JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A study on Project -based learning in enhancing academic performance in Secondary school students from Assam

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Abstract

The research evaluated the ability of project-based learning (PBL) techniques to improve secondary school student academic achievement in Assam. The implementation of inquiry-based projects allows PBL to develop students' critical thinking abilities together with their problem-solving skills and enhance their classroom engagement. This research developed a quantitative method which used surveys and analyzed data with SPSS 22.0. Research findings showed that project-based learning generated positive academic results through statistical data from 70 secondary school students displaying an R-value of 0.974 and R-square value of 0.948 which indicates PBL contributes to 95% of academic performance changes. ANOVA statistical results demonstrated the significance of this relationship with an F value of 1239.170 and p value of 0.000. Significant correlation values proved that PBL increases student engagement and critical thinking and problem-solving abilities. Students in Assam faced infrastructure problems and technology barriers but managed to gain meaningful academic progress through PBL methods which improved both knowledge understanding and practical application of course concepts. The research demonstrates how PBL transforms classroom instruction to create active learning spaces which develop both skill sets and interactivity. Additional measures to deal with existing implementation problems along with proper resource integration will help PBL reach its maximum potential in secondary education. The research shows that PBL stands as a replacement strategy for conventional teaching methods which delivers important benefits for student education results while readying them for future academic and professional demands.

Keywords: Project -based learning, academic performance, Secondary school students, Critical thinking, Students Engagement.

Introduction

Project-based learning (PBL) has emerged as an effective pedagogical approach to enhance academic performance among secondary school students in Assam. By shifting from traditional rote-based methods to hands-on, inquiry-driven projects, PBL fosters deeper understanding and engagement. This method emphasizes real-world applications, critical thinking, and collaboration, equipping students with 21st-century skills essential for academic and professional success.

In Assam, where challenges like limited technological access and traditional teaching practices often hinder educational outcomes, PBL has shown transformative potential. For instance, students in rural areas have successfully used technology to explore scientific concepts such as photosynthesis, creating multimedia presentations that demonstrate their understanding. Such activities not only increase engagement but also develop independent learning skills like problem-solving and creativity. Teachers in Assam report that PBL has made students more inquisitive and interactive, a significant shift from passive learning environments.(Arduino, 2020)

The benefits of PBL extend beyond subject knowledge. It enhances critical thinking by immersing students in complex scenarios that require analysis and decision-making. Additionally, collaborative projects promote teamwork and communication skills, preparing students for real-world challenges. In Assam, projects often integrate local contexts, such as rainwater harvesting or environmental conservation, making learning relevant and impactful.

Research supports the efficacy of PBL in improving academic performance. Studies indicate that students engaged in PBL show better knowledge retention and perform well on standardized tests compared to those taught through traditional methods. In Assam, the integration of technology in PBL has further bridged the digital divide, enabling students to access diverse resources and present their findings innovatively.(India Today Web Desk, 2020)

Despite its advantages, implementing PBL in Assam faces challenges such as inadequate infrastructure, frequent power cuts, and limited internet connectivity. However, creative solutions like using mobile hotspots and laptops have mitigated some of these issues. Teachers also play a crucial role as facilitators rather than instructors, guiding students through the learning process while fostering independence and curiosity.

In conclusion, project-based learning is revolutionizing education in Assam by making it more engaging, practical, and skill-oriented. By addressing implementation challenges and expanding its reach, PBL can significantly enhance the academic performance of secondary school students in the region while preparing them for future challenges.(Suzie Boss, 2011)

Concept of Project-Based Learning (PBL)

Project-Based Learning (PBL) is a dynamic teaching methodology that engages students in acquiring knowledge and skills through real-world, meaningful projects. Unlike traditional methods focused on rote memorization, PBL

emphasizes active learning by involving students in solving complex problems or answering challenging questions over an extended period.(Le, 2018) Through inquiry, collaboration, and creativity, students develop critical thinking, communication, and problem-solving abilities. PBL integrates interdisciplinary approaches, encouraging learners to apply knowledge from multiple subjects to construct solutions and create tangible products for real audiences. This student-centered strategy fosters deeper understanding, self-directed learning, and practical application of concepts, making education more relevant and engaging. By focusing on authentic challenges, PBL prepares students for future academic and professional success(Zhang and Ma, 2023)

Importance of academic performance in secondary schools

Academic performance in secondary schools is crucial as it serves as a foundation for students' future academic and professional success. It reflects the effectiveness of teaching methodologies, study habits, and the overall learning environment. High academic performance equips students with essential skills in subjects like mathematics, science, and language, enabling them to excel in competitive exams and secure better career opportunities.(Comfort O. Akomolafe, 2015). Research highlights that factors such as conducive classroom environments, effective teaching strategies, and strong teacher-student relationships significantly enhance academic outcomes. Moreover, good academic performance fosters self-confidence and motivation among students, encouraging lifelong learning. Schools play a vital role in overcoming socioeconomic barriers by promoting equitable learning environments, thus ensuring educational success for all students (Arnaiz-Sánchez *et al.*, 2020)

Education in Assam

The education system in Assam plays a pivotal role in shaping the socio-economic development of the state. It encompasses primary, secondary, and higher education, with free and compulsory education provided for children aged 6 to 14 under Article 45 of the Constitution. Assam follows the 10+2 system, overseen by the Assam Higher Secondary Education Council (AHSEC). The state has implemented significant reforms, such as adopting the New Education Policy (NEP), which emphasizes holistic development, experiential learning, and critical thinking.(Sing Kro, 2017) Initiatives like Gunotsav aim to improve the quality of education in government schools and reduce dropout rates. Despite progress, challenges persist, including inadequate infrastructure, high dropout rates, and disparities between rural and urban education. Addressing these issues through teacher training, vocational education, and inclusivity measures can further strengthen Assam's education system and enhance its impact on students' futures. (Bhuyan, 2024)

Literature review

(Bora, 2018) This study is to investigate the influence of parental involvement on the academic achievement of secondary school pupils in mathematics. The study population consists of all ninth-grade students attending secondary schools in the Karbi Anglong district of Assam. This study used a survey sampling approach. Nine hundred students from thirty secondary schools, including both urban and rural areas of the Karbi Anglong district,

took part in the study. The sample comprises 460 male pupils, 440 female students, 449 male parents, and 551 female parents. A total of 576 pupils are categorized as Scheduled Tribe, 54 as Scheduled Caste, and 270 as general category. Of the 900 participants, 400 are students from rural regions, while 500 are from metropolitan regions. Furthermore, 443 children are registered in government or government-funded schools, while 457 are enrolled in private institutions. This study has developed two research instruments: one to assess parental engagement in children's education and the other to measure children's mathematical ability. The gathered data have been processed and analyzed using version 22 of the Statistical Package for the Social Sciences (SPSS).

(Das, 2016) Karbi Anglong is one of the two mountainous districts in Assam, characterized by a mixed demography that includes tribal tribes like as the Karbi, Bodo, Dimasa, Kuki, and Hmar, with non-tribal communities consisting of Assamese, Nepali, Adivasi, Bengali, and Hindi-speaking residents. This district operates as an independent entity according to the Sixth Schedule of the Indian Constitution. The researcher sought to evaluate the development of secondary education in the district since its establishment. Historical records reveal that before to India's Independence, the quality of secondary education in Karbi Anglong was very inadequate. After independence, the state administration and the Karbi Anglong Autonomous Council (KAAC) undertook initiatives to improve and broaden secondary education. Consequently, several secondary schools were founded in the area. The Rashtriya Madhyamik Shiksha Abhiyan (RMSA), a government-supported educational program, is now aimed at enhancing secondary education in Karbi Anglong. The researcher used survey methodologies and documentary analysis to get pertinent data and insights for this study.

(Gogoi, 2016) The effectiveness of education mostly depends on the proficient use of resources by educational institutions. This research aimed to assess the efficacy of District Institutes of Education and Training (DIETs) in providing essential resources to teacher trainees and faculty members. The main objectives of the study were: (i) to gather data on the adequacy of educational facilities in DIETs and (ii) to examine the challenges faced by teacher trainees in these institutions. A sample including 50 primary school teachers, 3 District Institute of Education and Training (DIET) personnel, and 20 faculty members was selected for the study. Data was collected using a slightly modified questionnaire to preserve the research's original focus. After evaluating the collected data in alignment with the study's objectives, it was concluded that DIETs generally provide sufficient educational resources, particularly for teacher training initiatives.

(Mallik, 2015) English has significant relevance, both inside our society and beyond. No regional language in our nation has replaced English as a means of communication or as an official language. Proficiency in English often bestows more social esteem and augments intellectual, cultural, economic, commercial, and political interactions globally. Proficiency in this language is widely acknowledged as crucial across almost all academic fields and for most persons. Despite these advantages, a pertinent issue arises—how many students really achieve a high degree of competency in English? What percentage of them will demonstrate proficiency in actual English use upon completing their studies? This concern is particularly alarming for students from Assamese-medium institutions.

Despite many students achieving elevated exam scores, their practical use of English remains inadequate. This raises concerns over the quality of English education, perhaps hindered by factors such as ineffective pedagogical methods or lack of student engagement. This article aims to outline the challenges faced by upper secondary school pupils in Assam, specifically in Barpeta district, regarding the improvement of English language proficiency. It seeks to elucidate the present state of English education in Assam and provide strategies for improved pedagogical approaches. The objective is to assist students with less English exposure academically and otherwise in improving their language competence.

Research Methodology

This study delves into the study's measurements and techniques, including ethical issues, data collection, and analysis. Research is a way for academics to learn and grow. The research consists of the following steps, as stated by researchers: formulating and refining questions, coming up with hypotheses on potential answers, gathering data, drawing conclusions, and finally, verifying that the results are consistent with the original ideas.

Research design

Studies designs are valuable tools for determining which methods best answer research issues in a particular context. An organized data collection and analysis plan may be built around the research questions provided at the beginning of the project. This descriptive study aims to find out project -based learning in enhancing academic performance in Secondary school students from Assam. A quantitative approach was applied in the investigation. A research project cannot proceed without first defining the study's objectives and then gathering and evaluating participant data. We aim to study project -based learning in enhancing academic performance in Secondary school students from Assam.

Variable:

Independent variable: Project-Based Learning (PBL)

Dependent variable: Academic Performance, Student Engagement, Critical Thinking Skills, Problem-Solving Skills

Methods and Tools Used

Data was collected by way of survey using Google form. In corporate settings, surveys are a typical way to get employee information. A comprehensive evaluation was conducted using a checklist to ascertain the project -based learning in enhancing academic performance in Secondary school students from Assam. We have selected 70 school students from Assam.

Self-constructed questionnaires were utilized for data collection from school. A five-point Likert scale questionnaire was developed for each variable in the study.

Statistical analysis

To examine the data in this research, the statistical program SPSS 22.0 was used. We examined the crucial data Using Linear regression and percentage-based processes. The major topics of the research could be better comprehended using percentage analysis.

Result

Table: 1 Age of the respondents.

Age (In Years)		
	Frequency	Percent
16	22	31.4
17	33	47.1
18	15	21.4
Total	70	100.0

The research population consisted mainly of seventeen-year-olds represented 47.1% of participants (n=33) within the total N=70. A total of 22 participants (31.4%) aged 16 years were found in the sample along with 15 participants (21.4%) who were 18 years old. Most participants belong to the 17-year-old age group while the student population decreases as age moves away from this level.

Graph:1 Graphical representation of Age of the respondents.

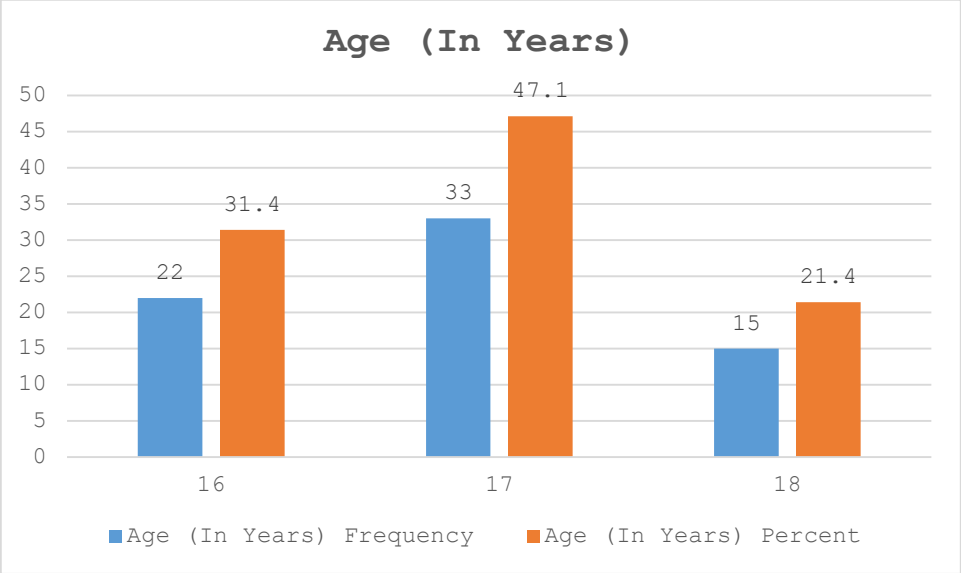

Table: 2 Gender of the respondents.

Gender		
	Frequency	Percent
Male	38	54.3
Female	32	45.7
Total	70	100.0

Data reveals that males outnumber females slightly among participants since 54.3% (n=38) of the subjects identify as male while 45.7% (n=32) identify as female.

Graph: 2 Graphical representations of Gender.

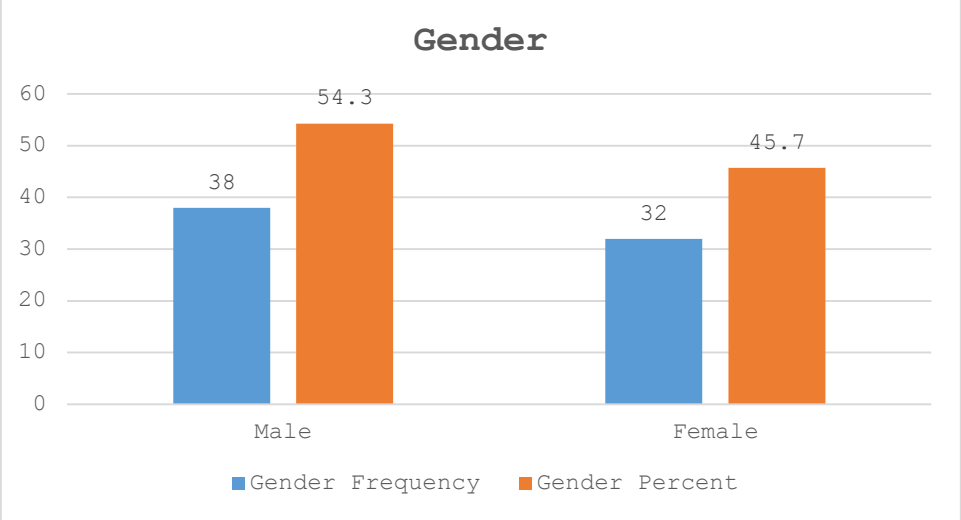

Table: 3 Resident of the respondents.

Resident		
	Frequency	Percent
Rural	43	61.4
Urban	27	38.6
Total	70	100.0

The collected data shows that rural residents represent 61.4 percent of the respondents at 43 which surpasses urban residents by 38.6 percent at 27 individuals.

Graph: 3 Graphical representations of Resident.

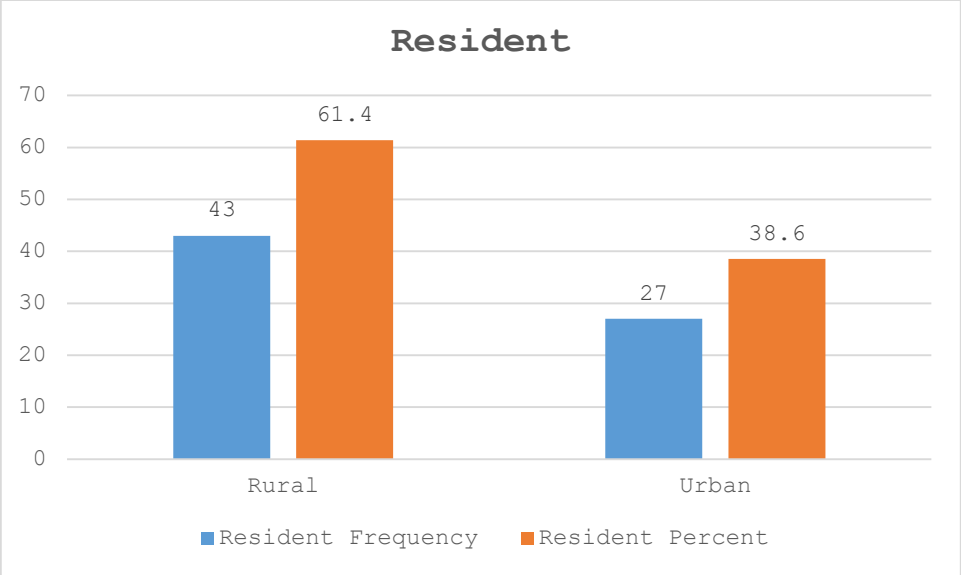

Table: 4 Regression test (There is a significant impact of project-based learning on the academic performance of secondary school students in Assam.).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.974[a]	.948	.947	1.57239

a. Predictors: (Constant), Project-based learning.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3063.720	1	3063.720	1239.170	.000[b]
	Residual	168.123	68	2.472		
	Total	3231.843	69			

a. Dependent Variable: Academic performance.

b. Predictors: (Constant), Project-based learning.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.112	.659		-.170	.865
	Project-based learning.	.988	.028	.974	35.202	.000
a. Dependent Variable: Academic performance.						

The reported data validates project-based learning as a strong influence on how secondary school students in Assam perform academically. The reported high R value of .974 demonstrates project-based learning creates a strong positive relationship with student academic performance. Academic performance explains nearly 95% of its variance through project-based learning according to the R Square value of .948. According to ANOVA analysis the model achieves statistical significance as demonstrated by an F-value of 1239.170 as well as a p-value of .000 and it proves the significant relationship between project-based learning and academic performance.

Statistical data in the coefficient table indicates project-based learning creates a very strong connection which leads to improved academic performance (B = .988 p = .000). The data demonstrates that academic performance enhances by .988 units for each established project-based learning unit change. Academic performance remains unchanged when project-based learning is not present as its constant value of (-.112) shows no statistical significance at (p = .865).

Academic performance among secondary school students of Assam shows significant enhancement because of project-based learning.

Table: 5 Correlation test (There is a significant relationship between project-based learning and students' engagement, critical thinking, and problem-solving skills).

Correlations						
		Project-based learning	Academic performance	Student Engagement	Problem-Solving	Critical Thinking
Project-based learning	Pearson Correlation	1	.974**	.384**	.336**	.287*

	Sig. (2-tailed)		.000	.001	.004	.016
	N	70	70	70	70	70
Student Engagement	Pearson Correlation	.384**	.416**	1	.750**	.912**
	Sig. (2-tailed)	.001	.000		.000	.000
	N	70	70	70	70	70
Problem-Solving	Pearson Correlation	.336**	.372**	.750**	1	.685**
	Sig. (2-tailed)	.004	.002	.000		.000
	N	70	70	70	70	70
Critical Thinking	Pearson Correlation	.287*	.331**	.912**	.685**	1
	Sig. (2-tailed)	.016	.005	.000	.000	
	N	70	70	70	70	70
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Project-based learning and students' critical thinking, problem-solving, and engagement are significantly correlated, according to the correlation analysis. Students who participate in project-based learning are likely to improve these cognitive skills, as evidenced by the somewhat favorable correlations found between project-based learning and student engagement (r =.384, p =.001), problem-solving (r =.336, p =.004), and critical thinking (r =.287, p =.016).

Furthermore, there is a substantial correlation between student involvement and critical thinking (r =.912, p =.000) and problem-solving (r =.750, p =.000), highlighting the importance of this skill in developing higher-order thinking skills. Additionally, there is a positive correlation between problem-solving and critical thinking (r =.685, p =.000), suggesting that children who become better at solving problems are also likely to become better at critical thinking.

All things considered, these results demonstrate that project-based learning has a major positive impact on students' cognitive growth, confirming how well this kind of instruction works to improve engagement, critical thinking, and problem-solving abilities.

Discussion

Secondary school students in Assam achieved better educational outcomes by implementing project-based learning (PBL) as per the research results. Statistical correlations indicate that PBL has a significant impact on academic

outcomes through its high R = 0.974 value and R^2 = 0.948 explanatory power. The p value of 0.000 confirms that PBL has a statistically significant impact on academic performance because the relationship between the two variables is not random. Each step of PBL implementation results in a 0.988-unit increase in academic performance rates. The educational method of PBL develops student involvement and analytical abilities and problem-solving competencies that form core elements of complete educational development. The students mentioned the demanding amount of time and work for PBL requiring better organizational frameworks to reach its maximum educational advantages. Research findings demonstrate that PBL creates superior learning outcomes which establishes its value as an effective method compared to traditional teaching practices in secondary education systems.

Major findings

- Project-based learning (PBL) demonstrates strong academic consequences on students at Assam secondary schools.
- Academic performance of students shows a strong positive correlation with PBL implementation which is shown by R's large value of 0.974.
- PBL accounts for 95% of academic performance causes by generating an R Square value of 0.948.
- Results from the ANOVA test indicate statistical significance because the F-value stands at 1239.170 and the p-value equals 0.000.
- Each increment of PBL leads to a 0.988-unit enhancement of academic performance according to the coefficient analysis.
- The implementation of PBL improves student involvement as well as their critical thinking abilities and their capacity to solve problems.

Conclusion

This research establishes the major effects of PBL on the educational outcomes of secondary school students from Assam. Statistical analysis shows a robust positive relationship between PBL implementation and academic results where R equals 0.974 and R-square tota Steps according to ANOVA show statistical importance which confirms PBL works effectively as an instructional method. The implementation of PBL develops students' critical thinking together with problem-solving and engagement skills that prepare students for vital 21st-century abilities. Integration of PBL in Assam schools proved successful despite the existing infrastructure challenges because this classroom approach has generated remarkable educational achievements. The effectiveness of this approach can be enhanced through addressing barriers to its implementation along with resource expansion. The application of PBL demonstrates its power as a strong educational practice which achieves higher learning results along with deep understanding and practical readiness for students.

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