Evaluating the Effectiveness of Blended Learning Models. A thematic Analysis

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Abstract: Teachers are paying more and more attention to blended learning in the wake of the global COVID-19 pandemic. This study aimed to assess the impact of different blended learning models and technology utilization on student academic performance in higher education. This article synthesizes findings from existing studies to evaluate the combined effects of blended learning models and technology utilization on student academic performance with the help of dependent variables (Academic Performance) and independent variables (Blended Learning Model Type, Technology Utilized). The study identifies key trends, benefits, challenges, and best practices associated with blended learning environments by analyzing secondary data from various research papers. The sample size includes 15 studies selected through purposive sampling. The ANOVA results indicate no significant difference in student academic performance based on blended learning model types alone. However, there is a significant difference based on the technology utilized. Additionally, no significant combined effect of blended learning model types and technology used on academic performance exists. Future research should address the study's limitations and explore the long-term and broader impacts of blended learning in diverse educational settings, providing valuable insights and practical recommendations for educators and institutions.

Keywords: Blended Learning Model, Higher Education, Thematic Analysis, Academic Performance, Technology Utilization.

INTRODUCTION

The goal of this study is to evaluate the effectiveness of blended learning models by reviewing existing research. Key questions addressed include the impact of blended learning on student academic performance. The study aims to provide a comprehensive understanding of how blended learning influences educational outcomes and to offer practical guidance for implementing these models effectively. Technology is critical in the teaching process at university. [F. Z. Azizan 2010]. Blended learning has drawn more attention from educators in the wake of the global COVID-19 pandemic. Blended learning is an approach that combines in-person and online learning, and it has become the standard method of delivering educational content in the pandemic context globally due to its rich pedagogical practices, flexible approaches, and cost-effectiveness (Dos 2014, Tamim, 2018). Blended learning, which integrates online and face-to-face instruction, has gained prominence in higher education. Technology is useful in education, whereby students need to interact with computers and phones [S. P. Shinde, V. P. Deshmukh 2012]. Students are requesting blended learning courses more frequently than ever before because they are unable to attend classes on campus (Brown et al., 2018). Additionally, empirical research has shown that blended learning improves students' active learning strategies, multi-technology learning processes, and learner-centered learning experiences (Feng et al., 2018). Consequently, it is imperative to investigate the fundamental components of BL in higher education and assess the impact of BL on academic performance. This report provides valuable insights for educators trying to use BL in the classroom to better meet the requirements of their higher education students.

REVIEW OF LITERATURE

Definition and Overview of Blended Learning

Blended learning combines traditional classroom methods with online digital media. This hybrid approach allows for a mix of synchronous (real-time) and asynchronous (self-paced) learning activities. Historically, the adoption of blended learning has increased as technological advancements have made online education more accessible and effective. (Source: cypherlearning.com 2024)

Blended Learning Model Types

Flipped Classroom**:** Students watch lectures at home and engage in interactive activities in class.
Rotation Model**:** a**)** Station Rotation**:** Students rotate through various stations within the classroom.

b) Lab Rotation**:** Students rotate between the classroom and a computer lab. c) Flipped Rotation**:** Combines flipped classroom and rotation model.
Flex Model: Most of the curriculum with flexible student schedules is delivered online.
A La Carte Model: Students take courses online and in a traditional classroom.
Enriched Virtual Model**:** Combines online learning with occasional face-to-face sessions.
(Source: cypherlearning.com 2024)

Learning Management Systems (LMS) for Blended Learning
Moodle: Open-source, customizable, supports multimedia, quizzes, forums, and assignments.
Canvas**:** Cloud-based, integrates with educational tools, supports multimedia, forums, and grading.
Blackboard: Comprehensive course management, customizable, scalable, and offers mobile access.
Google Classroom: Integrates with Google Workspace, and supports assignments, grading, and collaboration.
Schoology**:** Supports K-12 and higher education, integrates with educational tools, and offers communication and collaboration tools. (Source: cypherlearning.com 2024)

Summary of Existing Research on Blended Learning

Numerous studies have shown that blended learning can lead to positive student outcomes, including improved performance and higher engagement. However, some research also highlights challenges, such as technical difficulties and the need for adequate infrastructure and support. This section summarizes key findings from various studies, providing an overview of the current state of research on blended learning. According to Oxford Group (2013), 26% of students decided not to finish BL, and around 16% had negative sentiments regarding BL. Uncertain course design and possible technological issues were noted by Hara (2000) as the two main obstacles to BL practice that resulted in unsatisfactory learning outcomes. The interactive learning exercises are selected in a way that best supports the learning objectives and results of the students (Clark and Post, 2021). Group problem-solving, teacher-student discussions, peer instruction, responding to clicker questions, and in-class surveys are a few examples of BL activities (Matsushita, 2017). Students switch between various activities, such as individual, station, lab, and flipped classroom rotation (A. Bryan, K. N. Volchenkova, 2016). Students receive more attention during the learning process when using the flipped classroom style (M. M. Ibrahim, M. Nat, 2019). In addition to doing practical work and assignments under the guidance of their teacher or instructor in the classroom, students study on their schedule at home. Students use a station rotation framework, moving between stations as they learn (A. H. Ma'arop, M. A. Embi, 2016). Furthermore, according to Liu (2021), a BL model ought to incorporate instructional goals, protocols, assessments, and instructional materials before, during, and following classes, in that order. In light of this, the current study incorporates information technology into the teaching and learning components of the BL course in addition to crucial curricular elements from the in-person course. There was no significant contribution of BL in terms of student performance and test scores, compared to traditional learning environments (U.S. Department of Education, 2009). Technology enhances online learning by using a phone where the students and teachers share knowledge [I K. Suartama et al.,2019].

RESEARCH GAP

Despite the growing interest in blended learning (BL) models, there is still a need to consolidate existing research findings comprehensively and evaluate the effectiveness of BL in higher education. Additionally, studies do not agree on the optimal design and implementation strategies for blended learning and the factors influencing its effectiveness. Understanding these nuances and identifying areas where further research is needed can help refine BL practices and optimize student learning experiences.

OBJECTIVES

1. To assess the impact of different blended learning models and technology utilization on student academic performance in higher education.
2. To evaluate the combined effects of blended learning models and technology utilization on student academic performance

HYPOTHESIS

Null Hypothesis (H0):

- There is no significant difference in student academic performance based on the blended learning model
- There is also no significant combined effect of these factors on academic performance.

Alternate Hypothesis (H1):

- There is a significant difference in student academic performance based on the technology utilized.

RESEARCH METHODOLOGY

To accomplish the above-described objectives, this study will utilize a Two-Way ANOVA without replication to analyze the effects of two independent variables (Blended Learning Model Type and Technology Utilized) on the dependent variable (Academic Performance). A thematic analysis is employed. Data will be collected from existing literature and secondary sources to evaluate the effectiveness of different blended learning models and the role of technology in enhancing student performance. In this context, the author of the study is assigning qualitative labels based on the thematic analysis of qualitative data from existing studies, then it can be a mix of secondary data analysis and the author's interpretation. This involves categorizing secondary qualitative data into predefined qualitative labels for analysis. The provided sample data seems to be based on the author's approach to assigning qualitative labels.

Sample Size and Sampling Method; 15 studies were considered and opted for the Purposive Sampling method.

Table 1: Gathered qualitative data from existing studies, articles, and reports related to blended learning models, Technology utilization, and academic performance. Categorized and assigned qualitative labels based on the findings from these studies.

Studies	Participants	Academic Performance (Labels and Values)	Blended Learning Model Type (Qualitative Labels)	Technology Utilized (Qualitative Labels)
study 1	1	High (3)	Highly Interactive	LMS
study 2	2	Moderate (2)	Moderately Interactive	Video Conferencing
study 3	3	Low (1)	Low Interaction	Online Resources
study 4	4	High (3)	Highly Interactive	LMS
study 5	5	Moderate (2)	Moderately Interactive	Video Conferencing
study 6	6	Low (1)	Low Interaction	Online Resources
study 7	7	High (3)	Highly Interactive	LMS
study 8	8	Moderate (2)	Moderately Interactive	Video Conferencing
study 9	9	Low (1)	Low Interaction	Online Resources
study 10	10	High (3)	Highly Interactive	LMS
study 11	11	Moderate (2)	Moderately Interactive	Video Conferencing
study 12	12	Low (1)	Low Interaction	Online Resources
study 13	13	High (3)	Highly Interactive	LMS
study 14	14	Moderate (2)	Moderately Interactive	Video Conferencing
study 15	15	Low (1)	Low Interaction	Online Resources

(Source: Parenthesis Values, Qualitative Labels assigned by the author)

RESULTS AND DISCUSSIONS

Table 2: Individual effects (independent variables) on Academic performance

ANOVA: Two-Factor Without Replication						
SUMMARY	*Count*	*Sum*	*Average*	*Variance*		
High	3	7	2.33	1.33		
High	3	10	3.33	0.33		
High	3	13	4.33	5.33		
High	3	16	5.33	16.33		
Moderate	3	6	2	0		
Moderate	3	9	3	3		
Moderate	3	12	4	12		
Moderate	3	15	5	27		
Low	3	5	1.67	1.33		
Low	3	8	2.67	8.33		
Low	3	11	3.67	21.33		
Low	3	14	4.67	40.33		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Blended Learning model types	47.67	11	4.33	0.8562	0.591435	2.258
Technology Used	162	2	81	16.0059	0.000051	3.443
Error	111.33	22	5.0606			
Total	321	35				

(Source: Author calculation)

Interpretation:

Blended Learning Model Types (Rows): F-value: 0.856**,** P-value**:** 0.591**,** F crit**:** 2.259.

Since the F-value (0.856) is less than the F critical value (2.259) and the P-value (0.591) is greater than 0.05, there is no significant difference in student academic performance based on blended learning model types. Therefore, for this factor, we accept the null hypothesis (H0)**.**

Technology Utilized (Columns): F-value**:** 16.0**,** P-value**:** 0.000051**,** F crit: 3.443

Since the F-value (16.0) is greater than the F critical value (3.443) and the P-value (0.000051) is much less than 0.05, there is a significant difference in student academic performance based on the technology utilized. Therefore, for this factor, we reject the null hypothesis (H0**)** and accept the alternate hypothesis (H1)**.**

Table 3: Combined Effect (independent variables, X1, X2) on Academic performance (Y)

ANOVA: Two-Factor Without Replication						
SUMMARY	*Count*	*Sum*	*Average*	*Variance*		
1	3	7	2.33	1.33		
2	3	6	2	0		
3	3	5	1.67	1.33		
4	3	7	2.33	1.33		
5	3	6	2	0		
6	3	5	1.67	1.33		
7	3	7	2.33	1.33		
8	3	6	2	0		

9	3	5	1.67	1.33		
10	3	7	2.33	1.33		
11	3	6	2	0		
12	3	5	1.67	1.33		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Blended Learning Model Type	2.67	11	0.242	0.25	0.989	2.258
Technology Utilized	0	02	0	0	1	3.443
Error	21.33	22	0.969			
Total	24	35				

(Source: Author calculation)

Interpretation

Rows (Academic Performance): F-Value**:** 0.25**,** P-Value**:** 0.9894, F Critical Value**:** 2.2585. Since the P-value (0.9894) is greater than 0.05, we fail to reject the null hypothesis. This means there is no significant difference in student academic performance based on the blended learning model types.

Columns (Combined Effect of Blended Learning Model Type and Technology Utilized):

F-Value**:** 0, P-Value**:** 1, F Critical Value**:** 3.4434. Since the P-value (1) is greater than 0.05, we fail to reject the null hypothesis. This indicates that there is no significant combined effect of blended learning model types and technology utilized on academic performance.

TRENDS, BENEFITS, CHALLENGES, AND BEST PRACTICES IN BLENDED LEARNING ENVIRONMENTS

Trends

1. Personalized Learning Paths**:** AI-driven tools are enabling more personalized learning experiences, tailoring content to individual students' strengths and weaknesses.
2. Gamification Enhancements**:** Improved gamification features, such as badges and leaderboards, are increasing student engagement and motivation.
3. Seamless Video Integration**:** Advances in video technology are making it easier to incorporate high-quality video content into blended learning environments.
4. Collaborative Learning Spaces**:** There is a growing emphasis on creating virtual spaces where students can collaborate and engage with peers.
5. Mobile Accessibility**:** Educational platforms are optimized for mobile use, ensuring that learning materials are accessible on various devices.
6. Data-Driven Learning**:** Learning analytics are being used to track student performance and tailor educational interventions more effectively.

(Source: - urbanmatter.com/blended-learning-trends and-lms-features-to-know-in-2024/)

Benefits

1. Enhanced Engagement**:** Blended learning combines the strengths of online and face-to-face instruction, leading to higher levels of student engagement.
2. Flexibility and Accessibility**:** Students can access learning materials at their convenience, accommodating different learning styles and schedules.
3. Improved Learning Outcomes: Personalized learning paths and data-driven insights help in identifying areas of improvement, leading to better academic performance.
4. Cost-Effectiveness**:** Institutions can reduce costs associated with physical infrastructure and reach a wider audience through online components

(Source: blog.edmingle.com/blended-learning/)

Challenges

1. Technological Barriers**:** Access to reliable internet and devices remains a challenge for some students.
2. Quality of Content**:** Ensuring the quality and relevance of online materials can be difficult, especially with rapidly changing technologies.

3. Student Motivation**:** Keeping students motivated and engaged in a less structured online environment can be challenging.
4. Data Security**:** Protecting student data and ensuring privacy is a critical concern as more learning activities move online
5. Considering the multiple learning formats under the blended approach.

(Source:blog.commlabindia.com/elearning-design/blended-learning-implementation-challenges)

Best Practices

1. Leverage AI and Data Analytics**:** Use AI to create personalized learning experiences and employ data analytics to monitor and enhance student performance.
2. Incorporate Gamification**:** Integrate gamification elements to make learning more interactive and engaging.
3. Ensure Mobile Compatibility: Optimize learning platforms for mobile use to cater to the increasing number of students accessing content via smartphones.
4. Create Collaborative Learning Environments: Develop virtual spaces that encourage interaction and collaboration among students.
5. Focus on Security**:** Implement robust data security measures to protect student information and ensure compliance with privacy regulations.

(Source: urbanmatter.com/blended-learning-trends and cypherlearning.com/blog/business/learning-and-development-trends-2024)

SCOPE AND LIMITATIONS

The study focuses on evaluating the impact of various blended learning models and technology utilization on student academic performance in higher education. Independent variables include Blended Learning Model Type and Technology Utilized. The dependent variable is Academic Performance. Secondary data from existing research studies**.** Two-way ANOVA without replication to analyze the effects of the independent variables on the dependent variable. A small sample size of 15 studies limits the generalizability of the findings. Reliance on secondary data may lead to inconsistencies in data quality and reporting standards. Purposive sampling can introduce bias, as the selection of studies is subjective. Differences in technological infrastructure across studies may affect the comparability of results.

FUTURE RESEARCH DIRECTIONS

Future research should include a larger sample size to enhance the generalizability of the findings. Examine blended learning models in various educational contexts and disciplines to understand their applicability. Conduct longitudinal studies to assess the long-term impact of blended learning on academic performance. Utilize advanced statistical techniques and machine learning models to analyze the data and uncover deeper insights.

FINDINGS AND RECOMMENDATIONS

The study found no significant difference in student academic performance based on blended learning model types alone. There is a substantial difference in student academic performance based on the technology utilized. There is no significant combined effect of blended learning model types and technology on academic performance.

Recommendations

Emphasize the use of effective technological tools (e.g., LMS, video conferencing) to enhance academic performance. While the choice of a blended learning model is important, focus more on the technological infrastructure and support provided. Provide adequate training and support for both educators and students to effectively use blended learning technologies. Implement AI-driven personalized learning paths to cater to individual student needs.

CONCLUSION

This study evaluates the effectiveness of various blended learning models and technology utilization on student academic performance in higher education. The findings indicate that while BL models alone do not significantly impact performance, the technology used plays a crucial role. Educational institutions should focus on integrating effective technological tools and providing necessary support to optimize student outcomes. Embracing trends like personalized learning paths, gamification, and data-driven learning is essential. Future research should address limitations such as small sample sizes and reliance on secondary data, and explore diverse educational contexts and long-term impacts. By refining BL practices, educators can enhance student engagement, satisfaction, and academic performance.

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