

The Impact of Technology Integration on Student Engagement and Academic Achievement in Secondary Education: A Case Study of Schools in Multan City

Amna Naz

M.Phil. Education, Gomal University, Dera Ismail Khan, KPK

Email: naazparacha@gmail.com

Dr. Muhammad Anees ul Husnain Shah

Associate Professor, Department of Education, University of Education Lahore, D.G Khan Campus

Email: draneesulhusnain@ue.edu.pk

Dr. Sabir Hussain

PST, School Education Department (SED), Government of Punjab

Email: sabirjanmarri@gmail.com

Received on: 11-01-2025

Accepted on: 13-02-2025

Abstract

This study addresses how incorporation of technology has influenced involvement and achievement of students in secondary school in Multan City, Pakistan. With the increased adoption of digital technology in the education system, the research attempted to look at the impact of technology on student motivation, engagement and success in learning activities. A mixed method approach that utilized both qualitative interviews and statistical surveys of teachers and administrators was used. The results demonstrate that effective application of technology can significantly enhance student-to-student interaction leading to higher grades. However, in the study, barriers to technology access, a lack of teacher preparation, and possible distraction were also mentioned. It is suggested that to make participation of all students and their performance as fruitful as possible. Fund extensive teacher training programs to improve the successful penetration of technology into the classroom.

Keywords: Technology integration, student engagement, academic achievement, secondary education, Multan City, teacher preparedness, digital resources, educational equity, learning outcomes.

Introduction

Education technology is an important aspect of education system modernization in the world (Li, 2024). As digital tools and resources increasingly gain in usage, the potential of technology to improve student engagement and learning outcomes have become the subject of many educational research studies (Kalyani, 2024; Beetham & Sharpe, 2013; Anderson &

Becker, 2011). Education technology is particularly relevant in secondary education when the students are preparing to enter the work force or secondary education or tertiary education (Aithal et al., 2024).

The adoption of technology in the classroom, especially in cities like Multan City in Pakistan has been positive towards enhancing the learning process. According to recent study, technology can lead to more interactive and personalized learning and increase interest and educational results. Technological success, however, is not always predetermined and depends on other factors such as teachers readiness, availability of resources and the approaches to pedagogy utilized (Hutchison & Reinking, 2011; Ginsburg, 2004; Zhao et al., 2002; Ertmer, 1999). The purpose of this paper was to discuss the impact of technology in teaching and learning on student participation and achievement in secondary schools of Multan City, and what are the pros and cons of technology integration in teaching and learning process.

Literature Review

The literature has well documented student engagement and use of technology. Magliocca et al. (2024) and Fredricks et al. (2004) describe engagement encompassing emotional, behavioral and cognitive areas, which may be influenced by technology. Appropriate use of technology provides students with opportunities to participate in learning more actively, embrace critical thinking, and collaborate (Kalyani, 2024; Hennessy et al., 2010). Technology in education have a role to play in the increase in motivation that closely relates to an increase in academic performance (David & Weinstein, 2024; Skinner et al., 2009).

Technology and Student Engagement

Research has discovered that technology can significantly increase student interaction, particularly in classrooms, with the use of digital tools which are used in creating more interactive and student-centered learning environments (Ginting et al., 2024). In one of them, Lai and Hong (2015) found that online learning materials (e.g., multimedia presentation, online discussion platform, etc.) were closely linked to behavioral engagement of students, which aroused their inspirations to participate and collaborate more often. Along those lines, a study carried out on the middle schools in the U.S. found that when the students were given technology into their classes, they were more active and more successful in school and so much more in subjects like science and mathematics (Becker, 2000).

Moreover, technology also has the potential to support cognitive engagement because students can access information and resources at their pace and experience personalized learning (Hardianti et al., 2024; Harrison & Hennessy, 2007). Lessons online, the use of learning software and online learning environments enhance the cognitive processes of the students leading to deeper learning and better retention of knowledge (Ye et al., 2024; Mouza et al., 2013).

Technology and Academic Achievement

A number of studies have been indicating the positive impacts of technology in academic performance, particularly where technology is applied to supplement traditional means of teaching. Khalid et al. (2024) and Cheung and Slavin (2013) indicate that the use of

technology-based learning environments has been associated with improved academic performance of students due to opportunities to deliver differentiated instructions as well as to provide instant feedback. Also, it has been associated with superior comprehension of intricate ideas and an improved academic performance (Tuzun et al., 2009).

Nonetheless, technology has not been shown to affect everyone positively (Cabellos et al., 2024). According to research conducted by Nurhidayat et al. 2024 and Hattie (2009), technology may improve academic achievement; however, its effectiveness largely depends on the manner in which it is used in the classroom. Consider the example of the integration of technology that is not linked to instructional purposes or that lacks adequate support on the part of the teacher (Abedi, 2024). It may not lead to meaningful academic returns. This emphasizes the significance of teacher readiness and the value of professional growth in order to assert that technology can be effectively applied in the classroom (Mouza, 2009).

Challenges in Technology Integration

Although the outcome of technology use is encouraging, there are various challenges to the successful usage of technology especially in developing nations such as Pakistan (Hyder et al., 2024). Among the challenges, there is unequal access to digital resources. Computers, tablets, and reliable internet connections, which are necessary to thoroughly implement technology in classrooms, are frequently unavailable to students in many urban and rural schools in Pakistan (Baig & Jamil, 2020; Khan & Iqbal, 2020). Whereas the digital divide between schools in the wealthy and less-fortunate areas intensifies the underlying disparities in educational opportunities (Patel & Soni, 2018).

There is also a problem of teacher preparedness and absence of program to prepare professionals. On one hand, we have those teachers who can easily use digital tools since they are trained and assisted to use them (Tondeur et al., 2017). Conversely, not all teachers have access to digital tools due to the lack of training and being provided with the relevant support (Tondeur et al., 2017). To be efficient in improving student engagement and achievement, teachers must not only have access to digital solutions, but must feel at ease using them in teaching (Ertmer & Ottenbreit-Leftwich, 2010).

Research Questions

This study aims to address the following research questions:

1. How does technology integration impact student engagement in secondary schools in Multan City?
2. What is the relationship between technology use and academic achievement in these schools?
3. What challenges do teachers and students face in integrating technology into classrooms?
4. How can schools ensure that technology integration is equitable and effective for all students?

Methodology

Mixed-methods research design was used to understand the association between technology

integration, student involvement and academic achievement. Four secondary schools in Multan City were chosen to gather data about the schools, which represent different degrees of technology utilization. There were 400 students (n=400), 40 teachers (n=40), and 8 school administrators (n=8).

Sampling and Participants

The schools were sampled according to their geographical setting (urban, sub-urban, and semi-rural) and different technological incorporation. Stratified sampling was employed so that different schools with various socio-economic backgrounds could take part in the study. This is the best sampling technique to use in order to guarantee the sample is representative of the population (Cohen et al., 2017).

Data Collection

A student engagement survey was used to collect quantitative data and measured emotional, behavioral, and cognitive engagement. Also, schools provided academic performance results, such as grades and standardized test scores. Semi-structured interviews conducted among teachers and administrators focused on their experience of technology integration and the problems they encountered served as a source of qualitative data.

Data Analysis

The survey data was analyzed using descriptive statistics (mean, standard deviation). The study utilized multiple regression analysis to determine how technology use, student engagement and academic achievement relate to one another. The thematic analysis of the qualitative data was conducted to determine the recurring issues and findings about the use of technology.

Results

Descriptive Statistics

The findings showed that integration of technology positively influenced student engagement. The average student engagement score was 3.80 meaning that students were highly or moderately engaged in the classroom where technology was frequently in use. The mean score in academic achievement was 86.4, and students in these classrooms appeared to be doing better than in traditional classrooms.

Table 1: Descriptive Statistics for Student Engagement and Academic Achievement

Variable	Mean	Standard Deviation	Minimum	Maximum
Student Engagement Score	3.80	0.48	2.50	4.90
Academic Achievement Score	86.4	6.00	72	98

Inferential Statistics

The result of the regression analysis indicated that academic achievement was significantly predicted by both technology use (B = 0.40, p < 0.001) and student engagement (B = 0.52, p < 0.001). This backs up the hypothesis that integration of technology positively affects the performance of students.

Table 2: Inferential Statistics (Multiple Regression Analysis)

Predictor Variable	Coefficient (B)	Standard Error	t-value	p-value
Technology Use	0.40	0.10	4.00	<0.001
Student Engagement	0.52	0.09	5.78	<0.001
Teacher Preparedness	0.30	0.12	2.50	0.014

Discussion

This study results are consistent with the findings of other studies that have shown that technology has a beneficial impact on the engagement and academic performance of students (Becker, 2000; Cheung & Slavin, 2013). The large correlation among student engagement and academic achievement ($B = 0.52, p < 0.001$) supports Fredricks et al. (2004) who also opined that engaged students are more successful in school. Correspondingly, the favorable effect of technology on academic performance ($B = 0.40, p < 0.001$) substantiates the study of Cheung and Slavin (2013) who have discovered that academic performance is improved by using technology effectively.

Nevertheless, a limitation of the study was also the difficulties in teacher preparation and resource access. The significance of offering teachers professional development opportunity in enabling them to incorporate technology in their teaching activities is highlighted by the positive correlation between teacher preparedness and academic achievement ($B = 0.30, p = 0.014$) (Ertmer & Ottenbreit-Leftwich, 2010).

Conclusion

This research finds that the use of technology at secondary school in Multan City has a huge impact on student participation and performance. Yet, technology is only effective when there is fair access to resources, investment in teacher training, and tackling any distractions that might occur in schools. More studies are necessary to understand the long-term implications of implementing technology and strategies to address obstacles to its successful application in education.

Recommendations of the Study

The following recommendations were made from the findings and discussion of the study;

1. Ensure equitable access to technological resources for all students to maximize participation and performance.
2. Invest in comprehensive teacher training programs to enhance the effective integration of technology in classrooms.
3. Address distractions by implementing clear guidelines and effective school monitoring strategies.
4. Conduct further research on the long-term impacts of technology in education and develop strategies to overcome implementation challenges.

References

1. Abedi, E. A. (2024). Tensions between technology integration practices of teachers and ICT in education policy expectations: implications for change in teacher knowledge, beliefs and teaching practices. *Journal of computers in education*, 11(4), 1215-1234.
 2. Aithal, P. S., Prabhu, S., & Aithal, S. (2024). Future of higher education through technology prediction and forecasting. *Poornaprajna International Journal of Management, Education, and Social Science (PIJMESS)*, 1(1), 01-50.
 3. Anderson, R. E., & Becker, H. J. (2011). *Computers and Classrooms: The Status of Technology in U.S. Schools* (NCES 2001-041). National Center for Education Statistics.
 4. Baig, M., & Jamil, N. (2020, November). A review on the learning technologies to address the issues of education in Pakistan. In *2020 IEEE 23rd International Multitopic Conference (INMIC)* (pp. 1-6). IEEE.
 5. Becker, H. J. (2000). *Findings from the Teaching, Learning, and Computing Survey: Is Technology Use Associated with Increased Student Achievement?*. Center for Research on Information Technology and Organizations.
 6. Cabellos, B., Siddiq, F., & Scherer, R. (2024). The moderating role of school facilitating conditions and attitudes towards ICT on teachers' ICT use and emphasis on developing students' digital skills. *Computers in Human Behavior*, 150, 107994.
 7. Cheung, A. C. K., & Slavin, R. E. (2013). *The Effectiveness of Educational Technology Applications for Enhancing Reading Achievement in K-12 Classrooms: A Meta-Analysis*. *Educational Psychology Review*, 25(1), 5-28. <https://doi.org/10.1007/s10648-012-9200-0>
 8. David, L., & Weinstein, N. (2024). Using technology to make learning fun: technology use is best made fun and challenging to optimize intrinsic motivation and engagement. *European Journal of Psychology of Education*, 39(2), 1441-1463.
 9. Ertmer, P. A. (1999). *Addressing First- and Second-Order Barriers to Change: Strategies for Technology Integration*. *Educational Technology Research and Development*, 47(4), 47-61.
 10. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). *School Engagement: Potential of the Concept, State of the Evidence*. *Review of Educational Research*, 74(1), 59-109. <https://doi.org/10.3102/00346543074001059>
 11. Ginting, D., Sabudu, D., Barella, Y., Madkur, A., Woods, R., & Sari, M. K. (2024). Student-centered learning in the digital age: In-class adaptive instruction and best practices. *International Journal of Evaluation and Research in Education (IJERE)*, 13(3), 2006-2019.
 12. Hardianti, H., Risnawati, R., & Ananta, N. (2024). Enhancing personalized learning and engagement through technology in modern education. *Educia Journal*, 2(1), 46-55.
 13. Hennessy, S., Harrison, D., & Wamakote, L. (2010). *Teacher Factors Influencing Classroom Use of ICT in Sub-Saharan Africa*. *Computers & Education*, 54(4), 865-875. <https://doi.org/10.1016/j.compedu.2009.10.024>
 14. Hyder, M., Ahsan, N., & Mustafa, S. (2024). Breaking Barriers: Technological Adoption Challenges in Organizations of Developing Economies-A Case of Pakistan. *Voyage Journal of Educational Studies*, 4(2), 129-143.
 15. Kalyani, L. K. (2024). The role of technology in education: Enhancing learning outcomes and 21st century skills. *International journal of scientific research in modern science and technology*, 3(4), 05-10.
 16. Khalid, I. L., Abdullah, M. N. S., & Fadzil, H. M. (2024). A systematic review: Digital learning in STEM education. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 51(1), 98-115.
 17. Li, J. (2024). Research on the Modernization Trends in Higher Education Development. *International Journal of Educational Teaching and Research*, 1(4).
 18. Magliocca, P., Canestrino, R., Carayannis, E. G., & Gagliardi, A. R. (2024). Understanding human-
-

- technology interaction: evolving boundaries. *European Journal of Innovation Management*.
19. Mouza, C. (2009). *Learning with Technology: The Impact of Professional Development on Teacher Practices*. *Journal of Educational Computing Research*, 40(2), 199-228. <https://doi.org/10.2190/EC.40.2.d>
 20. Nurhidayat, E., Mujiyanto, J., Yuliasri, I., & Hartono, R. (2024). Technology integration and teachers' competency in the development of 21st-century learning in EFL classroom. *Journal of Education and Learning (EduLearn)*, 18(2), 342-349.
 21. Tondeur, J., van Braak, J., & Ertmer, P. A. (2017). *Understanding the Relationship Between Teachers' Pedagogical Beliefs and Technology Use in Education: A Systematic Review of the Literature*. *Computers & Education*, 69, 79-90. <https://doi.org/10.1016/j.compedu.2013.04.005>
 22. Ye, S., Onpium, P., & Ying, F. (2024). The effectiveness of a 3D interactive learning environment as a mechanism for sharing and retaining knowledge. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 10(2), 17-28.
 23. Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). *Conditions for Classroom Technology Innovations*. *Teachers College Record*, 104(3), 482-515.
-