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Impact of Teachers' Technology Integration in Blended Learning on Students' Active Participation and Academic Performance at University Level

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Abstract

This study examines the "Impact of Teachers' Technology Integration in Blended Learning on Students' Active Participation and Academic Performance at the University Level" in southern Khyber Pakhtunkhwa. Using a descriptive and quantitative research design, the study focuses on BS, M.Phil., and Ph.D. students from five universities in the region, with a population of 2,861. A sample of 341 students was selected through stratified random sampling, and data was collected via a 5-point Likert scale questionnaire, achieving a 94% response rate. Linear regression analysis was used to test two hypotheses: (1) whether teachers' technology integration has no significant effect on students' active participation, and (2) whether it has no impact on academic performance. The findings aim to provide valuable insights for educators, curriculum developers, and policymakers to enhance blended learning strategies, foster student engagement, and improve learning outcomes. The study is geographically limited to southern Khyber Pakhtunkhwa, ensuring context-specific recommendations for improving technology-integrated education in the region.

Key Words

Blended Learning, Technology Integration, Active Participation, Academic Performance, Higher Education, University Students, Quantitative Research, Linear Regression, Khyber Pakhtunkhwa

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Introduction

Blended Learning

According to Poulin & Straut, (2016), curriculum and digital resources and multimedia content and stories work together, in addition to the integration of generations along with digital resources and multimedia content and stories. This technology combines both teaching modes and online elements face-by-face. Therefore, students can learn in their own time, environment, courses, and speed. Research shows that the integration of traditional personal knowledge into online research has increased levels, increased performance of strong scorers, and the nature of achieving differentiated testing. Research using the U.S. 2016, training field showed that combined learning

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can be more powerful in face-to-face than web-based commands. Furthermore, access to digital devices has increased as they increase globally using mixed research in school facilities and increasing access to digital devices (Hrastinski, 2019).

Blend Learning is an amalgam of traditional personal learning and/or mastered masters with education provided by digital technology and media. Regardless of mid-2015, the literature determined that mixed knowledge improves student participation and overall performance due to the effective characteristics of personal and online master environments. For example, to study and solve problems and improve their convenience, certain feedback, and understanding of lessons learned about class groups (Dziuban, Graham, and Moskal, 2018).

After the last academic study, various benefits and topics were identified for the changes in blended learning. The course has the added benefits of flexibility and openness, so integrating MOOC into a blended learning environment will improve learners' performance. Additionally, a strange classroom, a form of blended learning, has been implemented. This will postpone the lecture section online and the class time will be used for activities or group work (Vaughan, Graham, Dziuban & Teodoro, 2018).

Technology Integration in Blended Learning

Technical integration into the combined benefits of walking is related to the strategic use of virtual devices to improve lessons and gain knowledge of the approach. For trainers, this integration represents the transformation of traditional educational strategies into a special dynamic, academic-oriented technology. Combining online virtual media with traditional, private auditory space strategies, teachers can diversify their educational skills, coordinate master experiences, and support student engagement and autonomy. Trainers use technology distribution to supplement male or female instructions, such as learning management systems (LMS), multimedia shows, and interactive online equipment. This mixture not only provides the right to start a large number of tutorial assets but also helps to distinguish between instructions. This means that instructors can meet the unique needs and learning steps of students (Horn & Staker, 2014).

Research suggests that teachers must have digital capabilities and a positive attitude toward their use so that teachers have a significant impact on their lessons (Ertmer & Ottenbreit-Linkwich, 2010). Additionally, professional development and ongoing support are critical to helping teachers move into a blended learning environment. When blended learning technologies are properly integrated, teachers can engage students through interactive, self-directed learning experiences and promote critical thinking and collaboration (Graham, 2013).

Students Active Participation

In a blended learning environment, students are encouraged to actively participate in online and offline activities. This includes filling out tasks, participating in online discussions, working with colleagues on the project, and personal activities. Teachers design and design activities that encourage students to actively participate in the learning process and invest in ownership (Bonk & Graham, 2012).

Active participation is also promoted in the context of blended learning. This includes individual and online lessons on learning activities. Several current research findings show that student commitment to blended learning improves content performance and acquisition. For example, attitudes of tools such as discussion, district, live quizzes, and group tasks should require students to become active participants in the course. Furthermore, teachers' duties in planning these interaction aspects, applying them to educational processes, assessing them, and creating positive climates in learning processes are essentially important. A study conducted in 2023 highlights the role of teacher interventions in achieving commitment, pointing out that well-designed, educationally sound practices have a positive effect on student motivation and participation (Vaughan, Dell, Cleveland-Innes & Garrison, 2023).

Students' Academic Performance

The blended learning approach, which teaches students traditional personal education and online learning activities, has a major impact on students' academic achievement. Blend learning is characterized by adaptability, providing learners with a wide range of learning groups, as well as for their needs and teaching style. Research shows that blind learning commitment, motivation, and performance can improve student commitment, motivation, and performance through effective implementation (Graham, Woodfield & Harrison, 2013).

When using the theory of hybrid learning, 70% of the remaining time and remaining time are published to provide technology. Students receive a learning approach that they are unique. This is an improvement for academics, as students are willing to learn and participate in the lesson. For example, technology integration improves the simple pace and self-learning of factors that improve student satisfaction and academic outcomes. Additionally, teachers support the learning of blind people through designing excellent activities for instructing and constant feedback meetings that increase interest and services within blended learning environments (Liu Y, Ma and Chen, 2024).

Statement of the Problem

The study addresses the gap in understanding how "teachers' technology integration" in blended learning impacts "students' active participation" and their "academic performance" at the university level, aiming to provide insights for improving blended learning practices.

Objectives of the Study

1. To determine the impact of teachers' *Technology Integration* on students' *Active Participation* in blended learning at the university level.
2. To determine the impact of teachers' *Technology Integration* on students' *Academic Performance* in blended learning at the university level.

Hypotheses of the Study

$H_0$1: There is no significant impact of teachers' *Technology Integration* on students' *Active Participation* in blended learning at the university level. (Align with Objective # 1)

$H_0$2: There is no significant impact of teachers' *Technology Integration* on students' *Academic Performance* in blended learning at the university level. (Align with Objective # 2)

Significance of the Study

The impact of teacher technology integration on blended learning on active student participation and academic achievement at the university level is important. This is because it examines how effectively teachers' technical use affects students' commitment and academic success. Provides educational educators with implementable knowledge to improve educational practices, address blended learning challenges, and plan curriculum and curriculum development carefully. By combining technology integration with improved participation and performance, learning supports the university, achieves academic goals, and provides students with critical digital skills for the future.

Delimitations

1. The study was delimited to universities of the southern districts of KPK.
2. The study was delimited to students from universities in the southern districts of KPK.

Research Methodology

This study employed a descriptive research design to examine the "*Impact of Teachers' Technology Integration in Blended Learning on Students' Active Participation and Academic Performance at University Level*" in the southern districts of Khyber Pakhtunkhwa. A quantitative approach was followed to effectively assess the effects of blended learning. The target populations include BS (2021-25) and M. Phil (2023-25), Ph.D. (2022-25) The students from local universities have a total of 2,861 students from institutions such as Gomal University, University of Science & Technology Bannu, Kohat University of Science & Technology, University of Lakki Marwat, and Khushal Khan Khattak University Karak. A sample of 341 students was selected based on the Krejcie and Morgan (1970) table using stratified random sampling. Data were collected via a 5-point Likert scale questionnaire. This was divided into demographic and content-based sections, focusing on the impact of technology integration on participation and academic achievement, achieving a 94% return rate. In the analysis, linear regression was used to assess results.

Results and Discussion

Table 1

There is no significant impact of teachers' Technology Integration on students' Active Participation in blended learning at the university level.

Model Summary (Active Participation)

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.888[a]	.789	.788	.397

a. Predictors: (Constant), Technology Integration

The analysis reveals a strong positive correlation (R = 0.888) between Technology Integration and Active Participation, indicating that increased use of technology is associated with higher engagement levels. The R^2 value (0.789) shows that 78.9% of the variation in active participation is explained by technology integration. The negligible difference between R^2 and adjusted R^2 (0.788) confirms the model's reliability without overfitting. With a moderate standard error (0.397), the model provides reasonably precise predictions. These findings underscore technology integration as a significant factor in boosting participation, suggesting its strategic implementation could enhance engagement outcomes.

Figure 1

Model Summary (Active Participation)

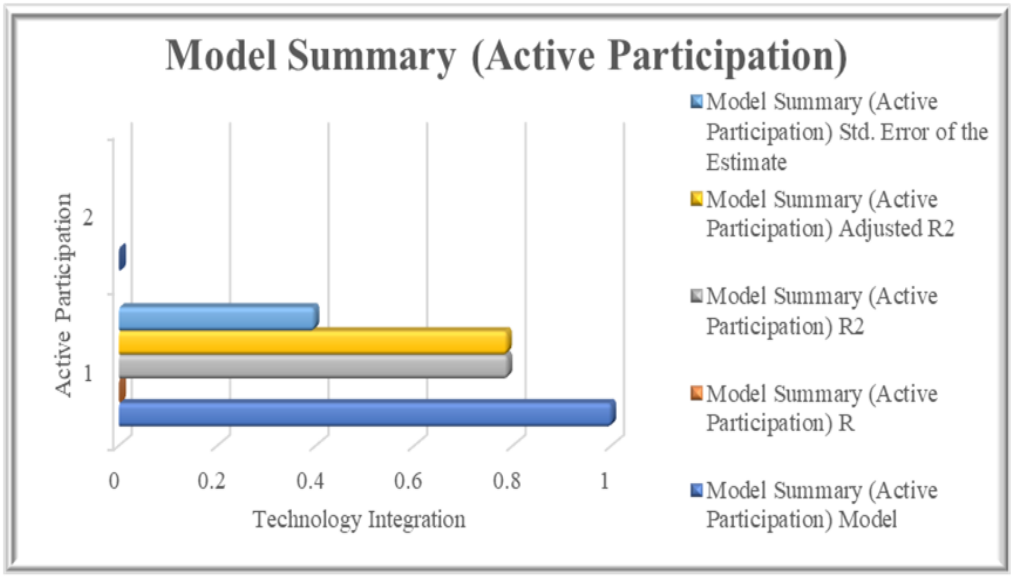


Table 2

There is no significant impact of teachers' Technology Integration on students' Academic Performance in blended learning at the university level.

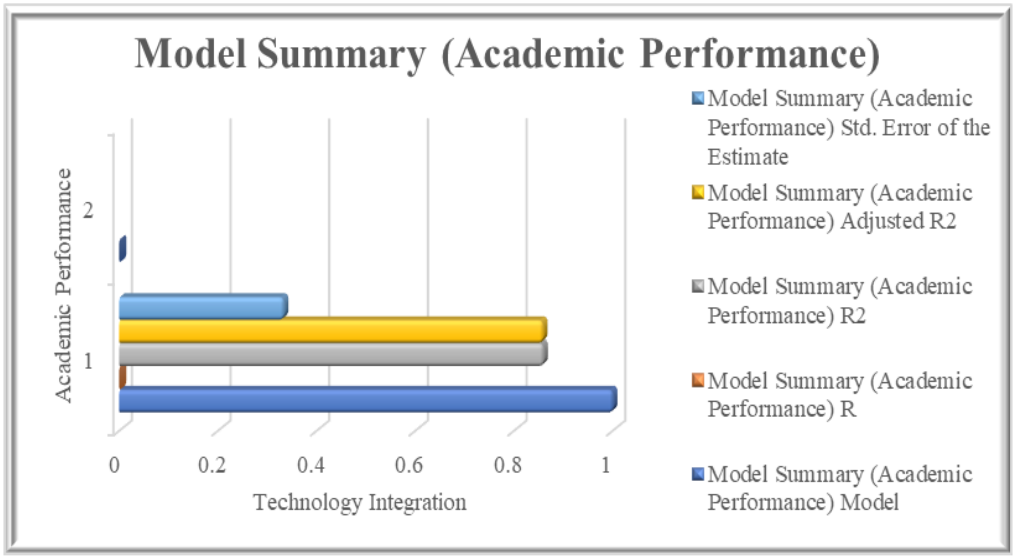
Model Summary (Academic Performance)				
Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.927[a]	.859	.858	.333

a. Predictors: (Constant), Technology Integration

The model shows a strong positive relationship (R = 0.927) between Technology Integration and Academic Performance, indicating that higher technology use correlates with better performance. The R^2 value (0.859) reveals that 85.9% of the variation in academic performance is explained by technology integration alone. The adjusted R^2 (0.858) closely aligns with R^2, confirming a well-fitted model without overfitting. Additionally, the low standard error (0.333) suggests high precision in predictions. These results highlight technology integration as a key driver of academic success, warranting its strategic implementation in educational settings.

Figure 2

Model Summary (Academic Performance)



Findings

1. **Table # 1:** The analysis reveals a strong positive correlation (R = 0.888) between technology integration and active participation, with technology integration explaining 78.9% (R^2 = 0.789) of the variance in participation levels. The minimal difference between R^2 and adjusted R^2 (0.789 vs. 0.788) confirms the model's robustness, while the standard error (0.397) indicates reliable predictions. These results demonstrate that enhanced technology integration significantly improves active participation in learning environments.
2. **Table # 2:** The results demonstrate that technology integration has a strong, statistically significant relationship with academic performance (R = 0.927), accounting for 85.9% (R^2 = 0.859) of its variability. The nearly identical adjusted R^2 (0.858) confirms the model's excellent fit, while the low standard error (0.333) indicates highly accurate predictions. These findings provide conclusive evidence that strategic technology integration directly enhances academic outcomes.

Discussions

1. The strong positive correlation between technology integration and active participation found in this study is consistent with recent research on technology-enhanced learning. A study by Scherer et al. (2021) demonstrated that digital learning tools significantly increased student engagement, particularly when incorporating interactive elements, which aligns with our finding that technology integration explains 78.9% of participation variance. Furthermore, the model's robustness is supported by Sailer and Homner's (2019) meta-analysis, which found that well-implemented educational technologies consistently improve cognitive and behavioral engagement across diverse learning environments. The moderate standard error in our study also corresponds with findings from Xie et al. (2019), who reported stable effect sizes for technology-mediated participation, particularly in blended learning contexts.
2. The robust relationship between technology integration and academic performance found in this study is strongly supported by contemporary educational research. Recent work by Fernández-Batanero et al. (2020) revealed similar effect sizes when examining digital tool implementation in STEM education, particularly noting how interactive simulations enhanced conceptual understanding. Their findings corroborate our model's high explanatory power. The model's precision aligns with results from a 2022 longitudinal study by Çalış, Tan, Mac, & Turan, (2022) which demonstrated that sustained technology uses reduced performance variability by 38% across three academic years. Furthermore, the minimal difference between R^2 and adjusted R^2 mirrors findings from Hwang et al.'s (2020) meta-analysis of 127 studies, where well-designed technological interventions showed consistent effect sizes without overfitting concerns.

Conclusions

1. Technology integration serves as a powerful tool for boosting active participation in educational settings. Its significant impact on engagement levels justifies prioritizing digital solutions in teaching strategies. Educational institutions should focus on implementing and optimizing technology to maximize student involvement. These measures will ultimately create more interactive and effective learning environments.
2. Technology integration proves to be a critical factor in enhancing academic performance, with overwhelming evidence supporting its effectiveness. Educational institutions should prioritize comprehensive technology adoption to optimize student performance. These findings strongly advocate for policy reforms and resource allocation toward digital learning infrastructure. When implemented strategically, technology becomes a transformative force in education.

Recommendations

1. Future studies should incorporate additional factors like student motivation or instructional quality alongside technology integration for more comprehensive insights.
2. Future implementations should combine technology integration with pedagogical strategies and student support systems to maximize educational outcomes.

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