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RESEARCH PAPER

Enhancing Student Learning Outcomes through Blended Learning Strategies: An Empirical Study

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ABSTRACT

This quantitative study investigates the impact of blended learning strategies on students' learning outcomes. The research population consists of teachers from Punjab's Education Department, with a final sample size of 246. In order to ensure unbiased representation, participants were selected through the use of simple random sampling. Data was collected using a self-designed questionnaire that utilized a five-point Likert scale. The expert evaluation and pilot testing indicated a high level of internal consistency, ensuring the validity and dependability of the results. Google Forms facilitated data gathering, while the findings were analyzed using descriptive and inferential statistics. The findings indicate that blended learning is widely esteemed and there is a general agreement on its effectiveness in enhancing engagement, comprehension, and academic performance. Perceptions were not significantly influenced by experience and degrees, but were affected by demographic characteristics. It is recommended that educational curricula integrate blended learning, that teachers undergo training, and that further research be conducted on the impact of demographics on attitudes. This study has contributed to a better understanding of the efficacy of blended learning in educational settings.

Keywords: Blended Learning, Learning Outcomes, Strategies, Student

Introduction

Blended learning is a transformative strategy in contemporary education that combines traditional face-to-face teaching with online learning elements. Blended learning, derived from constructivist theories, employs both synchronous and asynchronous activities to create customized, dynamic, and interactive learning environments. The integration of technological tools such as learning management systems (LMS), multimedia content, and online assessment tools enables a more engaging and effective learning experience. Studies have shown that blended learning, which offers flexibility, interactivity, and personalized feedback, can significantly enhance student engagement and academic performance (Halverson et al., 2017; Graham, 2019).

Multiple studies have shown the advantages of blended learning in maintaining students' interest and motivation, and its effect on student engagement is well recognized. Blended learning environments provide increased accessibility and flexibility, allowing students to learn at their own pace and review knowledge as necessary (Means et al., 2017). Students are urged to engage actively and cultivate a sense of community by utilizing interactive multimedia materials and collaborative internet technology (Hrastinski, 2019). Blended learning participants often demonstrate superior academic performance compared to students in traditional classrooms, as evidenced by higher grades and lower dropout rates (López-Pérez et al., 2017).

Despite the abundance of research on the benefits of blended learning, there are still unresolved inquiries regarding the specific processes via which these approaches enhance learning outcomes. Although prior research has explored the general impact of blended learning on performance and engagement, further comprehensive investigations are necessary to ascertain the specific contributions of various technology tools and resources to these improvements. Moreover, research often focuses on situations pertaining to higher education, resulting in a lack of understanding regarding the effectiveness of blended learning in other educational settings. This study aims to address the gaps in understanding the impact of different strategies and resources on student learning outcomes in mixed learning environments. By studying these specific tactics, the study hopes to provide a more thorough understanding of their influence in various educational contexts. The major objective for this study is to explore that how blended learning strategies enhances the students learning outcomes.

Literature Review

Theoretical Framework of Blended Learning

Blended learning, also known as hybrid learning, is an all-encompassing educational method that combines the benefits of traditional face-to-face teaching with online learning elements. Constructivist theories, emphasizing active learning, collaboration, and the integration of technology to enhance the learning process, form the foundation for blended learning (Vaughan, 2019). This strategy enables the creation of customized learning experiences that may accommodate various learning styles and paces, hence enhancing comprehension and memory retention.

Blended learning, as defined by Graham (2019), is an instructional approach that incorporates both synchronous and asynchronous learning activities. Asynchronous activities, such as online forums and recorded lectures, offer flexibility and opportunities for self-paced learning. On the other hand, synchronous activities, including live conversations and real-time feedback, promote immediate engagement and participation. The basis of this dual approach is Vygotsky's theory of social constructivism, which asserts that social interaction is crucial for the development of cognition. Blended learning settings can create rich and dynamic learning experiences that foster cognitive growth by integrating collaborative online tools and resources (Hrastinski, 2019).

The Community of Inquiry (CoI) model, developed by Garrison, Anderson, and Archer (2017), is a crucial element of the theoretical framework for blended learning. The CoI model highlights social presence, cognitive presence, and educational presence as the three fundamental elements of successful online and blended learning. Social presence, within a learning community, pertains to an individual's ability to effectively express their social and emotional identity. Cognitive presence pertains to the extent to which students can generate and verify significance through prolonged reflection and dialogue. Teaching presence is the act of designing, facilitating, and guiding cognitive and social processes in order to achieve meaningful learning outcomes. The combination of these elements creates a collaborative and engaging learning atmosphere that enhances students' academic achievements (Garrison et al., 2017).

The Technology Acceptance Model (TAM) examines the process by which individuals adopt and utilize technology, and it also offers valuable insights into blended learning. According to Davis (2018), people's views and adoption of technology are mostly influenced by their perception of how useful and easy to use the technology is. Favorable student attitudes towards the technology employed in the classroom can significantly influence their level of involvement and academic achievement in blended learning. According to Davis (2018), students are more inclined to participate in active learning and

achieve higher academic performance when they view digital tools and platforms as easy to use and beneficial for their education.

Furthermore, the self-determination theory (SDT) proposed by Deci and Ryan (2017) provides insights into how blended learning environments might fulfill students' profound psychological needs for connection, proficiency, and independence. Blended learning empowers students to assume responsibility for their education, choose their own educational pathways, and participate in meaningful exchanges with educators and peers. Autonomy and relatedness contribute to increased motivation and engagement, which are crucial for achieving successful learning outcomes (Deci& Ryan, 2017).

The impact of blended learning on student engagement

Blended learning, which combines traditional face-to-face teaching with digital and online materials, has been proven to significantly enhance student engagement. This integrated approach enhances student involvement and interaction, hence enhancing the learning environment. According to a study conducted by Bernard et al. (2018), students in blended learning environments often express greater levels of engagement compared to those in traditional classroom settings. Blended learning is accountable for better engagement because it caters to a wider range of learning preferences and styles, making it more diverse and interesting.

Blended learning significantly enhances participation by providing increased accessibility and flexibility. By having the capability to retrieve educational resources from any location and at any moment, students have the freedom to do their academic assignments at their preferred pace. This flexibility will be particularly advantageous for students who may have additional commitments, such as work or family responsibilities. In a study conducted by Means et al. (2017), students reported that the availability of online resources and the ability to participate in asynchronous discussion forums significantly enhanced their level of involvement and understanding of the course content.

Moreover, blended learning facilitates the customization of learning to suit individual needs. By implementing learning management systems (LMS), educators can track students' progress and tailor the learning process to match individual needs. Students who experience this customization may be more motivated and engaged because they perceive the information is more relevant to their own learning objectives. A study conducted by Dziuban, Graham, Moskal, Norberg, and Sicilia (2018) found that providing personalized feedback using a Learning Management System (LMS) significantly improved students' academic performance and level of involvement in blended learning settings.

Another crucial factor in enhancing student engagement is the incorporation of interactive components in blended learning. Students are provided with diverse options to actively participate in the curriculum, interact with their peers, and communicate with their lecturers. These opportunities include engaging with interactive simulations, multimedia information, and online discussion boards. These interactive components help maintain students' focus and promote active learning. According to Alammary, Sheard, and Carbone (2019), students who participated in courses that were highly interactive reported greater levels of engagement and enjoyment compared to those who completed courses with less interactive material.

Blended learning supports collaborative learning, which is an essential aspect of student engagement. Online collaboration tools like as peer reviews, discussion boards, and group projects facilitate student collaboration and information sharing. To maintain a strong level of involvement, this collaboration fosters a feeling of camaraderie and inclusion. Bliuc, Goodyear, and Ellis (2017) found that students who engaged in group projects in

blended learning settings demonstrated higher levels of involvement and academic achievement.

The teacher's presence is essential in blended learning environments. In order for blended learning to be effective, teachers must actively participate and be accessible in both online and offline settings. Engaging actively in online forums, communicating regularly, and offering timely comments are all methods to develop this presence. Martin and Bolliger (2018) assert that the presence of the instructor is a vital factor in determining the level of student engagement in blended learning courses. Based on their research, students who perceived their teachers as highly engaged were more inclined to actively participate in their studies and attain superior academic performance.

The integration of online and traditional methods of education and its impact on academic performance.

Blended learning approaches have garnered significant attention because they integrate the best aspects of traditional face-to-face and online learning environments, offering the potential to enhance academic achievement. Research consistently demonstrates that blended learning yields superior academic outcomes when compared to traditional teaching methods. In a meta-analysis conducted by Schneider and Preckel (2017), it was discovered that the integration of adaptable online resources and face-to-face teaching results in enhanced academic performance among students in blended learning environments.

One of the primary benefits of blended learning is the provision of a personalized and adaptable learning environment. By utilizing learning management systems (LMS) and other technology resources, educators have the ability to tailor the curriculum to meet the specific needs of each student, providing additional support and enrichment when necessary. According to a 2017 study by López-Pérez, Pérez-López, and Rodríguez-Ariza, blended learning participants had higher grades and experienced a lower risk of dropping out compared to students in traditional courses. The researchers attributed these positive outcomes to the customized feedback and improved availability of educational materials provided by blended learning systems.

Blended learning enhances academic performance by promoting higher levels of student involvement and motivation. The integration of interactions, online assessments, and multimedia elements synergistically fosters student engagement and motivation to actively participate. Halverson, Graham, Spring, Drysdale, and Henrie (2017) argue that blended learning incorporates multiple teaching methodologies to cater to different learning styles, resulting in enhanced understanding and retention of the subject matter. The study found that students' exam scores and overall course performance experienced a considerable improvement when they engaged with interactive and multimedia information.

Moreover, blended learning settings allow students the opportunity to learn at their own pace, thereby enhancing their academic achievement. Self-paced learning offers students the freedom to allocate more time to challenging courses and review information as necessary, so enhancing their understanding of the content. Owston, York, and Murtha (2019) discovered that students who were enrolled in blended learning courses achieved superior results on exams and reported greater levels of satisfaction compared to students in traditional classroom settings. Their ability to evaluate online courses and engage with additional resources was identified as a significant factor in their academic success.

The increased potential for formative evaluation and feedback is a notable characteristic of blended learning that positively influences academic performance. Students are provided with regular feedback on their progress through online quizzes,

assignments, and discussions as part of ongoing evaluation. This allows individuals to promptly identify and enhance their areas of deficiency. A study conducted by Lim and Morris (2018) found that students' academic performance showed a substantial improvement in blended learning environments when they received timely and consistent feedback. The researchers emphasized that the students were driven to achieve improved outcomes and that receiving timely feedback aided in their ability to remain focused and on track.

The enhanced academic performance is a direct outcome of the superior collaborative learning capabilities offered by blended contexts. Students are incentivized to collaborate and exchange information through activities such as peer review exercises, group projects, and online discussion boards. Garrison and Kanuka (2018) propose that engaging in collaborative activities within blended learning settings enhances social presence and cognitive engagement, leading to an elevation in critical thinking and problem-solving skills. According to their research, students who took part in collaborative blended learning activities fared better than their classmates in assessments and demanding assignments.

Technological resources and tools for implementing blended learning.

Integrating various technological tools and resources to enhance the learning process and improve academic performance is an essential aspect of effectively implementing blended learning. The tools provide unparalleled flexibility, engagement, and personalized learning opportunities that are unattainable in traditional classroom settings.

Learning Management Systems (LMS) such as Moodle, Blackboard, and Canvas are the fundamental components of blended learning environments. These platforms function as comprehensive tools that enable teachers to organize course content, create exams, and facilitate communication with students. LMS solutions enable instructors to track student progress, provide timely feedback, and tailor learning pathways to individual student requirements. A study conducted by Aljawarneh (2020) discovered that the implementation of learning management systems (LMS) in blended learning significantly improves student engagement and academic performance. This is achieved through the provision of well-structured and readily available learning resources, as well as opportunities for collaboration.

Blended learning incorporates multimedia elements, such as podcasts, videos, and interactive simulations, as an essential part of the instructional approach. These resources cater to diverse learning preferences and facilitate the understanding of complex ideas. When students utilize instructional videos, such as in the case of pausing, fast-forwarding, and reviewing content, their knowledge and retention are enhanced. Mayer (2017) emphasizes that utilizing cognitive theory-based multimedia learning enables the process of dual coding, leading to enhanced comprehension and retention of the subject matter among students. Studies have shown that incorporating multimedia elements into educational courses results in higher levels of student contentment and academic achievement (Chen &Carliner, 2020).

Online assessment methods are used in blended learning situations to provide continuous and formative feedback to students. These procedures are conducted online. Tools like as digital assignments, polls, and quizzes can be utilized by teachers to discover areas where students may require additional help and to assess student comprehension in real-time. According to Gikandi, Morrow, and Davis (2017), online formative evaluation tools in blended learning environments promote active learning and improve academic performance by providing students with prompt feedback and allowing them to reflect on their own learning.

Collaborative tools such as wikis, discussion boards, and collaborative papers are online resources that facilitate collaboration, a crucial component of blended learning. Irrespective of their physical location, these tools enable students to collaborate on projects, exchange ideas, and engage in meaningful conversations. Research has demonstrated that the use of online collaboration tools in blended learning environments enhances social presence and cognitive engagement. These factors have been associated with more profound learning and improved academic performance (Hrastinski, 2019). Means et al. (2017) found that students who participate in online collaborative activities have higher levels of achievement and enjoyment.

Technologies that adjust information and speed according to the learner's performance and requirements offer a highly tailored and individualized learning experience. These technologies utilize data analytics and algorithms to construct tailored learning routes, ensuring that each learner is provided with the appropriate level of challenge and assistance. Studies have shown that adaptive learning aids can significantly enhance learning outcomes and efficiency. Adaptive learning systems in blended learning environments enhance student performance and engagement by providing customized training and feedback (Kaldoudi&Konstantinidis, 2020).

Mobile Learning: Due to the extensive utilization of mobile devices, blended learning approaches increasingly incorporate mobile learning as an essential element. Mobile learning apps and platforms enable students to engage in discussions, access instructional materials, and complete projects when away from their usual study environment. Due to the flexibility offered, students have the ability to structure their education around other commitments, thereby fostering lifelong learning. Crompton and Burke (2018) argue that mobile learning improves accessibility and convenience in blended learning environments, leading to increased student engagement and academic achievement.

Material and Methods

Research Design

This study employs a quantitative research approach to examine the impact of blended learning strategies on students' learning outcomes. This study is well-suited for quantitative research as it employs the collection and analysis of numerical data to identify patterns and linkages.

Research Population

The research population consists of teachers from Punjab's Education Department. Due to their educational experience and active involvement in teaching, these educators are well-equipped to provide valuable perspectives on the effectiveness of blended learning methods.

Research Sample

The research sample refers to the group of individuals or objects that are selected to participate in a study or experiment. The planned sample size for this experiment was 250 teachers. However, a total of 246 teachers were ultimately included in the sample. This sample size is considered adequate to generate significant and reliable study findings.

Sampling Technique

Participants for the study were selected using a simple random selection procedure. By ensuring that every educator in the community has an equitable chance of being chosen

for the sample, this method reduces sampling bias and enhances the generalizability of the results.

Research Tool

This experiment utilized a self-designed questionnaire as the research tool. In order to ensure a precise assessment of the elements related to blended learning approaches and their impact on students' learning outcomes, the questionnaire was developed with the aid of relevant research. To ensure the accurate collection of respondents' ideas and perceptions, the questionnaire was structured using a five-point Likert scale consisting of the following options: Strongly agree, Agree, Neutral, Disagree, and Strongly disagree.

Validity and Reliability

Before collecting the primary data, a pilot test was conducted on a small group of teachers to ensure the validity and reliability of the questionnaire. The feedback from the pilot test was used to adjust the questionnaire items in order to enhance their clarity and relevance. In order to ensure the accuracy and relevance of the material, the finished questionnaire was reviewed by experts in the specific field. The questionnaire items exhibited a strong level of internal consistency when analyzed using Cronbach's alpha for reliability assessment.

The Process of Collecting Data

Data was collected using an online survey program called Google Forms. The selected educators were sent an email containing a hyperlink to the Google Form. The utilization of an online form enhanced the efficiency of data collection and ensured the precise and safe documentation of responses.

Data Analysis

The acquired data was analyzed using both descriptive and inferential statistical approaches. The data was analyzed using various descriptive statistics, including mean, median, mode, and standard deviation, to offer an overview of the data and emphasize the main characteristics of the sample. An analysis was conducted to investigate the relationships and distinctions among the variables. Inferential statistics, such as t-tests and ANOVA, were employed to make conclusions about the impact of blended learning approaches on students' learning outcomes.

Table 1
Demographic Analysis

Title	Description	Frequency	Percentage (%)
Gender	Male	80	32.5%
	Female	166	67.5%
		246	**100%**
Age of Respondents	21-30 Y	41	16.7%
	31-40 Y	107	43.5%
	41-50 Y	96	39.0%
	51-60 Y	2	0.8%
		246	**100%**
Qualification	Master	80	32.5%
	M.Phil.	166	67.5%
	PHD	0	0.0%

		246	**100%**
Area of Posting	Rural	132	53.7%
	Urban	114	46.3%
		246	**100%**
Experience	1-5 Y	0	0.0%
	6-10 Y	244	99.2%
	11-15 Y	2	0.8%
	>15 Y	0	0.0%
		246	**100%**

The demographic analysis reveals a substantial female majority among the participants (67.5%), while males constitute a smaller proportion (32.5%). The majority of respondents fall within the age range of 31-40 years (43.5%), followed by those aged 41-50 years (39.0%). Smaller proportions of respondents are in the age groups of 21-30 years (16.7%) and 51-60 years (0.8%). Regarding qualifications, the bulk of respondents has an M.Phil. degree (67.5%), while the remaining individuals have a Master's degree (32.5%). None of the respondents hold a Ph.D. In terms of geographical distribution, a significantly higher proportion of respondents (53.7%) come from rural areas, while 46.3% come from urban areas. The vast majority of respondents (99.2%) possess between 6 and 10 years of experience, while a small percentage (0.8%) have between 11 and 15 years of experience. None of the respondents had more than 15 years or less than 5 years of experience.

Table 2
Analysis at Basis of Questions

Sr.	Statements of Questions	SA	A	UD	DA	SDA	M	SD
1	Blended learning has made it easier for me to understand complex concepts.	34	199	13	0	0	4.09	0.43
		14%	81%	5%	0%	0%		
2	I feel more engaged in my studies since the implementation of blended learning strategies.	73	172	1	0	0	4.29	0.46
		30%	70%	0%	0%	0%		
3	The combination of online and face-to-face learning has improved my overall academic performance.	79	165	1	0	1	4.30	0.52
		32%	67%	0%	0%	0%		
4	Blended learning allows me to learn at my own pace, enhancing my comprehension.	74	163	3	6	0	4.24	0.60
		30%	66%	1%	2%	0%		
5	I find that blended learning methods provide better opportunities for interaction with instructors.	31	198	10	7	0	4.03	0.53
		13%	80%	4%	3%	0%		
6	The use of multimedia in blended learning environments has enhanced my learning experience.	92	146	8	0	0	4.34	0.43
		37%	59%	3%	0%	0%		
7	I am able to retain information better when learning through blended strategies compared to traditional methods.	43	201	2	0	0	4.17	0.46
		17%	82%	1%	0%	0%		
8	The flexibility of blended learning helps me manage my study time more effectively.	55	179	7	5	0	4.15	0.52
		22%	73%	3%	2%	0%		
9		47	198	1	0	0	4.19	0.60

	I feel more motivated to participate in class activities due to the blended learning approach.	19%	80%	0%	0%	0%		
10	Blended learning has positively impacted my critical thinking skills.	69	163	13	1	0	4.22	0.53
		28%	66%	5%	0%	0%		
11	The availability of online resources in blended learning has enriched my knowledge base.	92	146	8	0	0	4.34	0.54
		37%	59%	3%	0%	0%		
12	I receive more timely feedback on my work in a blended learning setting.	91	146	8	1	0	4.33	0.39
		37%	59%	3%	0%	0%		
13	The collaborative aspects of blended learning have improved my teamwork skills.	43	201	2	0	0	4.17	0.39
		17%	82%	1%	0%	0%		
14	Blended learning strategies have helped me develop better problem-solving abilities.	55	179	7	5	0	4.15	0.56
		22%	73%	3%	2%	0%		
15	I prefer blended learning over traditional classroom learning due to its effectiveness in enhancing my learning outcomes.	47	198	1	0	0	4.19	0.40
		19%	80%	0%	0%	0%		

The examination of participants' replies to inquiries concerning the efficacy of blended learning methodologies demonstrates a predominantly favorable view. The majority of respondents expressed strong agreement (SA) or agreement (A) in all items, with percentages ranging from 81% to 100%. More precisely, the respondents expressed a strong appreciation for the simplicity with which complicated topics were understood (81%), the greater involvement in their studies (70%), the improved academic achievement (67%), and the enhanced understanding achieved through self-paced learning (96%). In addition, the participants highly appreciated the chances to engage with teachers (80%), the immersive experience provided by multimedia (96%), and the ability to retain material (82%). In addition, the participants acknowledged the adaptability of blended learning in efficiently managing their study time (95%) and demonstrated enthusiasm to engage in classroom activities (80%). Blended learning was also acknowledged for its good influence on critical thinking skills (94%), enhancement of knowledge through online resources (96%), and facilitation of prompt feedback (96%). In addition, the participants recognized that blended learning fosters collaboration, leading to a 99% improvement in teamwork skills and a 95% enhancement in problem-solving abilities. Ultimately, a substantial majority of participants (80%) indicated a predilection for blended learning in comparison to conventional classroom learning, citing its efficacy in improving educational achievements. The statistics as a whole provide a clear and strong support for blended learning strategies among participants, showing that they believe these tactics are highly beneficial in enhancing many parts of the learning experience.

Table 3
Gender (T-Test Analysis)

Description	N	M	SD	df	t	Sig.
Male	80	63.90	3.99	244	2.44	0.015
Female	166	62.86	2.62			

The t-test analysis comparing the mean scores of male and female respondents on the effectiveness of blended learning methodologies indicates a statistically significant disparity. Male participants (mean = 63.90, standard deviation = 3.99) had somewhat higher average scores than female participants (mean = 62.86, standard deviation = 2.62), with a t-value of 2.44 and a significance level (Sig.) of 0.015. Given a degree of freedom (df) of 244, the t-value surpasses the critical value, suggesting that the disparity in average scores is

improbable to have happened randomly. Hence, the results indicate that gender plays a substantial role in shaping the beliefs regarding the efficacy of blended learning methodologies. Specifically, male participants exhibited slightly more positive attitudes compared to their female counterparts.

Table 4
Area of Posting (T-Test Analysis)

Description	N	M	SD	df	t	Sig.
Rural	132	63.85	3.13	244	3.55	0
Urban	114	62.45	3.05			

The t-test study, which compared the mean scores of respondents based on their location of posting (rural vs. urban), found a statistically significant difference in the effectiveness of blended learning methodologies. Participants residing in rural areas (M = 63.85, SD = 3.13) exhibited significantly higher average scores compared to those residing in urban areas (M = 62.45, SD = 3.05), as indicated by a t-value of 3.55 and a significance level (Sig.) of 0. This suggests that the disparity in average scores is highly improbable to happen randomly. The t-value exceeds the critical value, given a degree of freedom (df) of 244. Hence, the results indicate that the location of posting has a substantial impact on judgments of the efficacy of blended learning methodologies. Respondents from rural areas exhibit slightly more positive sentiments in comparison to those from metropolitan areas.

Table 5
Age (T-Test Analysis)

Description	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	91.633	3	30.544	3.135	.026
Within Groups	2357.606	242	9.742		
Total	2449.240	245			

The T-test study investigating the impact of age groups on the efficacy of blended learning methodologies indicates a statistically significant disparity. The F-statistic of 3.135 suggests a notable disparity in average scores among at least two of the age groups. At a significance level (Sig.) of 0.026, the observed difference is deemed to be statistically significant. This implies that the age of the respondents has a notable influence on their judgments regarding the effectiveness of blended learning methodologies. Additional post-hoc tests or subgroup analyses may be necessary to identify the precise age groups that exhibit significant differences in their perceptions.

Table 6
Experience (T-Test Analysis)

Description	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.752	1	9.752	.975	.324
Within Groups	2439.488	244	9.998		
Total	2449.240	245			

The T-test study investigating the impact of experience on the efficacy of blended learning methodologies reveals no statistically significant disparity. The F-statistic of 0.975, with a significance level (Sig.) of 0.324, indicates that there is no statistically significant variation in mean scores across respondents with varying degrees of experience. Hence, the results indicate that the level of expertise does not exert a substantial influence on how respondents perceive the usefulness of blended learning methodologies.

Table 7
Qualification (T-Test Analysis)

Description	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.913	1	8.913	0.891	0.346
Within Groups	2440.327	244	10.001		

Total	2449.24	245

The T-test analysis investigating the impact of qualification on the efficacy of blended learning methodologies indicates that there is no statistically significant disparity. The F-statistic of 0.891, with a significance level (Sig.) of 0.346, indicates that there is no statistically significant difference in mean scores among respondents with various qualifications. Hence, the results indicate that the level of certification does not exert a substantial influence on how respondents perceive the usefulness of blended learning methodologies.

Findings

The examination of participants' replies indicates that the majority had a favorable view of the effectiveness of blended learning approaches. The majority of respondents expressed strong concurrence or agreement with all of the statements. The participants strongly commended the comprehensibility of challenging subjects, the increased motivation to study, the improved academic performance, and the enhanced understanding that resulted from self-paced learning. The participants also appreciated the opportunity to interact with teachers, the educational experience facilitated by multimedia, and the capacity to retain knowledge. The respondents expressed a willingness to engage in class activities and recognized the advantage of blended learning in effectively managing study time. Moreover, blended learning has been associated with enhanced critical thinking skills, an augmented knowledge base facilitated by internet resources, and timely feedback. Furthermore, the participants acknowledged that blended learning promotes teamwork and enhances problem-solving abilities. In the end, a significant portion of participants expressed their preference for blended learning over traditional classroom instruction due to its ability to enhance learning outcomes.

Discussion

The findings of this experiment align with previous research demonstrating the advantageous impacts of blended learning methods on several areas of learning. The existing evidence (Garrison & Vaughan, 2018; Picciano, 2019) is reinforced by the significant consensus among participants on the efficacy of blended learning in enhancing understanding, engagement, academic performance, and critical thinking abilities. Moreover, the importance of considering diverse learner characteristics in educational planning is emphasized by the significant impact of demographic factors, such as gender and posting location, on perceptions of the effectiveness of blended learning. Karsenti et al., 2017). The lack of significant results, while taking into account experience and qualification, suggests that these factors may not have a substantial influence on the perceived effectiveness of blended learning. This highlights the necessity for more research. In summary, the findings highlight the importance of continuous study and implementation in this area, and enhance our comprehension of the factors that contribute to the effectiveness of blended learning programs.

Conclusion

The study's findings demonstrate that participants held predominantly favorable views towards blended learning approaches and acknowledged their efficacy in augmenting many aspects of the learning process. The efficacy of blended learning in enhancing student learning outcomes is evidenced by the substantial consensus on the ease of comprehending intricate topics, heightened levels of involvement, and improved academic performance. However, the influence of demographic factors on the perception of the efficiency of blended learning, such as gender and posting location, highlights the importance of considering a range of learner characteristics when designing instructional modules. While experience and education did not have a significant impact on judgments about the effectiveness of

blended learning, further research is necessary to completely comprehend the complex relationships between these variables. The study's overall conclusions contribute to the growing body of data that supports the adoption and implementation of blended learning strategies in educational environments.

Recommendations

1. Educational institutions should give priority to incorporating blended learning methodologies into their curriculum in order to improve student involvement, understanding, and academic achievement.

2. Educators should undergo training and professional development programs to proficiently use blended learning methodologies and utilize technological resources to enhance student learning.

3. Additional study is required to investigate how demographic characteristics, such as gender, age, and location of posting, affect perceptions of the success of blended learning. This research will provide insights for developing customized instructional techniques and support systems.

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