

Impact of Blended Learning on Academic Achievement and Self-Assessed Confidence: Evidence from Postgraduate Family Medicine in Pakistan

Kiran Abdul Sattar, Abida Munir Badini

ABSTRACT

Objective: To evaluate the impact of a one-year blended learning program on academic achievement and self-assessed confidence among postgraduate Family Medicine students in Pakistan.

Study design and setting: A retrospective analysis conducted at a public sector Pakistani university.

Methodology: Data from 20 students who completed a six-module Family Medicine certificate program (2022–2024) were analyzed. Each module included a 15-item multiple-choice pre- and post-test and a self-assessment of confidence level using a three-point scale. The Wilcoxon Signed Rank Test compared pre- and post-test scores, while frequency distributions examined changes in self-assessed confidence.

Results: Mean test scores increased significantly from 8.1 ± 3.2 to 11.3 ± 3.8 ($p < 0.001$). Self-assessed confidence levels rose markedly: the proportion of students reporting comfort increased from an average of 16% pre-module to 54% post-module, while discomfort decreased from 12% to 2%. Improvements were consistent across most modules, though Module 2 showed a smaller, non-significant gain.

Conclusions: Blended learning significantly enhances academic performance and self-assessed confidence in postgraduate Family Medicine education. These parallel improvements suggest the approach effectively bridges theoretical knowledge and professional confidence, supporting its adoption in specialized medical training programs. The findings underscore blended learning's potential to address both cognitive and affective learning domains simultaneously.

KEYWORDS: Education, Family Practice, Self-assessment, Medical, Graduate

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INTRODUCTION

Educational institutions use a variety of teaching methods depending on their specific circumstances, including traditional and online methods. Traditional methods, like lectures and text books, are very commonly used in many colleges and universities. However, online methods, such as virtual classrooms and interactive videos, are becoming progressively prevalent due to their flexibility and accessibility.¹ Blended learning includes combination of online learning and face-to-face learning.²⁻³ Online learning includes synchronous and asynchronous components. Synchronous sessions contain real-time communication where all learners are present at the same time, such as in a live video conference or chat. This permits for feedback and interaction among participants at the same time like a

physical class. On the other hand, asynchronous sessions do not require all students to be present simultaneously and communication can occur at different times, such as through discussion boards and recorded sessions.¹ Blended learning conceptualizes learning as an ongoing process than a single time event thus motivates students to learn and be engaged even outside the classroom.⁴ Learners get the benefit of increased flexibility which allows them to access the internet and work on the course material whenever and wherever they prefer.⁵ Blended learning is innovative because it combines the strengths of both traditional face to face teaching and latest online modes which creates a dynamic and compliant learning environment. It results in active and more personalized learning active learning by encouraging students to engage with course content through a variety of interactive formats, such as live discussions, assignments, and digital simulations, rather than passively receiving information thereby enhancing student engagement which helps them become independent learners and promotes autonomous learning.⁶⁻⁸ Self-assessment is a process of formative assessment during which students reflect on and evaluate the quality of their work and learning, and identify strengths and weaknesses in their work and revise accordingly.⁹⁻¹⁰ Research has shown that self-assessment is a valuable component of the learning process, as it enables

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learners to recognize their current level of understanding and identify areas that require further improvement. This reflective awareness fosters intrinsic motivation and facilitates deeper, ongoing learning by helping students focus on their individual educational needs and set specific goals for improvement. By taking ownership of their learning through self-assessment, students become more engaged and empowered in their academic journey. Additionally, self-assessment lets teachers to better modify their coaching to meet the unique needs of each student, ultimately leading to more successful learning outcomes.¹¹⁻¹² Postgraduate Family Medicine training requires the integration of theoretical knowledge, practical skills, and professional confidence to deliver comprehensive, patient-centered care. Recent systematic reviews have confirmed that blended learning can significantly enhance knowledge acquisition, skill performance, and learner engagement compared to traditional teaching methods.^{13, 14} In Pakistan, this approach has been shown to address barriers related to time, location, and faculty availability, while maintaining educational quality.¹⁵⁻¹⁶ Despite these advantages, Family Medicine as a discipline in Pakistan remains underdeveloped, with a shortage of structured training programs and qualified family physicians. Geographic constraints and heavy clinical workloads further limit opportunities for interactive, learner-centered teaching.¹⁵ Hence, this study intended to evaluate the impact of a one-year blended learning program on academic achievement and self-assessed confidence among postgraduate Family Medicine students in Pakistan. By investigating dual results across six distinctive modules, this study provides broad insights into the effectiveness of blended learning approach in postgraduate medical education. The significance of blended approach lies in its potential to strengthen the Family Medicine workforce by producing graduates who are not only knowledgeable but also confident in applying their skills in real-world primary care settings.

METHODOLOGY

After ethical approval from the University's Ethical Review Committee (JSMU/IRB/2024/890), this retrospective study was conducted from March to April 2025. A pre-existing data of 20 participants were drawn from postgraduate Family Medicine students who were formally enrolled in the blended certificate program between 2022 and 2024. Only those who successfully completed all six modules and had both pre- and post-test scores, along with self-assessment data available in the learning management system, were included in the analysis. Students who did not complete the program requirements or had missing assessment data were excluded from the final dataset. The program is divided in six modules of equal duration. The six modules covered core topics in Family Medicine progressing from foundational concepts to more specialized areas of practice. The online components were delivered through a learning management system (MOODLE) and included asynchronous activities like

recorded lectures, discussion forums, supplementary reading materials and synchronous sessions were conducted via zoom once weekly. Students could access online materials at their convenience throughout the duration of program. In this study, two primary outcome variables were assessed: academic achievement and self-assessed confidence. Academic achievement was measured through module-specific formative assessments consisting of 15 multiple-choice questions (MCQs) developed by subject experts and validated for content relevance and clarity. A test blueprint was developed to ensure alignment of items with module learning outcomes and cognitive levels. Reliability was assessed using Cronbach's alpha for each module, and item analysis (difficulty and discrimination indices) was conducted to evaluate question quality. Each student completed a pre-test prior to the start of a module and a post-test upon its completion. Scores were recorded as the number of correct responses out of 15, with higher scores reflecting greater knowledge acquisition. Self-assessed confidence was measured using a structured three-point Likert-type scale administered before and after each module. Students rated their comfort level with the module content as "comfortable," "moderately comfortable," or "uncomfortable." These responses were coded as A, B, and C respectively, and analyzed as categorical data to capture shifts in perceived confidence. Data of students with complete pre/post test scores and pre/post self-assessed form with comfort level was extracted from learning management system and entered in spss version 24. Since the data did not follow a normal distribution, non-parametric tests were employed. The Wilcoxon Signed Rank Test was used to compare pre-test and post-test scores for each module and overall. For self-assessment data, frequency distributions and percentages were calculated to determine shifts in comfort levels before and after each module. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 20 postgraduate students were included in the analysis. Blueprinting confirmed that all items mapped appropriately to intended outcomes and cognitive levels. Cronbach's alpha values ranged from 0.72 to 0.88 across modules, indicating acceptable to good reliability. Item analysis showed that most items had difficulty indices between 0.35 and 0.75 and discrimination indices above 0.20, supporting the overall quality of the assessments. The mean pre-test score across all modules was 8.1 ± 3.2 which increased to 11.29 ± 3.76 in the post-test. This improvement was statistically significant ($p < 0.001$). Module wise improvement from pretest to post test for all modules is shown in Table 1. In terms of self-assessed confidence, Figure 1 shows a comparison of postgraduate students' comfort level prior to and subsequent to the completion of each of the six modules in a blended one-year Family Medicine program. In all modules, an observable trend is

the increased proportion of students who evaluated themselves as comfortable (A) upon completion of the modules. For example, during Module 1, the rate of students feeling at ease improved from 24.8% pre-module to 57.69% post-module. This same pattern exists among other modules—Module 2 rose from 14.7% to 58.25%, Module 3 from 15.3% to 54.27%, Module 4 from 10.3% to 49.17%, Module 5 from 10.0% to 56.88%, and Module 6 from 14.5% to 54.12%.

On the other hand, the percentage of students who graded themselves as not comfortable (C) fell enormously after the module. It fell from 14.6% to 1.54% in Module 1, and in some modules (3 and 5), it was 0%. The declining pattern indicates that the program improved students' self-assessed confidence. The proportion of students who were moderately comfortable (B) decreased or had a relatively stable trend, which suggests that most students moved away from uncertainty towards being more confident after instruction

Table 2 shows the outcome of the Wilcoxon Signed Rank Test on the paired pre and post formative assessment scores of postgraduate students in a blended Family Medicine program. The non-parametric test was employed to determine the significance of differences in students' performance prior to and following each module. The findings reveal a general trend of improvement in all modules, with the proportion of positive ranks (representing score increases) significantly greater than negative ranks (representing decreases).

DISCUSSION

Our findings demonstrate significant improvements in both academic achievement and self-assessed confidence levels among postgraduate Family Medicine students who participated in the blended learning program. These results align with existing evidence in the literature that supports the efficacy of blended learning approaches in medical education. A systematic review and meta-analysis by Liu et al. found that blended learning consistently demonstrated better effects on knowledge outcomes compared to traditional

learning in health education.¹⁷ Their analysis of 56 studies with 9,943 participants showed a standardized mean difference of 1.07 (95% CI 0.85 to 1.28) in favor of blended learning, which supports our findings of significant improvements in formative assessment scores. The notable increase in self-assessed comfort levels across all modules, with the percentage of students feeling comfortable rising substantially (e.g., from 24.8% to 57.69% in Module 1), reflects the positive impact of the blended learning approach on students' perceived confidence. This aligns with recent research which found that students in a blended learning medical nutrition course demonstrated significantly higher self-efficacy, particularly in organizing study plans, participating in interactive learning activities, and applying course knowledge compared to those in a traditional learning environment.¹⁸ Our study found significant improvements in formative assessment scores across most modules, with the overall mean score increasing from 8.1 ± 3.2 to 11.29 ± 3.76 ($p < 0.001$). A recent research comparing blended learning to traditional on-site instruction in medical genetics education found that blended learning led to higher overall final grades and better exam scores.¹⁹ A notable finding in our study is the parallel improvement in both academic achievement and self-assessed confidence levels. This relationship suggests that as students gain knowledge and skills through blended learning, their confidence in their abilities also increases which is supported by evidence that self-assessment promotes metacognitive awareness and

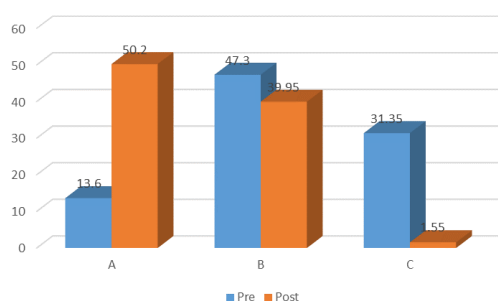
Table 2: Ranks of Wilcoxon Signed Rank Test of Pre and Post Score

Module			N
Overall	Post - Pre	Negative Ranks	14
		Positive Ranks	94
		Ties	11
Module 1	Post - Pre	Negative Ranks	1
		Positive Ranks	17
		Ties	1
Module 2	Post - Pre	Negative Ranks	3
		Positive Ranks	15
		Ties	2
Module 3	Post - Pre	Negative Ranks	2
		Positive Ranks	17
		Ties	1
Module 4	Post - Pre	Negative Ranks	3
		Positive Ranks	14
		Ties	3
Module 5	Post - Pre	Negative Ranks	2
		Positive Ranks	16
		Ties	2
Module 6	Post - Pre	Negative Ranks	3
		Positive Ranks	15
		Ties	2

Table 1: Paired Statistics of Pre and Post Score

Module		N	Mean $\pm$ SD	Minimum	Maximum	P-Value
Overall	Pre	120	8.1 ± 3.2	0	15	< 0.001
	Post	119	11.29 ± 3.758	0	15	
Module 1	Pre	20	6.7 ± 2.473	3	14	< 0.001
	Post	19	11.05 ± 2.198	8	15	
Module 2	Pre	20	5.75 ± 1.97	0	10	0.10
	Post	20	7.75 ± 3.16	0	10	
Module 3	Pre	20	8.9 ± 2.337	5	15	< 0.001
	Post	20	13.25 ± 2.673	7	15	
Module 4	Pre	20	8.15 ± 3.265	3	15	0.001
	Post	20	11.25 ± 2.447	6	14	
Module 5	Pre	20	10.2 ± 3.002	4	15	0.013
	Post	20	12.6 ± 3.589	0	15	
Module 6	Pre	20	8.9 ± 3.892	0	15	0.018
	Post	20	11.85 ± 5.264	0	15	

Figure 1: Pre and post self-assessment in all 6 Modules



helps students recognize their strengths and areas needing improvement.²⁰ The significant improvement in self-assessed comfort levels across all modules in our study suggests that blended learning not only enhances knowledge acquisition but also builds confidence in applying that knowledge. The concept of self-assessment as a valuable component of the learning process is supported by research showing that reflective awareness fosters intrinsic motivation and facilitates deeper, ongoing learning.^{13, 20} Our findings add to this literature by demonstrating a concurrent improvement in both academic achievement and self-assessed confidence in a postgraduate medical education context. At the same time, our results highlight variability across modules. While most modules showed significant improvements in both self-assessed confidence and formative assessment scores, Module 2 demonstrated a smaller, non-statistically significant increase in scores (from 5.75 ± 1.97 to 7.75 ± 3.16 , $p = 0.10$). This variation suggests that the effectiveness of blended learning may depend on the specific content, complexity, or design of individual modules.²¹⁻²² The differences in module effectiveness highlight the importance of continuous evaluation and refinement of blended learning curricula. As Dias and Diniz suggest, enhanced learning management systems for blended learning should incorporate distinct learner profiles and adaptable approaches to accommodate different learning needs and content types.⁶ Our findings indicate that the blended learning format may foster the development of self-directed learning skills among postgraduate medical students. The decrease in students reporting discomfort with content (e.g., from 14.6% to 1.54% in Module 1) suggests that students enhanced their learning more effectively.¹⁶ The success of this blended learning approach has significant implications for medical education in resource-limited settings like Pakistan. A recent study on family physician graduates of blended-learning courses in India found that this model creates an important pathway for doctors, especially women, to pursue higher education with flexibility.²³ In our study context, the public university in Karachi was able to deliver effective postgraduate education to family medicine students through a blended approach that may have overcome barriers related to time, location, and resources.

This study has several limitations that must be acknowledged.

First, the absence of a control group prevents us from making direct comparisons between blended learning and traditional or online-only methods. Our conclusions are therefore limited to within group improvements and cannot establish the superiority of blended learning. Second, the study relied on module level pre and posttests categorized as formative assessments, designed to provide feedback on progress rather than to serve as summative evaluations of long-term retention. Third, participant demographic data such as age, gender, and prior academic performance were not collected, restricting the generalizability of the findings. Fourth, the self-assessment tool used to measure confidence was a simple three-point scale and was not formally validated, which limits the reliability of conclusions regarding confidence levels. Finally, the small sample size and retrospective design further limit the strength of the conclusions. Future research should address these gaps by incorporating larger, prospective cohorts, validated assessment tools, demographic profiling, and comparative control groups. Mixed-method approaches, including qualitative feedback, may also provide deeper insights into learner experiences and the mechanisms driving variability across modules.

LIMITATION

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CONCLUSION

This study found that a one-year blended learning program in Family Medicine was associated with significant improvements in both academic achievement and self-assessed confidence among postgraduate students. These within group gains suggest that blended learning can positively influence knowledge acquisition and learner confidence in this context. However, given the absence of

a comparative control group, small sample size, and reliance on formative assessments, the findings should be interpreted with caution. While our results are consistent with international evidence supporting blended learning in medical education, they cannot establish superiority over traditional or online-only approaches. Future research using larger cohorts, validated assessment tools, and controlled study designs is needed to confirm these preliminary findings and to explore how blended learning can be optimized for postgraduate Family Medicine training, particularly in resource-limited settings.

CONFLICT OF INTEREST

All authors do not have any conflict of interest

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Authors Contribution:

Kiran Abdul Sattar: Both authors contributed equally towards preparation of manuscript

Abida Munir Badini: Both authors contributed equally towards preparation of manuscript

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