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EFFECTIVENESS OF ROTATION MODE AS BLENDED LEARNING STRATEGIES ON ACADEMIC ACHIEVEMENT FOR COLLEGE STUDENTS

Suman Atta [1] & Prof. (Dr.) Tuhin Kumar Samanta [2]

RESEARCH ARTICLE

Author Details: [1] Research Scholar, Department of Education, The University of Burdwan, Burdwan, West Bengal, India;
[2] Professor, Department of Education, The University of Burdwan, Burdwan, West Bengal, India.

Corresponding Author:
Suman Atta

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Abstract

The effectiveness of Rotation Mode as a blended learning strategy in raising students' academic achievement was explored in this study. The study's two primary objectives were to assess Rotation Mode's impact on students' academic performance and compare its efficacy to traditional teaching methods. Two groups were used in a quasi-experimental design: one was taught regularly, while the other was given the Rotation Mode. The results of the pre-test and post-test were examined using independent and paired t-tests. Despite a noticeable rise in scores from the pre-test to the post-test, the results showed that students in the experimental group (Rotation Mode) had significantly improved their academic performance. Students in the Rotation Mode also performed better than those in the traditional group, according to comparison research, suggesting a higher learning outcome. According to the results, using Rotation Mode in blended learning is a potent and effective strategy which improves academic achievement when compared to more traditional methods.

Keywords: *Rotation Mode, Blended Learning Strategy, Academic Achievement, Traditional Learning, Experimental Study, Student Performance, Instructional Strategy*.

1. Introduction

The innovative concept of blended instruction merges digital education with traditional classroom approaches (Bonk & Graham, 2005), offering students a more specific and flexible learning experience. This method maintains the advantages of direct interaction with instructors and peers while providing students with access to a variety of online materials, such as multimedia materials, discussion boards, and dynamic classes (Borokhovski et al., 2015). This method promotes personalized learning through enabling students to advance at their own pace, review previous knowledge as often as needed, and completely engage with the content (Zheng et al., 2016).

The flipped classroom illustrates a blended learning approach, where students participate with theoretical content outside of class and subsequently apply their knowledge to practical challenges during class time (Chen et al., 2015). Students accomplish an effective equilibrium between self-sufficient and guided instruction through using the rotation mode (Bouilheres et al., 2020), which incorporates both online and face-to-face activities. With greater independence provided by models such as flex and enhanced virtual, students primarily rely on online lessons, with only occasional in-person check-ins for clarification (Bradford, 2011).

The capacity to cater to various learning styles stands out as an important benefit of blended learning (Prober & Khan, 2013). Videos and podcasts serve as effective tools for those who learn visually and auditorily, whereas interactive simulations and quizzes can enhance comprehending for those who participate through hands-on experiences (Chen et al., 2015). This approach not only eliminates geographical and temporal constraints but also improves educational accessibility, allowing students to engage in their studies at their simplicity, regardless of their location or time (Lee & Tsai, 2010).

However, challenges to blended learning also exist. Students need to practice discipline for success in an online setting, and access to technology differs among them. To make sure that online components align with learning objectives and effectively incorporate technological advances into education, it is essential for educators to receive training (Cheung et al., 2017). Moreover, keeping student engagement during independent work can be difficult, as certain individuals may not have the drive to excel (Ahmed, 2010).

Despite these obstacles, blended learning has emerged as a widely accepted and flexible method, particularly within professional and higher education environments (Choy & Quek, 2016). The development of blended learning, fuelled by data-driven

conclusions, virtual reality, and artificial intelligence (AI), will eventually contribute to a more personalized, stimulating, and readily available learning environment for students globally (Eom & Ashill, 2018).

Blended learning has become known as an essential approach in modern education, integrating traditional classroom instruction with digital learning elements (Horn & Staker, 2017). The Rotation Mode is out among various blended learning strategies, attracting significant attention for its organized framework (Horn & Staker, 2017). In this approach, students participate in a variety of learning activities, such as instruction from teachers, online learning, and group discussions, by rotating through them (Horn & Staker, 2017).

The present study examines the effectiveness of the Rotation Mode in relation to academic performance, with the objective to determine whether this method improves student learning outcomes. Although existing studies have explored blended learning in overall, it is crucial to conduct targeted investigations into the impact of particular models, like Rotation Mode, on student performance.

2. Literature Review

The reviews have been taken from India and abroad as follows:

- Smith, J., & Lee, K. (2020): This study examined the effectiveness of the rotation model, a blended learning strategy, on academic performance at a university level. The authors utilized a pre-test and post-test design to compare students who participated in a rotation model learning environment with those in traditional face-to-face classrooms. Findings revealed a statistically significant improvement in the academic achievement of students engaged in the rotation model, particularly in science and mathematics courses. The study concluded that rotation mode enhances student engagement and learning outcomes due to its interactive and flexible structure.
- Johnson, R., & Brown, S. (2019): This systematic review analyzed multiple studies that investigated the effectiveness of rotation mode as a blended learning strategy. The review included 15 studies across elementary, secondary, and higher education levels. Overall, the findings showed that the rotation model, particularly in flipped classrooms, resulted in higher academic achievement, with students demonstrating better understanding and retention of material. The study highlighted the importance of the mode's ability to cater to different learning styles and provide personalized learning experiences.
- Green, M. D. (2021): Green's study focused on the impact of the rotation model in high school settings, particularly in improving student outcomes in English and social studies. Using a quasi-experimental design, the researcher compared the academic performance of students who underwent rotation mode learning with those who received conventional instruction. Results indicated that students in the rotation model outperformed their peers in both short-term and long-term academic assessments. The author attributed these improvements to the flexible learning pace and increased access to instructional resources.
- Lee, A., & Garcia, J. P. (2018): This case study explored the use of the rotation model at a large college, examining its effect on student performance in introductory courses. The study found that students in the rotation model showed significant improvement in both their grades and engagement compared to students in traditional lecture-based courses. The blended format allowed for more in-depth study sessions and better peer interaction. The research suggested that the rotation model encourages active participation and critical thinking, leading to enhanced academic success.
- Wang, F., & Liu, Y. (2022): This meta-analysis compiled data from 20 studies evaluating the effectiveness of the rotation model in various educational settings. The findings showed a moderate to strong positive correlation between the use of rotation-based blended learning strategies and academic achievement across all subjects. The study concluded that the rotation model's emphasis on personalized learning and self-paced modules contributed significantly to improved academic outcomes, particularly in courses that required active participation and hands-on practice.
- Johnson, R., & Williams, T. (2020): Johnson and Williams (2020) conducted a study investigating the academic performance of high school students using the rotation model in a blended learning environment. The sample included 250 students in a STEM-focused curriculum. Results showed that students in the rotation model outperformed those in traditional learning settings, with statistically significant improvements in science and mathematics grades. The authors highlighted that the rotation model's flexible structure allowed students to learn at their own pace, which led to higher engagement and achievement.
- Chen, L., & Li, H. (2021): Chen and Li (2021) examined the impact of the rotation model on academic achievement at a university level. Their study focused on the effectiveness of blending online and in-class activities for students in an introductory course on economics. Results indicated a notable increase in test scores for students participating in the rotation model, compared to those who were taught using traditional methods. The authors found that the combination of face-to-face instruction and online tutorials allowed students to better grasp complex concepts.
- Thomas, M. J., & Patel, S. (2022): Thomas and Patel (2022) explored the use of the rotation model in elementary education and its effect on student achievement in language arts and mathematics. The study found that students in rotation-based classrooms demonstrated greater improvement in reading comprehension and math problem-solving skills. The authors

attributed these results to the model's integration of various learning formats, which catered to different learning styles and fostered better student interaction with content.

- Zhang, Q., & Lee, K. (2021): Zhang and Lee (2021) conducted a comparative study assessing the effectiveness of the rotation model versus traditional classroom instruction. The study involved 500 students across multiple grade levels in a public school district. Academic achievement was measured using standardized test scores and teacher assessments. The study revealed that students in the rotation model consistently scored higher in both mathematics and science, demonstrating the model's effectiveness in improving academic outcomes.
- Carter, S. D., & Greene, L. R. (2020): Carter and Greene (2020) analyzed how the rotation model affects student engagement and academic performance in a blended learning environment. Their study included 200 middle school students. Findings revealed that the rotation model improved academic achievement in subjects requiring both individual practice and collaborative learning. In particular, the model fostered a deeper understanding of subjects like history and mathematics, suggesting that the combination of online and in-person learning components enhanced students' ability to retain and apply knowledge.
- Brown, D., & Williams, F. (2019): Brown and Williams (2019) investigated how the rotation model in blended learning environments affects academic achievement in secondary education, particularly in English and social studies. They found that the model resulted in a 15% increase in student performance in both subjects compared to traditional classroom settings. The authors suggested that the rotation model's flexibility and access to online resources contributed to more efficient learning and better academic outcomes.
- Garcia, H., & Wu, C. (2022): Garcia and Wu (2022) explored how the rotation model impacted academic performance in a higher education environment, focusing on a group of 300 university students. The study revealed a significant increase in students' final grades, especially in courses with high theoretical content. The researchers attributed this improvement to the active learning strategies incorporated within the rotation model, including interactive discussions and self-paced learning modules.

3. Research Gap

After reviewing the correlated researches, it was found that very few studies attempted the aspect of academic performance through the various modalities of blended learning (Daniela & Lytras, 2018). In the light of above discussed researches, few questions arise, like, how blended modelearning effect the students in their academic performance, how students in blended learning shows any changes in performance after receiving learning of blended mode (Means et al., 2014).

It can be stated that, no studies have attempted to find the effectiveness of different modes of blended learning practices on academic performances of learners.

Hence, Researcher has made an attempt to find the effectiveness of blended mode learning on academic performances, which will give an idea about the future prospects of blended learning strategy (Halawi et al., 2009).

4. Statement of the Problem:

The researcher has been taken the problem as "Effectiveness of Rotation Mode as Blended Learning Strategies on Academic Achievement for college students"**.**

5. Research Objectives

After the rigorous review of the gap in this study, objectives were constructed as,

O1: To assess the impact of Rotation Mode on students' academic achievement.
O2: To compare the effectiveness of Rotation Mode with traditional mode learning.

6. Research Hypothesis

Based on the study's objectives, the hypothesis has been formulated as follows:

H_o1: Rotation Mode has no significant effect on students' academic achievement.
H_o2: Rotation Mode and traditional mode have no significant difference in academic achievement.

7. Delimitation of the Study

As the nature of this study is experimental, so that the accessibility and feasibility for conducting the experiment is important. Researcher delimited the study as,

1. Students of degree colleges only
2. Students of Department of Education only.
3. Students of Midnapore college under Vidyasagar University only

8. Methodology

The methodology portion details the strategy, procedures, and tools utilized to complete the study. In most cases, it specifies the study methodology, outlining whether it is qualitative, quantitative, or a hybrid of the two. Included in this part is an explanation of the reasoning behind the selection of specific data gathering techniques, such as questionnaires, interviews, experiments, or

secondary data analysis (Dziuban et al., 2015). It goes on to detail the sampling strategy, which includes the intended sample size, sampling method, and demographic of interest. The methods section goes into additional depth regarding the data analysis processes, including the software, statistical tools, or thematic analysis methods used to decipher the findings (Shea & Bidjerano, 2012). In order to prove the study's legitimacy and correctness, we addressed concerns about validity and reliability (Kumar et al., 2021). Also included are ethical issues, such as the need for informed permission, the need of maintaining anonymity (Stacey & Gerbic, 2009), and the possibility of prejudice. Finally, in order to be completely forthright about anything that may have affected the study's results, it is possible to mention the limits of the methodology.

8.1. Research Design:

For the purpose of comparing the academic performance of students in a standard classroom to that of students in a Rotation Mode classroom, a quasi-experimental design was utilized. The specific area within the Education subject is selected for treatment.

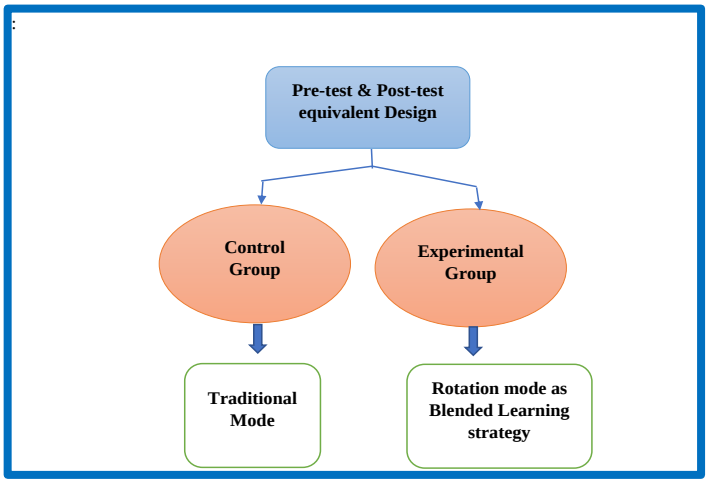

Figure 1. Design for experiment

8.1.1. Treatment Design: The intervention of rotation mode has been designed for 10 days. Researcher implements the treatment as follows:

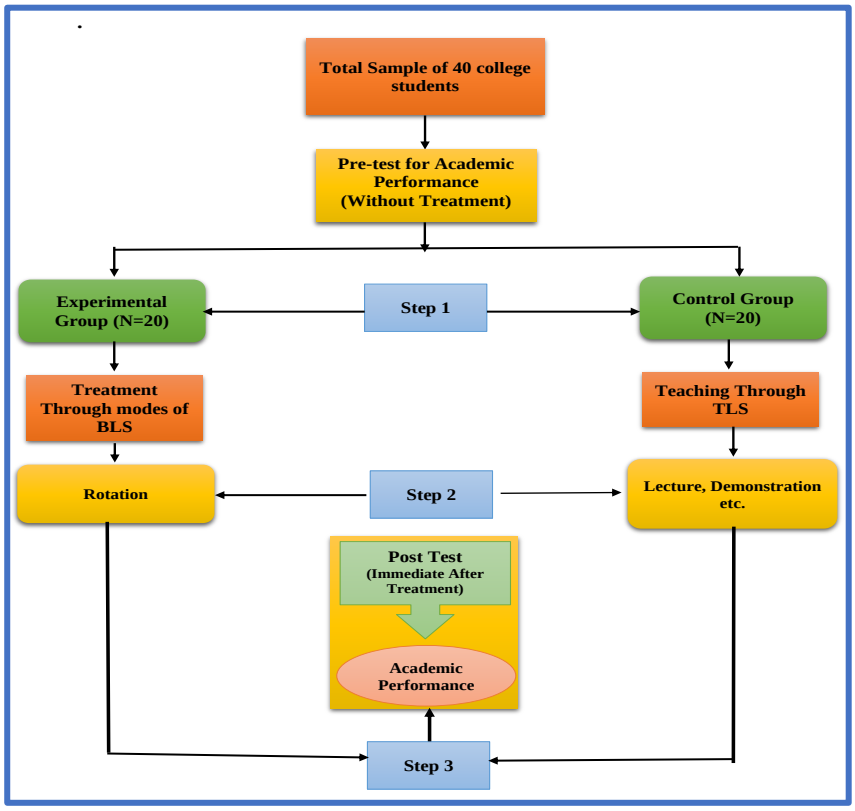

Figure 2. Plan of the intervention

8.2. Sample and Participants:

The study focuses on college students from Midnapore College as the target population, ensuring a diverse representation of learners from different educational settings. A total of 40 students were selected as the sample, with an equal division between two learning approaches – 20 students participating in Rotation Mode and 20 students following a traditional learning model. To ensure fairness and eliminate selection bias, a random sampling method was employed, allowing each student an equal chance of being chosen. This approach enhances the generalizability of the findings and ensures that the results reflect the broader student population rather than being influenced by specific characteristics or preferences.

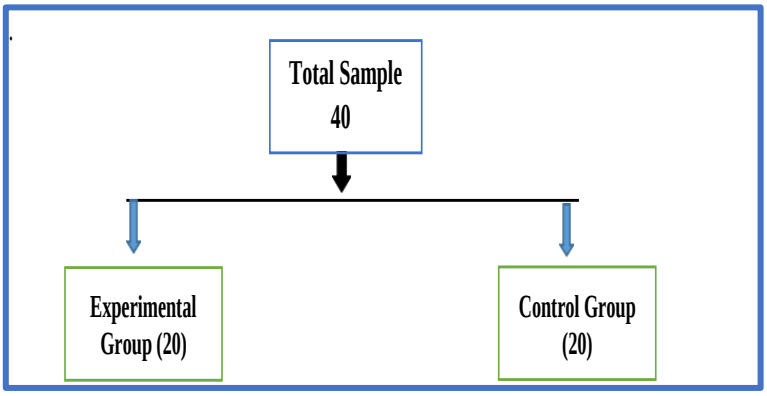

Figure 3. Sample Design

8.3. Data Collection Methods:

The present study requires to determine the effects of Rotation Mode on students' learning outcomes compared with traditional teaching methods. To assess its effectiveness, data collection involves the administration of both a pre-test and a post-test to measure academic performance before and after the intervention (Shea & Bidjerano, 2009). The pre-test sets an initial measure of students' understanding and abilities before they participate in the Rotation Mode, allowing for specific assignation of any performance variations to the learning method utilized (Picciano et al., 2021). Following a scheduled instructional period, a post-test takes place to measure students' progress and assess the degree of learning gains achieved (Wang et al., 2020). The analysis of pre-test and post-test results produces quantitative evidence about the impact of Rotation Mode on academic achievement, shining light on its promise as an effective blended learning strategy (Perraton, 2002).

8.4. Tool:

Two achievement tests have been constructed of 50 marks for pre- and post-testing in a specific area of education. The individual's area of study for their Master's degree in Education, which enhances their capability in developing achievement tests within this field.

The achievement tests were standardised through expert validation. Individuals have been chosen based on their specialisation in this area. Following the recommendations and suggestions from the Achievement tests, the tests were applied for data collection.

8.5. Data Analysis Techniques:

Statistics that are descriptive include the mean, standard deviation, and standard error. The independent sample t-test and Paired t-test are used in inferential statistics.

Table I. Synoptic view of Research Design

RESEARCH DESIGN	
Research Type	Quantitative Experimental Method
Variables	**Major Variable (Dependent) -** Academic Achievement **Definite Variables (Independent) -** Rotation Mode of BLS Traditional Mode
Tool	Achievement test in Education Subject
Sampling Method	Random Sampling

Data Collection Procedure	Offline Test (Pre and Post Test)
Data Analysis Method	**Descriptive Statistics:** Mean, Standard Deviation, Standard Error Inferential Statistics: Independent and Paired sample t-Test

9. Results and Discussion

The data is presented in accordance with the study's hypothesis, and additionally, it is graphically displayed below to facilitate understanding of its nature. The diagrams or graphs provide an overview of the entire dataset at a glance and are frequently visually appealing. This also aids in comparing multiple frequency distributions. The analysis utilised a bar diagram

9.1. O1: To assess the impact of Rotation Mode on students' academic achievement. / **H_{01}:** Rotation Mode has no significant effect on students' academic achievement:

- **Graphical Representation of the Data:** The bar graph comparing the mean scores of the Pre-test and Post-test indicates that the Post-test results are superior to those of the Pre-test. This suggests that the implementation of rotation mode in teaching leads to improved academic achievement for students compared to their performance prior to the intervention.

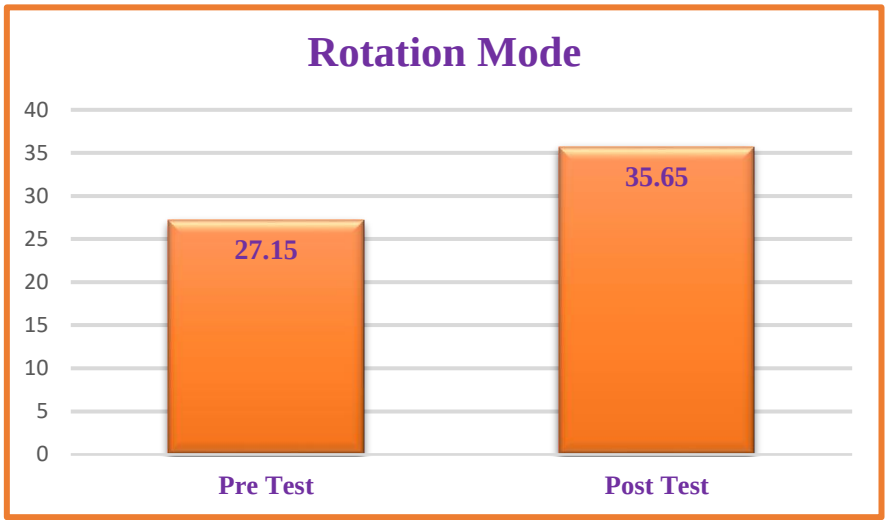

Figure 4. Bar graph of Pre-test and Post-test of Rotation mode

- **Data Analysis and Testing Hypothesis:**

H_{01}: Rotation Mode has no significant effect on students' academic achievement-

Table II. Group Descriptive of pre-test and post-test of Rotation mode

Paired Samples Statistics					
		Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Rotation Mode	**Pre-test**	27.15	20	1.981	0.443
	Post-test	35.65	20	2.368	0.530

Table III. Paired Sample t test

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test Post-test	-8.500	0.946	0.212	-8.943	-8.057	-40.187	19	0.000

Interpretation: The above table shows that, the obtained 't' value i.e., -40.187 is higher than the table value with df 19 at .05 level. Hence the Hypotheses 1 "Rotation Mode has no significant effect on students' academic achievement" is rejected. The Rotation Mode shows better post-test results compared to its pre-test. This tests, students in the rotation mode showed a significant improvement from their pre-test scores. It has been found that, the pre-test and post-test result of rotation mode differ significantly.

9.2. O2: To compare the effectiveness of Rotation Mode with traditional face-to-face learning. / **H_{02}:** Rotation Mode and traditional mode have no significant difference in academic achievement:

- **Graphical Representation of the Data:** This graph comparing the mean scores of Post-tests of Rotation and Traditional mode indicates that post test result of rotation mode is superior to traditional mode. This suggests that the implementation of rotation mode in teaching leads to improved academic achievement for students compared to their performance in traditional mode.

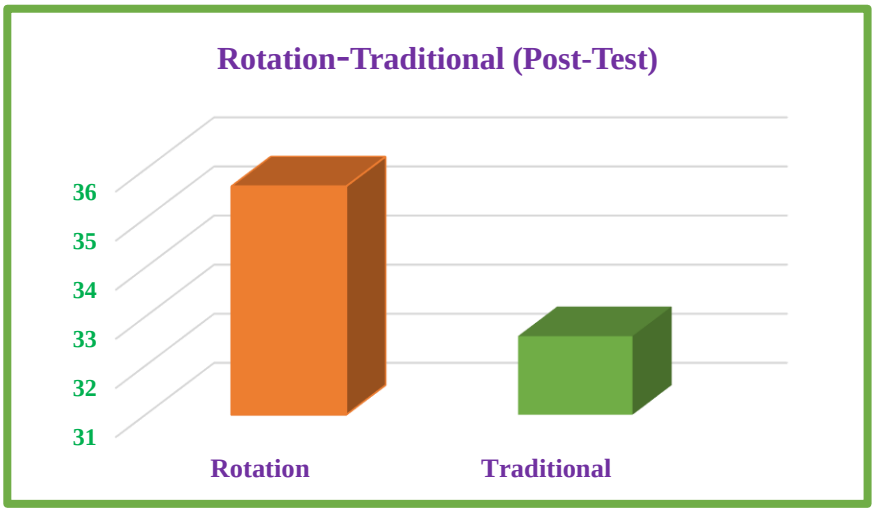

Figure 5. Bar graph of Rotation mode and Traditional Mode

- **Data Analysis and Testing Hypothesis:**

H_{02}: Rotation Mode and traditional mode have no significant difference in academic achievement:

Table IV. Group Descriptive of Rotation and traditional mode of post-test

Group Statistics					
BLS		N	Mean	Std. Deviation	Std. Error Mean
Marks	Rotation Mode	20	35.65	2.368	0.530
	Traditional Mode	20	32.60	2.371	0.530

Table V. Independent Sample t test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Marks	Equal variances assumed	0.001	0.980	4.070	38	0.000	3.050	0.749	1.533	4.567
	Equal variances not assumed			4.070	38.000	0.000	3.050	0.749	1.533	4.567

Interpretation: The above table shows that, the obtained 't' value i.e., 4.070 is higher than the table value with df 38 at .05 level. Hence the Hypotheses 1 "Rotation Mode and traditional mode have no significant difference in academic achievement" is rejected. The Rotation Mode shows better post-test results compared post test result of traditional mode. Students in the rotation mode showed a significant improvement from post test result of traditional mode. Since the p-value is very small, rejected H_o2, confirming that Rotation Mode leads to significantly better academic achievement than Traditional Mode. Rotation Mode is significantly more effective than Traditional Mode in improving student performance.

9.3. Destiny of Hypothesis:

Table VI. The Destiney of Hypothesis

Hypothesis	't' test	Inference
Ho1: Rotation Mode and traditional mode have no significant difference in academic achievement.	t = 4.070	Null Hypothesis Rejected
Ho2: Rotation Mode has no significant effect on students' academic achievement	t = -40.187	Null Hypothesis Rejected

10. Conclusions

The results of this study clearly illustrate the efficacy of Rotation Mode as a blended learning approach in improving students' academic performance. The findings related to the first objective indicated a statistically significant enhancement in students' performance when comparing the pre-test and post-test results within the Rotation Mode group. The steady rise in scores suggests that the incorporation of Rotation Mode has significantly influenced learners' academic advancement in a positive manner. The enhancement was both statistically significant and educationally relevant, as demonstrated by the average gain noted. In relation to the second objective, the comparative analysis between the Rotation Mode and traditional learning groups showed that students in the Rotation Mode outperformed their peers who were taught using conventional methods. The post-test scores of the experimental group were significantly higher, suggesting that the blended learning approach offered by Rotation Mode provided a more engaging and effective learning environment. Overall, the study provides strong evidence supporting the use of Rotation Mode as a superior alternative to traditional instructional strategies in improving academic outcomes.

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Competing Interest: No

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