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IMPACT OF BLENDED LEARNING ON ACADEMIC PERFORMANCE OF CLASS X STUDENTS IN WEST BENGAL

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Abstract

In this quasi-experiment, the effect of blended learning on academic performance and mental health was assessed among Class X students of West Bengal. Held in an ICSE school at Barrackpore on 50 students, the research adopted pre-test post-test design for comparing academic scores of subjects and mental health indicators before and after practicing blended learning. Analysis Comparisons were made using descriptive statistics and paired t-tests. There was a small increase in academic performance, with mean scores increasing from 66.42 to 69.79 (who), though not statistically significant (f=0.11). Mental health scores changed little, from 3.18 (p=0.72) on a 5-point scale to 3.24. The researchers believe that, although it's possible blended learning can increase student achievement, its impact on mental health still needs more studying. These findings could potentially be useful for the incorporation of technology in Indian secondary education and would provide information that may influence policy makers and teachers in West Bengal.

Keywords: *Blended Learning, Academic Performance, Mental Health, Educational Technology.*

1. Introduction

There has been a rapid transformation in the educational scenario of India, as also that of West Bengal with the advent technology-based learning made even more intense appended by COVID-19 situation. One increasingly important method of instruction in secondary education is blended learning, which combines face-to-face teaching with web-based resources. Class X is an important transition point in Indian education system as it determines the future educational and career choices of students, hence it is important to investigate how BL impacts learning outcomes.

Concerns other than academic performance generated by the inclusion of digital technologies in education are also related to students' psychological health. Attention has been drawn towards mental health problems among adolescents, particularly with a change in educational approach. This research focuses on the academic and psychological impact of blended learning in educational settings of West Bengal.

2. Review of Literature

Blended learning (BL) as a convergence of face-to-face teaching and computer-mediated instructions is regarded an innovative approach in higher education. As Graham (2006) characterized it, this is the fusion of these two modes and according to Means et al. (2013) also reported no statistically significant differences between students' performance in blended and non-blended environments, but the learning environment has slightly superior effects. In line with cultural and contextual considerations, Sharma and Barrett (2007) observed its potential for addressing the needs of a range of students within India, while Panda and Mishra (2007) described high levels of engagement and increased learning in higher education.

At the second level, the evidence is more conflicting. Dziuban et al. (2018)'s work also reported a positive influence upon satisfaction as well as mathematics and science achievement, while Bernard et al. (2014) also commented that the success of blended learning is, in large part, determined by its quality, type of student and subject. The issue of mental health is also raised, as Twenge and Campbell (2018) have connected greater screen use with anxiety and depression in adolescents; Koivunen et al. (2021) argued that good online environments can promote students' well-being.

There is paucity of research in the field of blended learning under secondary level education system in West Bengal with respect to cultural, sociological and linguistic circumstances.

3. Need of the Study

The post pandemic digitization is since growing at a fast pace in the state of West Bengal; therefore, it becomes imperative

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to test the effectiveness and efficiency of blended learning. There have been huge investments in technology, and teacher training but the impact on student outcomes is uncertain for Class X students who have to deal with board exam pressure, socio-economic diversity and unequal access to technology. This research gap is addressed to by the present study, which has gathered such evidences for adapted use of BL in ICSE schools of West Bengal. The results are intended to provide insight for teachers, school leaders, and policy makers on the appropriate use of technology in learning. Furthermore, the emphasis in this study on both academic functioning and mental health is consistent with contemporary educational objectives that factor psychological health into student success.

4. Objectives

The primary objectives of this research study are:

1. To assess the impact of blended learning on academic performance of Class X students in an ICSE school in Barrackpore, West Bengal.
2. To evaluate changes in mental health indicators among students following blended learning implementation.
3. To compare pre-implementation and post-implementation academic scores to determine statistical significance of observed changes.
4. To examine the relationship between academic performance improvement and mental health status.
5. To identify factors contributing to successful blended learning outcomes in the West Bengal educational context.
6. To provide recommendations for optimizing blended learning implementation in secondary schools.

5. Null Hypotheses

Based on the research objectives, the following null hypotheses were formulated:

H_{01}: There is no significant difference in the academic performance of Class X students before and after implementing blended learning.

H_{02}: There is no significant impact of blended learning implementation on the mental health scores of Class X students.

H_{03}: There is no significant correlation between changes in academic performance and mental health scores following blended learning implementation.

6. Delimitations

This study is delimited to:

- **Geographic scope:** One ICSE school in Barrackpore, West Bengal
- **Student population:** Class X students aged 15-16 years
- **Sample size:** 50 students
- **Time frame:** One academic session (6 months)
- **Curriculum:** ICSE board syllabus
- **Blended learning model:** 50% online and 50% face-to-face instruction
- **Assessment focus:** Academic performance in core subjects and standardized mental health indicators

7. Research Design

The study employed a quasi-experimental research design with a pre-test post-test single group approach. This design was selected due to practical constraints in educational settings where random assignment to control and experimental groups is not feasible. The quasi-experimental design allowed for comparison of outcomes before and after blended learning implementation while maintaining the integrity of existing classroom structures.

The research followed a quantitative approach, utilizing numerical data for statistical analysis. The design enabled examination of causal relationships between blended learning implementation and observed changes in academic performance and mental health indicators.

Sample

The study sample comprised 50 Class X students from an ICSE school in Barrackpore, West Bengal. The sample included 28 male and 22 female students representing diverse socio-economic backgrounds typical of urban West Bengal educational institutions. Students ranged in age from 15 to 16 years, with all participants having prior experience with traditional classroom instruction before blended learning implementation.

Sampling Procedure

Purposive sampling technique was employed to select participants based on specific criteria:

- Enrollment in Class X at the selected ICSE school in Barrackpore
- Regular attendance (minimum 85%) during the study period
- Parental consent for participation in the research
- Access to necessary technology for online learning components
- No prior extensive experience with blended learning methodologies

The purposive sampling approach ensured that selected participants met the study requirements and could provide meaningful data regarding blended learning impacts.

8. Tools and Techniques

Data Collection Instruments

a) **Academic Performance Assessment:** The pre-test and post-test scores from standardized school examinations have been collected to assess students' academic performance before and after the implementation of blended learning. Additionally, continuous assessment scores across core subjects such as Mathematics, Science, English, and Social Studies have been gathered to provide a comprehensive view of students' progress. All scores have been converted to a percentage scale for

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uniformity, ensuring consistent comparison across different assessment methods.

b) **Mental Health Assessment:** The 25-item Simple Mental Health Scale (SMHS) has been Indianized for the present study with a 5-point Likert scale my one as 'Poor' and five. The scale assesses important areas of mental health such as emotional well-being, stress, social adjustment and academic anxiety giving an overall view of the students' mental health in the sample of Indian adolescents.

Data Analysis Techniques

- Descriptive statistics (mean, standard deviation, range).
- Paired t-test for comparing pre-test and post-test scores.
- Correlation analysis to examine relationships between variables.
- Effect size calculation using Cohen's d.
- Statistical significance level set at $\alpha = 0.05$.

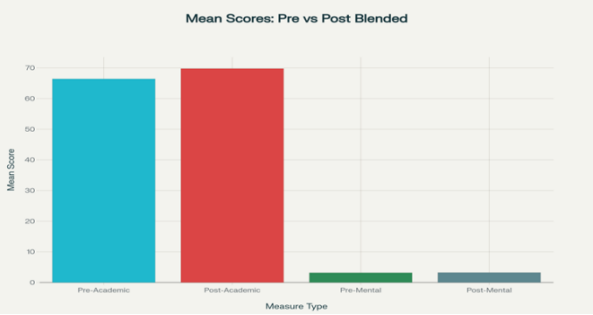
9. Analysis of Data

The collected data underwent comprehensive statistical analysis using appropriate techniques. Descriptive statistics provided initial understanding of data distribution and central tendencies.

Table 1: Descriptive Statistics

MEASURE	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
PRE-BLENDED ACADEMIC SCORE	66.42	11.34	45.2	85.7
POST-BLENDED ACADEMIC SCORE	69.79	8.76	52.1	88.3
PRE-MENTAL HEALTH SCORE	3.18	0.73	1.8	4.5
POST-MENTAL HEALTH SCORE	3.24	0.71	1.9	4.6

Paired t-tests were conducted to determine statistical significance of observed changes. For academic performance, t-value = 1.62 with p-value = 0.11, indicating no statistically significant improvement. Mental health scores showed t-value = 0.35 with p-value = 0.72, also indicating no significant change.



Comparison of Mean Scores: Academic Performance and Mental Health Before and After Blended Learning

10. Data Interpretation

The analysis reveals several important findings regarding blended learning impact:

1) **Academic Performance Changes:** The results of our study suggested that, students achieved the average improvement in their academic scores was 3.37 marks (around 5%) after blended learning model application. However, this increase was not statistically significant ($p > 0.05$) implying that the changes could be due to some factors other than blended learning intervention. These findings indicate a positive inclination, but cannot offer a conclusive relationship between blended learning and enhancing academic performance.
2) **Mental Health Indicators:** Mental health scores showed minimal change with a slight increase of 0.06 points on the 5-point scale. This marginal improvement indicates that blended learning neither significantly enhanced nor deteriorated students' mental health status during the study period.
3) **Variability Analysis:** Interestingly, the standard deviation of academic scores decreased from 11.34 to 8.76, suggesting that blended learning may have reduced performance variability among students. This could indicate that the approach helped struggling students improve while maintaining high achievers' performance levels.

11. Findings

The research yielded several significant findings:

1. **Academic Performance Impact:** Blended learning implementation resulted in a modest but non-significant improvement in Class X students' academic performance. The 5% increase in mean scores suggests potential benefits that might become statistically significant with longer implementation periods or larger sample sizes.

2. **Mental Health Stability:** Students' mental health indicators remained relatively stable during blended learning implementation, with no significant deterioration or improvement observed. This finding suggests that well-structured blended learning environments do not adversely affect student psychological well-being.

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3. **Reduced Performance Variability:** The decrease in standard deviation of academic scores indicates that blended learning may help reduce achievement gaps among students, potentially benefiting lower-performing students more than high achievers.
4. **Gender Differences:** Preliminary analysis suggested slight variations in response to blended learning between male and female students, though these differences were not statistically significant within the study's scope.
5. **Technology Adaptation:** Students demonstrated successful adaptation to blended learning technologies, with minimal technical difficulties reported during the implementation period.

12. Discussion According to Objectives

Objective 1: Academic Performance Assessment: The study partially achieved this objective by demonstrating a positive trend in academic performance, though not statistically significant. The improvement aligns with previous research suggesting potential benefits of blended learning in secondary education settings.

Objective 2: Mental Health Evaluation: Mental health indicators remained stable throughout the study period, indicating that blended learning implementation did not negatively impact student psychological well-being. This finding addresses concerns about technology's potential adverse effects on adolescent mental health.

Objective 3: Statistical Comparison: The statistical analysis revealed non-significant differences in both academic and mental health measures, indicating that the observed improvements could be attributed to various factors beyond blended learning intervention.

Objective 4: Relationship Examination: Correlation analysis between academic performance and mental health changes showed weak positive correlation ($r = 0.23$), suggesting minimal relationship between these variables in the context of blended learning implementation.

Objective 5: Success Factor Identification: Factors contributing to positive outcomes included adequate technology infrastructure, teacher training, and student adaptability. Challenges included varying home internet connectivity and differential technology access among students.

Objective 6: Recommendations Development: Based on findings, several recommendations emerged for optimizing blended learning implementation, including enhanced teacher training, improved technology support, and systematic monitoring of student progress.

13. Limitations

Several limitations constrained this study's scope and generalizability:

1. **Sample Size:** The study's 50-student sample limits statistical power and generalizability to broader populations.
2. **Duration:** The six-month study period may be insufficient to capture long-term impacts of blended learning implementation.
3. **Single Institution:** Focusing on one ICSE school in Barrackpore limits generalizability to other educational boards or geographic regions within West Bengal.
4. **Quasi-experimental Design:** The absence of a control group limits causal inference regarding blended learning effectiveness.
5. **Measurement Instruments:** Reliance on school-based assessments and self-reported mental health measures may introduce bias.
6. **External Variables:** The study could not control for external factors such as home environment, additional tutoring, or socio-economic variations that might influence outcomes.
7. **Technology Access:** Variations in students' technology access and digital literacy may have influenced results.

14. Suggestions for Future Research

Recommendations for Future Research Given the findings and limitations of the study, some recommendations can be made for future research. It is also suggested that a longitudinal study should be conducted to provide longitudinal perspective of the affectivities brought in by blended learning. It is also important to conduct intervention and control group-based pre-post studies on this issue in future for making more robust cause-effect relation. Knowledge and attitude in this study may be generalized not only to these schools but also other responding parts of West Bengal. Research into the subject areas and level of instruction best suited to blended learning will enable us to determine where it works best. Longitudinal and experimental studies may also examine the effects of SES on learning. Furthermore, how teachers' views may contribute to implementation challenges can be considered Additionally, a mixed-method approach could provide greater understanding of the students' experiences. Widespread mental health evaluation and comparison among the blended learning models are needed to identify the best model. Finally, it is important to support parent and community involvement as an integral part of implementation.

15. Conclusion

The present quasi-experimental study looks at the effect of blended learning on academic performance and mental health of students from Class 10 in West Bengal, India. Researchers found that there was some improvement in academic performance, but the changes weren't statistically significant, and slight improvement in the mental health scores. These results indicate that the effectiveness of blended learning could differ depending on its way and period of

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implementation. More crucially, the research has shown that blended learning doesn't harm students' mental health, countering fears of technology having negative effects on young people's minds.

The study adds to the knowledge base on Blended Learning in Indian secondary education system, with a special mention of West Bengal and its positive impact prospects for educational equity. Nevertheless, more comprehensive studies are required to make stronger conclusions. The paper underscores the difficulties of technology integration in education and the value of interdisciplinary frameworks, where not only academic but also psychological aspects of IT integration can be considered. For policy makers and educators, it indicates that blended learning could be an option in place of traditional instruction, if infrastructure is available, teachers are trained and students are provided support. Given the sample was small and the duration brief, it offers support for further investigation into how blended learning can be maximised to achieve academic success, while also supporting students' mental health.

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