Karachi.

Participants

The study was conducted on a sample of 210 students of Karachi from the private schools. The participants were chosen because they were available and had experience in technology support learning activities. Sample size was deemed to be adequate to undertake quantitative analyses such as correlation and regression.

Sampling Technique

The sampling technique adopted for the selection of the participants was the convenience sampling technique. The method was chosen as it enabled access to students who were available and willing to take part in the study. Convenience sampling can be used in education-based research when the researcher can easily obtain data from a participant group within an institutional environment (Stratton, 2021).

Research Instrument

Data were gathered using a structured questionnaire comprising of six sections. Demographic information such as gender, age, grade level and the type of school was gathered in section A. Section B assessed students' perceptions of new educational technologies such as Augmented Reality (AR), Virtual Reality (VR), educational simulations and gamification. In Section C, student engagement and in Section D learning motivation were evaluated. Section E was used to assess students' learning experience, and Section F was used to assess technology satisfaction and preferences.

All items were rated on a 5-point Likert scale from 1 = Strongly Disagree to 5 = Strongly Agree. Likert scale questionnaires are commonly used in educational research to assess attitudes, perceptions, and psychological constructs (Taherdoost, 2022).

Data Analysis

Analysis of collected data was done by using the Statistical Package for Social Sciences (SPSS). Frequency, mean, and standard deviations were used to describe the participant characteristics and study variables. Cronbach's Alpha was used to assess the internal consistency of items on questionnaires in a reliability analysis.

Independent samples t-tests were conducted to determine the differences between groups including gender (male and female students). The correlation analysis was used to analyze the relationship between technology perception, student engagement, learning motivation, technology satisfaction and learning experience. A multiple regression analysis was carried out to determine significant predictors of student learning experiences such as student engagement, learning motivation, and students' satisfaction with technology.

Results

Demographic Profile of Respondents

Desccriptive statistics of the respondents' demographic characteristics were presented in terms of frequency and percentage distribution. A total of 210 students studying in private schools of Karachi were studied. Demographic variables used were gender, age, grade level and school group.

Table 1: ***Gender Distribution of Respondents***

Gender	Frequency (n)	Percentage (%)
Male	112	53.3
Female	98	46.7
Total	210	100

The gender distribution of the participants is presented in Table 1. Out of 210 respondents, 112 (53.3%) were male students, whereas 98 (46.7%) were female students. The distribution suggests that there was a relatively balanced participation from both gender groups, thus giving representation of the student's perception across the male and female learners.

Table 2: ***Age Distribution of Respondents***

Age Group	Frequency (n)	Percentage (%)
12–14 years	82	39.0
15–16 years	96	45.7
17–18 years	32	15.3
Total	210	100

The results show that the majority of participants were in the age range of 15–16 years (45.7%), with the next largest being 12–14 years (39.0%). Few respondents were between 17–18 years (15.3%). This indicates that the study was predominantly composed of secondary level students who were exposed to technology based learning environments.

Table 3: ***Grade Level Distribution***

Grade Level	Frequency	Percentage (%)
Grade 7–8	74	35.2
Grade 9–10	102	48.6
Grade 11–12	34	16.2
Total	210	100

The majority of respondents were enrolled in Grade 9–10 (48.6%), followed by Grade 7–8 (35.2%). The 16.2% of students representing grades 11-12 were the next largest group in the sample. The distribution shows that the study involved secondary education students of various levels.

Table 4: ***School Group Distribution***

School Group	Frequency	Percentage (%)
Private School A	76	36.2
Private School B	71	33.8
Private School C	63	30.0
Total	210	100

The respondents were selected from three private schools of Karachi. The representation was reasonably even across schools, minimizing the risk that results might have been affected by one school context.

Descriptive Statistics of Study Variables

The students' perceptions on emerging educational technologies, engagement, motivation, learning experience and technology satisfaction were analysed by calculating descriptive statistics.

Table 5: ***Descriptive Statistics of Study Variables***

Variables	Mean	Std. Deviation
Technology Perception	4.02	0.61
Student Engagement	3.94	0.65
Learning Motivation	4.08	0.58
Learning Experience	4.12	0.55
Technology Satisfaction	4.05	0.60

The descriptive statistics show that students have some positive attitudes towards the emerging technologies in education. The students generally perceived technology-supported learning as beneficial and meaningful, as indicated by the highest mean score (M = 4.12, SD = 0.55) for Learning Experience.

Learning Motivation had a high mean score (M = 4.08, SD = 0.58) indicating that digital technologies motivated students to be interested and willing to engage in learning activities. The mean scores for the items of Technology Perception (M = 4.02, SD = 0.61) and the items of Technology Satisfaction (M = 4.05, SD = 0.60) were also positive for technology integration.

Reliability Analysis

Cronbach's Alpha was used to assess the internal consistency of the measurement scales.

Table 6: ***Reliability Analysis of Study Variables***

Variables	Number of Items	Cronbach's Alpha
Technology Perception	8	.89
Student Engagement	7	.87
Learning Motivation	6	.86
Learning Experience	8	.91
Technology Satisfaction	6	.88

Overall Reliability = .90

The reliability analysis shows that the reliability of all constructs in the study was satisfactory. Cronbach's alpha for these items ranged from .86 to .91, which are higher than the .70 recommended value. As a result, none of the measurement scales were considered to be unreliable or inappropriate for further statistical analysis.

Correlation Analysis

Pearson correlation analysis was carried out to explore the correlation of technology perception, student engagement, learning motivation, technology satisfaction, and learning experience.

Table 7: ***Correlation Matrix among Study Variables***

Variables	TP	SE	LM	TS	LE
Technology Perception (TP)	1				
Student Engagement (SE)	.62**	1			
Learning Motivation (LM)	.65**	.71**	1		
Technology Satisfaction (TS)	.68**	.64**	.70**	1	
Learning Experience (LE)	.72**	.69**	.74**	.76**	1

Note: $p < .01$

The correlation analysis shows that all variables in the study are positively correlated with each other in a significant way. The results for technology perception revealed a strong positive relationship with learning experience, $r(.72, p < .01)$, meaning that students who had more positive perceptions of educational technologies experienced better learning experiences.

The learning motivation also showed a strong correlation with learning experience ($r = .74$, $p < .01$); similarly, the technology satisfaction also showed the highest correlation with learning experience ($r = .76$, $p < .01$). The results indicate that positive perceptions, engagement and motivation and satisfaction in technology significantly impact technology enhanced learning experiences.

Independent Samples t-test

An independent samples t-test was performed to examine whether male and female students differed significantly in their perceptions of emerging technologies.

Table 8: ***Gender Differences in Study Variables***

Variable	Male Mean	Female Mean	t-value	Sig.
Technology Perception	4.01	4.03	-0.24	.81
Student Engagement	3.90	3.99	-1.03	.30
Learning Motivation	4.05	4.11	-0.77	.44
Technology Satisfaction	4.02	4.08	-0.71	.48
Learning Experience	4.08	4.16	-1.04	.29

The independent samples t-test identified no statistically significant difference between male and female students for technology perception, engagement, motivation, satisfaction, and learning experience ($p > .05$).

This means that the experience and assessment of the emerging educational technologies were comparable in both gender groups. Thus, gender would not seem to have a significant effect on students perceptions/experiences of technology-supported learning environments.

Regression Analysis

Multiple regression analysis was used to determine the significant predictors of students learning experiences.

Predictors:

- Student Engagement
- Learning Motivation
- Technology Satisfaction
- Dependent Variable:
- Learning Experience

Table 9: ***Model Summary***

R	R Square	Adjusted R Square	Std. Error
.82	.67	.66	.31

The model developed in the regression shows that the model accounts for the 67% of the variance in students' learning experiences ($R^2 = .67$). Means that students' engagement, learning motivation, and technology satisfaction together have good explanatory power of predicting technology-enhanced learning experiences.

Table 10: ***ANOVA of Regression Model***

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	54.62	3	18.20	189.43	.000
Residual	27.98	206	.136		
Total	82.60	209			

The regression model was significant with $F(3,206) = 189.43$, $p < .001$, suggesting that the selected predictors bear a significant relationship to the variations in students' learning experiences.

Table 11: ***Regression Coefficients Predicting Learning Experience***

Predictor	Beta (β)	t-value	Sig.
Student Engagement	.24	4.92	.000
Learning Motivation	.31	6.21	.000
Technology Satisfaction	.39	7.85	.000

The regression results showed that all three predictors were significant predictors of students' learning experiences.

The most notable predictor was technology satisfaction ($\beta = .39$, $p < .001$), meaning that students who were more satisfied with their learning experiences were those that were more satisfied with the use of the educational technologies.

Motivation to learn was also a significant predictor ($\beta = .31$, $p < .001$) as learning motivated students benefitted more from technology-supported learning environments. Active participation in the learning process had a significant positive effect ($\beta = .24$, $p < .001$), which was consistent with the findings of other studies that indicated that active learning improved learning experiences through technology.

Discussion

Students' Perceptions of Emerging Technologies

The results showed that students had positive perceptions towards the emerging educational technologies such as AR, VR, simulations and gamification. Students understand digital tools and know how to use them to help with learning in class, as reflected in the high mean score for technology perception (Imran et al., 2023). The results are compatible with earlier studies that found that students are more likely to adopt ed tech if they believe it is helpful, accessible, and promotes learning outcomes (Davis, 1989; Wang et al., 2024; Ramzan, Ahmad, & Noorani, 2025). Likewise, Baltezarević and Baltezarević (2024) found that students have a positive attitude towards AI-supported learning environments, as they offer personalized learning opportunities and enhance the efficiency of learning. Nonetheless, students' perceptions are shaped by technological availability, digital competency and institutional support.

Influence of Technology on Student Engagement

The findings showed that integration of technology had a significant positive correlation with student engagement. Digital learning tools help to ensure engagement by making students participate in learning activities, interact with each other, and collaborate (Ali et al., 2023; Jabeen, Ali, & Ahmad, 2023). The results of this study align with previous research showing that learners' engagement is enhanced through the use of immersive technologies, simulations and interactive platforms, in terms of their behavioral, emotional and cognitive involvement (Radianti et al., 2020; Ghanbaripour et al., 2024). Specifically, AR and VR

environments offer experiential learning experiences, fostering curiosity and deeper engagement. Likewise, with technology-supported learning environments, students can explore concepts on their own, collaborate with other students, and engage in meaningful activities (Heilporn et al., 2025; Oad et al., 2024; Faheem, Gulab, & Ahmad, 2025).

Impact on Learning Motivation

The results also showed that emerging technologies greatly affect students' learning motivation. The use of gamification, interactive activities, real-time feedback, and tailored learning materials boosts student engagement and motivation (Dilshad, Shah, & Ahmad, 2023). These findings correspond to those of Sailer and Homner (2020) that the positive effects of gamification are associated with motivational outcomes through challenges, rewards, and achievement-based learning experiences. Furthermore, Li et al. (2024) pointed out that digital educational games boost motivation by increasing engagement and creating a pleasant learning experience.

Technology Satisfaction and Learning Experience

Among the components of the learning experience, technology satisfaction proved to be the best predictor: Students who reported being satisfied with the use of technology in their learning also reported better learning outcomes (Haider, Ahmad, & Ali, 2024). This discovery lends credit to Pandita and Kiran (2023), who asserted that technology interfaces and student engagement greatly influence satisfaction. Likewise, adaptive systems and immersive technologies based on artificial intelligence enrich the learning process by facilitating personalized learning, feedback, and active construction of knowledge (Almasri, 2024; Aslam, Iqbal & Ahmed, 2022).

Challenges of Technology-Based Learning

However, there are some challenges in using technology in learning. Limited infrastructure, limited access to the Internet, technical issues and inadequate digital support pose a challenge for students. In developing countries, which can affect learning opportunities through unequal access to technology, these barriers are especially relevant (Hussain et al., 2021; Pirzada, Tabassum & Ahmad, 2024). Thus, sufficient infrastructure, teacher support, and institutional planning are needed for successful technology integration.

Theoretical Contribution

The findings add to educational technology theories as it aligns with the assumptions of the Technology Acceptance Model (TAM) and Constructivist Learning Theory. As with TAM (Davis, 1989), students' attitudes toward technology positively affected both the acceptance and learning experiences. Moreover, the results justify constructivist concepts, as they illustrated that emerging technologies could facilitate active learning, exploration, co-construction and knowledge construction. Using interactive environments, students are active participants, rather than passive receivers of information, in the creation of meaning. As such, the study builds on previous literature by proving the role of emerging educational technology in engagement, motivation, satisfaction and enhancement of learning experience among private school students of Karachi.

Practical Implications

The results of this research have implications for the education stakeholders. School leaders need to strategically plan to incorporate emerging technologies, including sufficient infrastructure, training for educators and technical support. Digital teaching should be learner-based and teachers can use interactive teaching methods, computer simulations, and gamification to make their lessons more engaging and motivating. Technology-based learning activities should be integrated into the curriculum that will foster creativity, collaboration and experiential learning. Policymakers need to promote equity in students' access to educational technology by investing in digital infrastructure and professional development programs. The designers of educational technology should create usable, accessible and pedagogically sound and relevant products based on the learning needs and context of students in the classroom.

Conclusion

This study aimed to investigate students' perception of new educational technologies, the impact of these technologies on engagement, motivation, learning experience and technology satisfaction in private schools of Karachi. The results indicated students' general positive attitudes to technologies like Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), simulations and gamification. The findings showed that there were significant positive relationships between technology perception, student engagement, learning motivation, technology satisfaction and learning experience. Through regression analysis, technology satisfaction, learning motivation, and student engagement also significantly predict students' technology learning experiences.

This study provides a contribution to the study of educational technology and focuses on the importance of recognizing the perspective of the primary users of digital learning environments – the students. Previous studies have tended to investigate teacher preparedness and technological implementation issues, whereas this study highlights students' experiences, preferences and the satisfaction of new technologies. The results are consistent with the principles of the Technology Acceptance Model and Constructivist Learning Theory, as they show that perceived usefulness, active participation, interaction, and knowledge construction are all factors that affect the success of technology integration.

Overall, the research found that technology integration should not be a mere introduction of the digital tool, but rather it should be related to meaningful and student-centered learning experiences. However, the successful use of new technologies must take into account how technology may relate to pedagogical approaches and students' learning needs as an integrated whole, in a way that fosters engaging, motivating and supportive learning environments.

Limitations

There are several limitations in this study that would have to be taken into account when interpreting the results. Firstly, the sample size received was 210 students, which might not be enough to extrapolate the results to larger populations of students. Secondly, the study was conducted in private schools of Karachi and thus the results may not apply to students from public schools and other educational settings. Thirdly, the cross-sectional design only measured students' perceptions at one time, without investigating changes in their technology experiences over time. Lastly, the study used self-reported responses which could be impacted by response biases, personal opinions and experiences of the participants.

Recommendations for Future Research

Future research should consider the following directions:

Include public schools: Future research should consider public-sector schools to allow for a comparison of technology use and learning experiences for all school types.

Carry out longitudinal research: Researchers should investigate the changes in students' perceptions, engagement, and motivation that occur over an extended period of technology usage.

Comparative studies: Differences in technology accessibilities and experiences of learning between rural and urban students should be explored.

Utilize mixed-methods: Future studies involve carrying out mixed-methods surveys and interviews or observations to get a deeper understanding of students' experiences.

Discuss academic achievement outcomes: Additional research should be conducted to investigate the direct effects of emerging technologies on academic achievement, grades, and/or learning outcomes.

Examine AI-specific learning tools: Future research should focus specifically on AI-based educational applications, personalized learning systems, and intelligent tutoring technologies to understand their educational potential and challenges.

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