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Influence of Student Engagement on Achievement in Mathematics: A Predictive Study of Lower Secondary Students of Bhutan

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Abstract

The study investigates the relationship between student engagement and mathematics achievement among VI-grade students, focusing on a lower secondary school in Paro, Bhutan. The researcher employed a descriptive survey method to collect data from 47 grade VI students using student engagement tools and mathematics achievement tests. Statistical analyses, including Pearson correlation and regression, were conducted to test the research objectives and hypotheses. Findings reveal a significant positive relationship between student engagement and mathematics achievement, supporting the hypothesis. Regression analysis further indicates that student engagement significantly predicts mathematics achievement, explaining 22.5% of its variance. These results underscore the importance of student engagement in enhancing academic outcomes and align with previous research. Overall, the study emphasizes the need for interventions to foster student engagement and improve mathematics performance among VI-grade students.

Keywords: Student Engagement, Achievement of Students in Mathematics, and LowerSecondary Students of Bhutan.

INTRODUCTION

In the global pursuit of educational excellence, the significance of student engagement in shaping academic achievement has garnered considerable attention. Particularly within the realm of mathematics education, where comprehension and mastery of concepts play a pivotal role in cognitive development and future career prospects, understanding the interplay between student engagement and achievement is paramount. This predictive study explores the relationship particularly focusing on lower secondary students in the unique context of Bhutan.Bhutan, a small Himalayan kingdom known for its Gross National Happiness index, has been increasingly recognizing the pivotal role of education in national development. Mathematics education, in particular, holds a central place in its curriculum, serving as a cornerstone for cultivating analytical thinking and problem-solving skills among its youth. Against this backdrop, investigating the influence of student engagement on mathematics achievement becomes not only academically relevant but also imperative for fostering holistic educational outcomes aligned with the nation's developmental aspirations.

Drawing upon existing literature on student engagement and academic achievement, this study adopts a predictive approach to explore the extent to which the student engagement affects mathematics performance among lower secondary students in Bhutan. By employing predictive modeling techniques, this research aims to illuminate the relationships between these variables, offering insights that can inform educational policy and instructional practices tailored to the Bhutanese context.

This study contributes to the growing body of research on student engagement and academic achievement by offering a distinct understanding within the specific context of Bhutanese lower secondary education. Moreover, by employing predictive analytics, it seeks to provide actionable recommendations for educators, policymakers, and stakeholders invested in enhancing mathematics education and fostering holistic student development in Bhutan.

STUDENT ENGAGEMENT

Student engagement in mathematics class refers to students' active participation, interest, and investment in learning mathematical concepts and skills. It involves their willingness to focus, persist, and demonstrate enthusiasm for mathematical tasks. Fredricks, Blumenfeld, and Paris (2004) define it as the extent to which students invest attention and effort in the learning process, encompassing cognitive, emotional, and behavioral aspects. This engagement is essential for promoting deeper understanding, problem-solving abilities, and academic achievement in mathematics. Skinner and Pitzer (2012) emphasize its developmental dynamics, while Appleton, Christenson, and Furlong (2008) stress the complexity of measuring and fostering engagement in

the mathematics classroom.

ACHIEVEMENT IN MATHEMATICS

Achievement in mathematics typically refers to the extent to which students successfully attain the learning outcomes, skills, and competencies outlined in the mathematics curriculum. It encompasses students' ability to comprehend mathematical concepts, solve problems, apply mathematical reasoning, and communicate mathematical ideas effectively. Achievement in mathematics is often measured through various assessment methods, including tests, quizzes, projects, and standardized exams, to evaluate students' mastery of mathematical content and skills. Researchers like Hattie (2009) emphasize that achievement in mathematics goes beyond mere performance on assessments, also encompassing deeper understanding, critical thinking, and the ability to transfer mathematical knowledge to real-world contexts. Moreover, achievement in mathematics is influenced by factors such as instructional quality, student engagement, socioeconomic status, and teacher effectiveness (Sirin, 2005). Achievement in mathematics reflects students' proficiency and proficiency in mathematical concepts and their ability to apply them in various contexts, contributing to their overall academic success and educational attainment.

LITERATURE REVIEW

The literature review synthesizes a range of studies investigating the complex interplay between student engagement and academic achievement, particularly in mathematics education. Consistent patterns emerge across various methodologies and sample populations, including secondary school students, college students, and primary school students. Maamin et al. (2022) highlighted the significant impact of affective engagement on math performance, echoing findings from (Park, 2005) hierarchical linear modelling analysis, which emphasizes the enduring influence of student engagement on academic growth, irrespective of individual-level factors. These findings are further supported by (Bodovski & Farkas, 2015), which underscores the pivotal role of engagement, particularly for students with lower proficiency levels. Delfino (2019) provided additional insight by identifying key predictors of engagement, including teacher, school, and family factors. Meta-analyses by (Chang et al., 2016 & Lei et al., 2018) corroborated the positive association between student engagement and academic success across diverse contexts and dimensions of engagement. Moreover, studies by (Schnitzler et al., 2020; Heng, 2013 & Dogan, 2015) shed light on the nuanced relationship between engagement patterns, academic self-concept, and motivational factors, further emphasizing the multifaceted nature of student engagement. Additionally, (Weiss & Garcia 2015) from findings in Mexicoand (Wong & Lam

2003) insights into problem-solving strategies underscore the importance of

considering contextual factors and learning approaches in understanding the impact of engagement on academic outcomes. Finally (Xia et al., 2022) studies among Chinese primary school students highlighted the importance of adaptive engagement strategies in fostering effective mathematics learning. Together, these studies provide robust evidence supporting the critical role of student engagement in shaping academic achievement and underscore the need fortailored interventions and a comprehensive understanding of educational practices.

STATEMENT OF PROBLEM

Influence of Student Engagement on Achievement in Mathematics: A Predictive Study of Lower Secondary Students of Bhutan

OBJECTIVES

1. To determine the relationship between student engagement and achievement in mathematics of VI grade students.
2. To explore the predictive role of student engagement in achievement in mathematics of VI grade students.

HYPOTHESES

1. There exists a significant positive relationship between student engagement and achievement in mathematics of VI grade students.
2. Student Engagement is a significant predictor of achievement in mathematics of VI grade students.

DELIMITATIONS

The present study was delimited to the students studying in grade VI from one lower secondary school, Paro, Bhutan, during the session 2023-24.

DESIGN OF STUDY

The present study was descriptive in nature, so in this study, descriptive survey method has been used. A sample of 47 students (comprising of 25 girls and 22 boys) of grade VI was selected through Convenience sampling technique from Doteng Lower Secondary School, Paro, Bhutan. The researcher collected required data from the grade VI students by using students' engagement tools adapted from Jamaludin and Osman (2014) and achievement test in mathematics (for grade VI students). The researcher employed Pearson Product Moment Correlation, Regression

Analysis, Model summary, ANOVA (analysis of variance) and Coefficients of Regression in order to test the research objectives and hypotheses.

RESULTS AND DISCUSSION

Analysis of data, result and interpretation of findings has been done keeping in view the objectives and hypotheses of the study.

Result Pertaining to Relation between Student Engagement and Achievement in Mathematics of VI grade students

The objective was to analyze the relationship between student engagement and achievement in mathematics of VI grade students. After administering the scales pertaining to student engagement and achievement test in mathematics, coefficient of correlation was calculatedthrough Pearson Product Moment Correlation Method. The results are shown in table 1.

Ha: There exists a significant positive relationship between student engagement and achievement in mathematics of VI grade students.

Table 1

Relation between Student Engagement and Achievement in Mathematics of VI Grade Students

Variables	N	df	r - value	Remark
Student Engagement and Achievement in Mathematics	47	45	.474**	p < .01

Critical values of r (df=45) at 0.05 and 0.01 level of confidence are 0.113 and 0.148 respectively.

Interpretation

Table 1 show the data, wherein the value of Pearson Product Moment Correlation Coefficient between student engagement and achievement in mathematics is .474. This value of correlation (.474) is positive and statistically significant at both the levels of confidence. Thus, the stated hypothesis that there exists a significant positive relationship between student engagement and achievement in mathematics of VI grade students is not rejected.

Hence, student engagement has positive statistical significant relationship with achievement in mathematics of students studying in VI grade. Results Pertaining to Student Engagement as Predictor of Achievement in Mathematics of VI Grade Students

The objective was to explore the predictive role of student engagement in achievement in mathematics of VI grade students. After administering, student engagement and mathematics achievement test, Regression has been computed and results have been presented in table 2, 3 and

4.

Ha: Student Engagement is a significant predictor of Achievement in Mathematics of VI
         grade students.

Table 2 -Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.474	.225	.208	7.20

Table 3 –ANOVA Summary

Model	Sum of Squares	df	Mean Square	F	Remark
Regression	**676.45**	**1**	**676.45**		
Residual	**2330.03**	**45**	**51.78**	**13.06**	**p < .01**
Total	**3006.48**	**46**			

Dependent Variable: Achievement in Mathematics and Predictor: Learning Engagement

Interpretation

It is clear from the regression table 2 and 3 that student engagement yielded coefficient Regression
(R) of .474 and R square for same found to be .225.This indicates that 22.5% variation in
achievement in mathematics of VI grade students is explained by student engagement in the
modal. The variation of 22.5% is significant at (0.01) level of significance. So, it is evident from
the table 2 (R square = .225) that only 22.5% of the achievement in mathematics has been
explained by the student engagement in case of VI grade students. Therefore, 22.5% variation in
the achievement in mathematics is explained by the independent variable (student engagement)
and 77.5% variation in the achievement in mathematics is explained by other variables, which are
beyond the scope of this study.

Table 4 -Coefficients of Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	-34.079	14.579	-	2.338	.024
Learning Engagement	.846	.234	.474	3.614	.001

Interpretation

From the table 4 of coefficients of regression, the regression equation is

Achievement in Mathematics = -34.079 + .846 (Student Engagement).

So, with one unit increase in student engagement there will be .846 times increase in achievement in mathematics of VI grade students.

Hence the stated hypothesis, student Engagement is a significant predictor of Achievement in Mathematics of VI grade students, is not rejected completely.

FINDINGS OF THE STUDY

1. The student engagement has positive statistically significant relationship with achievement in mathematics of VI grade students studying in a lower secondary school of Paro, Bhutan.

2. The student engagement is significant predictor of achievement in mathematics of VI grade students.

The same result has also been reported by Maamin et al. (2022); Park (2005); Chang et al. (2016) and Xia et al. (2022) that student engagement is a considerable predictor of achievement in mathematics of VI grade students.

CONCLUSION

Thus, it has been concluded that student engagement has positive significant relationship with academic achievement in mathematics among grade VI students in Bhutan. The results highlight a strong beneficial relationship between mathematics performance and student involvement, affirming the importance of fostering active involvement and interest in learning. Moreover, the predictive analysis reveals that student engagement serves as a notable predictor of mathematics achievement, describing and explaining a substantial portion of the variance in students' performance. While the study contributes valuable insights into the Bhutanese educational

context, emphasizing the relevance of student engagement for holistic educational outcomes, it also emphasizes the necessity of specialized interventions and regulations to improve the teaching of mathematics. By recognizing the intricate dynamics between engagement and achievement, educators, policymakers, and stakeholders can better address the unique challenges and opportunities within Bhutan's educational landscape, ultimately fostering a more conducive learning environment that aligns with the nation's developmental aspirations and promotes student success in mathematics and beyond.

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