Comparing The Effectiveness Of Traditional And Flex Blended Learning Approach On Student Academic Achievement

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Abstract
This study investigated the effectiveness of flex blended learning compared to traditional classroom instruction in teaching Educational Statistics to B.Ed. (Bachelor of Education) (1.5) students at the Federal College of Education, Islamabad. Forty students were randomly divided into experimental and control groups based on pre-test scores. The experimental group received instruction using a flex blended approach, which provided students with greater flexibility in terms of time, place, and pace of learning. In contrast, the control group followed a traditional lecture-based format. Both groups studied the same topics over three weeks. Pre-test and post-test data was collected and analyzed using t-tests. The results revealed a significant difference in academic performance between the two groups, with the flex blended learning group demonstrating superior outcomes. The study suggests that the flex blended approach can be a valuable tool for enhancing student achievement in Educational Statistics and other social sciences subjects.

Keywords: Flex Blended approach, Control and Experimental Groups, traditional lecture method, pre-test, post-test

INTRODUCTION

The rapid advancements in technology have transformed educational practices, leading to the emergence of alternative instructional approaches. Blended learning, which combines traditional face-to-face instruction with online components, has gained prominence as a method that can enhance student engagement and learning outcomes. Among the various blended learning models, the flex blended approach stands out by offering students a high degree of control over their learning experience. This flexibility contrasts with the more structured nature of traditional classroom instruction.

While traditional learning methods have long been the cornerstone of education, the evolving demands of 21st-century learners necessitate more personalized and flexible learning environments. The flex blended learning approach offers potential benefits by accommodating diverse learning styles and providing opportunities for self-directed learning. However, questions persist regarding its effectiveness in comparison to traditional instructional methods, particularly in terms of academic achievement.

This study aims to compare the effectiveness of traditional classroom instruction with the flex blended learning approach in improving the academic performance of students enrolled in the Bachelor of Education (1.5 years) program in Educational Statistics at the Federal College of Education, Islamabad. By investigating the potential advantages of the flex model, this research sought to determine that it can lead to superior academic outcomes and recommended as a pedagogical strategy for enhancing student learning in higher education.

Statement of the Problem

Flex blended learning approach is one of the emerging approaches of blended learning. Therefore, the present study was conducted to compare the effectiveness between the traditional classroom setting and the flex blended learning approach to overcome the academic achievement gap.

Objective of the Study

The objective of the study was to compare the effectiveness between the traditional classroom setting and the flex blended learning approach to overcome the student achievement gap.

Hypothesis of the Study

Following null hypotheses were tested to achieve the objectives of the study:
Ho1: There is no significant difference between the performance of experimental and control group before pre-test.
Ho2: There is no significant difference between the performance of control group in pre-test and post-test.

Ho3: There is no significant difference between the performance of experimental group in pre-test and post-test.
Ho4: There is no significant difference between the performance of experimental and control group in post-test.

LITERATURE REVIEW

Blended learning, a pedagogical approach that combines traditional face-to-face instruction with digital tools, has gained significant attention in the 21st century as educators explore innovative ways to improve learning.

While definitions can vary, most agree that blended learning involves the integration of both physical and virtual environments to create a more flexible and effective learning experience (Almaiah, Al-Khasawneh, & Althunibat, 2020). Graham (2004) characterizes blended learning as the convergence of synchronous, human-interaction-based environments with asynchronous, text-based environments. Mason and Rennie (2006) expand this definition to include "other combinations of technologies, locations, or pedagogical approaches," while Garrison & Vaughan (2008) emphasize the thoughtful fusion of face-to-face and online learning experiences, urging a redesign of teaching and learning environments.

Blended learning is not merely the supplementation of traditional classrooms with online resources. Driscoll and Carliner (2005) describe four primary forms of blended learning: (1) a mix of web-based technologies, (2) a combination of teaching methods, (3) the integration of digital content and face-to-face instruction, and (4) a blend of instructional technology with practical tasks. These patterns demonstrate that blended learning is more than a single method but a combination of instructional practices that vary depending on the learning context.

One variation of blended learning is the flex model, which offers students flexibility in how they access course materials and manage their learning. According to Nguyen (2023), the flex model enables students to access online materials while attending physical classrooms, granting them control over their learning pace. The teacher's role shifts from delivering content to providing individualized guidance and support. This model allows teachers to customize instruction and learning resources to cater to students' diverse needs and preferences. It also enhances teacher-student relationships by enabling more personalized interactions.

Research indicates that flexible learning addresses students' need for more autonomy in their learning process, often facilitated by blended learning designs (Müller, Mildenberger, & Steingruber, 2023). These designs must provide clear structure, activate learning tasks, encourage interaction, and offer timely feedback to enhance student engagement. The effectiveness of the blended approach can depend on several factors, such as the proportion of online content in the learning environment. Owston and York (2018) found that students in courses with higher online components (50% or more) performed better and rated their learning environments more positively than those with lower online engagement.

Further studies have supported the positive impact of blended learning on student performance. A meta-analysis by Yu et al. (2023) revealed that blended learning had a medium to high impact on students' learning outcomes. Factors like teaching methods, online interaction, and regional context were found to moderate the effectiveness of blended learning, suggesting that its success depends on contextual variables and instructional design.

In contrast, Vo et al. (2020) highlighted that instructional design factors such as setting clear goals and encouraging collaborative learning are crucial predictors of student success in blended courses. While blended learning fosters a more flexible and collaborative environment, its effectiveness is influenced by other factors such as instructor feedback and facilitation, which impact the learning experience but are not always reflected in final grades.

Within the Pakistani context, Fida, Rehman, and Naeemullah (2023) examined the impact of blended learning on students' performance in Economics at the higher education level. Their findings supported the view that blended learning fosters a more collaborative learning environment, contributing to higher academic performance compared to traditional classroom settings.

The concept of the flipped classroom is also linked to blended learning. In this model, traditionally in-class activities like lectures are moved online, while exercises and problem-solving are brought into the classroom, allowing students to engage in more active learning. This concept, popularized by Bergmann and Sams (2014), has shown promising results in terms of improving student engagement and learning outcomes, as students can access content at their own pace and use classroom time for collaborative learning under teacher guidance.

In conclusion, blended learning offers flexibility, customization, and enhanced engagement, which can improve students' learning experiences. However, the effectiveness of this model depends on the design of the course, the balance between online and face-to-face components, and the specific educational context in which it is applied. Future research should focus on understanding the activity-level interactions and the underlying causes of learning outcomes in blended environments, as proposed by Graham (2019).

METHODOLOGY

Method and Procedure

The population was consisted of all students studying the subject of Educational Statistics in B.Ed. (1.5 years) at Federal College of Education, Islamabad. Forty students studying the subject of Educational Statistics in B.Ed.(1.5 years) at Federal College of Education, Islamabad were the sample of the research study. The sample students were divided into experimental and control group through paired random sampling technique on the basis of pre-test scores.

Research Design

Pre-test, post-test equivalent group design was used in the study. The symbolic representation of the design is:

R-E = $O_1T O_2$ =   R = Randomly selected
R-C = $O_3 - O_4$ =   E = Experimental group
dRE= $O_2 - O_1$ =   C = Control group

dRC= $O_4 - O_3$ =   O = Observation or Measurement
Where
D = d_{RE} - d_{RC}
dRE = O_2 - O_1
dRC = O_4 - O_3

D = d_{RE} - d_{RC}	T= The experimental treatment to which a group is exposed i.e. Independent variable d_{RE} = The difference between the scores on pre-test and post-test for the experimental group d_{RC} = The difference between the scores on pre-test and post-test for the control group.

Source: Farooq & Tabassum (2017)

Research Instruments
Pre-test, post-test were used to compare the effectiveness between the traditional classroom setting and the flex blended learning approach.

Data collection & Analysis
Data was collected through the pre-test and post-test. The data was analyzed by applying t-test through SPSS.

ANALYSIS AND INTERPRETATION OF DATA
Ho1: There is no significant difference between the mean scores of Control and experimental groups on the pre-test.

Table 1. Significance difference of mean scores in t-test results

Group	N	Mean	SD	t-value	p-value
Control (pre-test)	20	34.63	5.088	0.154	0.878
Experimental (pre-test)	20	34.88	5.183		

df= 38 Non-significant Table Value at 0.05= 2..024

Table 1 shows that at the 0.05 level of significance, the t-value 0.154 was less than the table t-value of 2.024, therefore the null hypothesis was accepted which indicates non-significance results. It means that there was no significant difference in academic performance between the control group and experimental group in pre-test.
Ho2: There is no significant difference between the mean scores of pre-test and post-test in control group.

Table 2. Significance difference of mean scores in t-test results

Group	N	Mean	SD	t-value	p-value
Pre-test (Control)	20	34.625	5.088	4.907	0.000
Post-test (Control)	20	48.350	11.427		

df= 38 Significant Table Value at 0.05= 2..024

Table 2 reveals that the critical t-value (4.907) is higher than the table value of 2.024 at significance level of 0.05, therefore, the null hypothesis is rejected and alternative hypothesis is accepted. The mean value (>48.35, SD=11.427) of academic performance of the post-test control group is better as compared to the mean value (<34.625, SD=5.088) of pre-test of control group. It indicates that the post-test of control group students perform better than the pre-test of control group students.

Ho3: There is no significant difference between the mean scores of pre-test and post-test in experimental group.

Table 3. Significance difference of mean scores in t-test results

Group	N	Mean	SD	t-value	p-value
Pre-test (Experimental)	20	34.625	5.183	13.05	0.000
Post-test (Experimental)	20	65.925	9.296		

df= 38, Significant,Table Value at 0.05= 2..024

Table 3 shows that the critical t-value (13.05) is higher than the table value of 2.024 at significance level of 0.05, therefore, the null hypothesis is rejected and alternative hypothesis is accepted. The mean value (>65.925, SD=9.296) of academic performance of the post test of experimental group is better as compared to pre-test of experimental group having mean value (<34.625, SD=5.183). It means that the post-test experimental group students performed better than the pre-test students of experimental group.

Ho4: There is no significant difference between the mean scores of control and experimental groups on the post-test.

Table 4. Significance difference of mean scores in t-test results

Group	N	Mean	SD	t-value	p-value
Control (post-test)	20	48.35	11.427	5.335	0.000
Experimental (post-test)	20	65.92	9.297		

df= 38 Significant Table Value at 0.05= 2..024

Table 4 indicates that the critical t value (5.335) is higher than the table value of 2.024 at a significance level of 0.05, therefore, the null hypothesis is rejected and alternative hypothesis is accepted. The mean value (>65.92, SD=11.427) of academic performance of the experimental group is better as compared to the mean value (<47.04, SD=9.297) of control group. It indicates that the experimental group students performed better than the control group students.

DISCUSSION
The findings of this study demonstrate that students taught using the flex blended learning approach significantly outperformed those taught through traditional lecture methods. This aligns with previous research, reinforcing the effectiveness of blended learning in promoting student achievement and engagement.

For instance, Fida's (2023) study similarly concluded that students exposed to blended learning environments outperformed their counterparts in traditional settings. Fida's research highlights the enhanced academic outcomes that blended learning offers by combining face-to-face interaction with online resources, catering to diverse learning styles and promoting student autonomy.

Additionally, the results of this study support the findings of Osten and York (2018), who investigated the effects of blended learning across various subjects and course levels. Their study found that students' perceptions and academic performance improved when a significant portion of classroom time was replaced by online activities, suggesting that incorporating online components into traditional learning environments not only improves academic outcomes but also positively influences students' attitudes toward learning. The increased flexibility and access to resources that blended learning provides allows students to take greater control over their learning process, resulting in deeper engagement and better retention of material.

Hillard and Stewart (2019) also observed similar trends in their study, where students in classes with a high blend of online and face-to-face instruction reported perceiving higher levels of teaching quality. The use of blended learning models enabled students to engage with course content at their own pace while still benefiting from the guidance and support of their instructors during face-to-face interactions. The combination of online and in-person components fostered more interactive and collaborative learning experiences, which may contribute to students' perceptions of improved teaching quality.

Furthermore, Yu et al. (2023) analyzed the broader impact of blended learning on educational reform and development. Their study emphasized that blended learning has become a critical approach for modernizing education, facilitating flexible learning environments, and fostering student-centered teaching practices. The integration of technology into the learning process not only enhances access to learning materials but also allows for personalized learning pathways, which is particularly beneficial for accommodating different learning speeds and preferences. This flexibility is a key advantage of the flex model, as it grants students autonomy over their learning time, place, and pace.

In summary, the findings of this study, in conjunction with existing literature, underscore the effectiveness of the flex blended learning approach in enhancing student academic performance. Blended learning fosters active engagement, autonomy, and access to diverse learning resources, which can significantly improve educational outcomes. The present study, along with other research, suggests that educational institutions should consider integrating blended learning models, especially the flex approach, into their curricula to optimize student achievement and support educational reform.

CONCLUSIONS AND RECOMMENDATIONS
On the basis of analysis of the data following conclusions were drawn:
- There was no significance difference between the performance of students of both control and experimental groups in pre-test.
- There was a significance difference in the performance of students taught through flex model blended approach and traditional lecture method in their pre-test and posts.
- There was a significance difference in the performance of experimental and control group in post-test. The performance of students taught through flex model blended approach performed much better than traditional lecture method teaching.

The findings of this study demonstrate that the flex model blended learning approach significantly outperforms traditional lecture-based instruction in improving student academic performance. Students in the flex blended learning environment, with the autonomy to control their learning pace, time, and place, exhibited significantly higher academic gains compared to those in the traditional classroom setting.

This study supports the effectiveness of blended learning methods, particularly when combined with online components, in fostering deeper engagement, personalized learning, and enhanced knowledge retention. The flex model's adaptability to different learning preferences and its promotion of active, self-directed learning make it a powerful instructional approach in modern education.

RECOMMENDATIONS
The following recommendations have been prepared based on research findings:

• The present study revealed that the academic performance of the students taught through flex model blended was much better as compared to the students taught through traditional lecture method. It is therefore, recommended that the teaching method be shifted to flex model blended approach. In this way the student learning can be increased. For practical application of this model attention should be paid to design principles adequate course structure and guidance for students for activating learning task stimulation interaction and social presence of teacher and timely feedback on learning process.

• To maximize the benefits of the flex model, it is essential to provide teachers with professional development opportunities focused on blended learning strategies. This includes training on how to design and deliver effective online content, manage student progress, and integrate face-to-face sessions to provide personalized support and feedback.

• Schools and higher education institutions should invest in the necessary technological infrastructure, such as reliable internet access, learning management systems (LMS), and digital content repositories, to facilitate the smooth implementation of blended learning approaches. Where internet access is limited, offline or network-based solutions should be developed to ensure all students benefit from the flex model.

• Future research should explore the application of the flex model blended learning approach in various academic settings and subjects to further validate its effectiveness. Studies can also investigate long-term impacts on student learning, retention, and career readiness.

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