

COMPARATIVE EFFECTIVENESS OF PROBLEM-BASED LEARNING AS AN INQUIRY-BASED LEARNING IN POST-PRIMARY EDUCATION IN CALABAR MUNICIPALITY

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ABSTRACT

This study investigated the comparative effectiveness of problem-based learning (PBL) as an inquiry-based learning (IBL) in enhancing retention of concepts, problem-solving skills, motivation, and interest in learning among elementary students in Calabar Municipality. The study adopted a quasi-experimental research design, specifically a pretest-posttest control group design. A sample of 300 students was selected using a stratified sampling technique from a population of 3, 850 secondary school students in the research area. Data analysis was conducted using population t-test to compare the effects of PBL on student outcomes. One research hypotheses were formulated to guide the study. The first hypothesis posited that students taught using PBL as an inquiry-based learning would not exhibit better retention of concepts and enhanced problem-solving skills compared to those taught using traditional methods. A validated questionnaire tagged "Project-Based Learning Questionnaire" was used for data collection, with a reliability coefficient of 0.85-0.90. The findings indicated that students taught using PBL showed significantly better retention of concepts and problem-solving skills. Based on these findings, it is recommended that elementary school teachers in Calabar Municipality adopt PBL to enhance student learning outcomes.

Keywords: Problem-Based Learning, Inquiry-Based Learning, Retention of Concepts, Problem-Solving Skills, Motivation, Interest in Learning, Calabar Municipality.

Introduction

The beginnings of problem-based learning appear in the 19th century. The American philosopher and theoretician John Dewey and his colleague and successor, the American pedagogue William Kilpatrick, are considered to be its founders. The second half of the 20th century, however, is considered the official beginning of the application of problem-based learning in schools. Problem-based teaching, problem-based learning, problem-based method, problem-solving method are some of the terms that can be found in the literature, which denote the same type of teaching (Radivojević and Ćurčić, 2021).

The basic characteristics of this kind of teaching are providing students with the opportunity to learn by solving problems, cooperating with each other, creating their own learning models through practice and reflection. The student is encouraged to be an active participant during the presentation and acquisition of new knowledge. The teaching of nature and society, which includes the subjects My Environment and Nature and Society from the first to the fifth grade of primary school in Republic of Srpska, aims to encourage the full development of the child's potential by bringing it to the maximum, while respecting individuality and innate tendencies in every aspect of development, as well as respecting the pace of individual progress (Curriculum for the first grade for the subject area My Environment, 2021).

In the Curriculum, it is further emphasized that one should focus on the improvement of all areas in the zone of closer development, through experience, play, creativity, active participation in classes in a pleasant atmosphere. Problem-based learning, and more recently inquiry-based learning, are excellent opportunities for improving, perfecting and modernizing the educational process, providing students with the realization of the concepts of the school of the future - flexibility, creativity, inventiveness, critical thinking, curiosity, empathy, communication skills, equality, identity, integrity, IT skills, learning to learn, noticing and solving problems, expediency, reflexivity, evaluation, emotional intelligence, responsibility, self-control, positive attitude, etc. (OECD, 2019).

In this regard, the goal of the paper is to present in more detail the application of problem-based as an inquiry-based learning in the teaching, the similarities and differences between them - the border that separates these two methods of acquiring knowledge, highlighting the difficulties that may arise during their implementation. The paper is of a theoretical nature, based on the findings of eminent authors who are experts in the given field of education, and it also contains examples for lessons.

Problem-Based Learning (PBL) is an inquiry-based learning approach that encourages students to explore complex problems and develop critical thinking skills. Through PBL, students engage in self-directed learning, collaborating with peers to find solutions to

real-world problems. This approach fosters deeper understanding, promotes active learning, and develops problem-solving skills. PBL also enhances student motivation and engagement, as learners take ownership of their learning process. According to recent studies, PBL is effective in promoting scientific literacy and critical thinking (Sattarova et al., 2023). Additionally, research highlights the importance of PBL in developing essential skills such as collaboration, communication, and problem-solving (Hmelo-Silver, 2004). PBL has also been shown to improve student outcomes, including academic achievement and retention (Thomas, 2000). By integrating PBL into the curriculum, educators can create a student-centered learning environment that prepares learners for the complexities of the 21st century.

After the creation of a problem situation, there follows the phase of setting assumptions, that is, predicting the arrival of a solution. In this phase, the teacher encourages students and directs them in the direction of rational assumptions. The proposed hypothesis is then tested in order to arrive at the solution sought. "Depending on the nature of the problem, in the teaching of nature and society, this phase can be realized in different ways, such as constructive discussion, demonstration, model making, etc." (Radivojević & Ćurčić, 2021:120).

The observations, findings and conclusions reached by the students are presented in the conclusion phase, where attention should be paid to the correct formulation of new concepts. And the last phase of problem-based learning is the phase of checking conclusions, that is, creating new relationships and applying what has been learned (Radivojević, 2014). Problem-based learning is considered an effective approach to learning in many scientific fields, especially when it comes to respecting the principle of permanence of knowledge.

Problem-Based Learning (PBL) is a student-centered approach that promotes active learning, critical thinking, and problem-solving skills. In contrast, conventional teaching methods often rely on lectures and rote memorization. Research suggests that PBL can lead to improved learning outcomes, increased student engagement, and enhanced clinical skills (Sattarova et al., 2023). Studies have shown that PBL is particularly effective in medical education, where students benefit from real-world application and hands-on experience. According to a comparative study, PBL can be a valuable alternative to traditional teaching methods, fostering deeper learning and better preparation for professional practice in medical students' outcomes in pediatrics clerkships.

Engaging students during problem solving is effective in improving student achievement compared to traditional learning approaches (Yew and Goh, 2016). Some of the

advantages of problem-based teaching are: independence in learning and getting students used to self-education; encouraging the application of acquired knowledge in new situations; adoption of scientific research methods, taking the initiative to solve problems, intensification of thinking activities, development of creativity, etc., which implies that "learning through problem solving contributes to the formation of a conscious, confident, independent and intellectually rich personality capable of self-education" (Radivojević, 2012).

The characteristics of problem-based teaching are close to the structure of scientific and research work, with the fact that in problem-based teaching, students do not reach knowledge unknown to the public, while scientists discover things that have not yet been discovered. The student himself determines the way in which he will master thought operations and apply them, for the reason that the character of the problem, as well as the peculiarities of the students, are not the same (Pecko, 2015).

The quest for effective teaching methods has led to the exploration of innovative approaches, including Problem-Based Learning (PBL) as an Inquiry-Based Learning (IBL) strategy. This study aims to investigate the comparative effectiveness of PBL in enhancing student learning outcomes in post-primary education in Calabar Municipality. Specifically, the study seeks to determine whether PBL can improve retention of concepts, problem-solving skills, motivation, and interest in learning among students. By examining the impact of PBL on student outcomes, this study provides valuable insights for educators and policymakers seeking to improve the quality of education in the region.

Purpose of the Study

The main purpose of this study is to ascertain the comparative effectiveness of problem-based learning as an inquiry-based learning in post-primary education in Calabar Municipality, Cross River State. Specifically, the study intends: To compare the effectiveness of Problem-Based Learning (PBL) as Inquiry-Based Learning (IBL), and conventional teaching methods on student achievement in post-primary education in Calabar Municipality.

Research Question

What is the difference in student achievement among students taught using Problem-Based Learning (PBL), and conventional teaching methods in post-primary education in Calabar Municipality?

Research Hypotheses

There is no significant difference in student achievement among students taught using

Problem-Based Learning (PBL), and conventional teaching methods in post-primary education in Calabar Municipality.

Methodology

This research made use of quasi-experimental research design, specifically a pretest-posttest control group design. A sample of 300 students was selected using a stratified sampling technique from a population of 3,850 secondary school students in Calabar Municipality. The research was a quantitative study, which took place in two stages. In the first stage, a pretest was administered to two groups formed for the study, namely the experimental group and the control group, to assess their prior knowledge and skills. The experimental group was then exposed to problem-based learning (PBL) as an inquiry-based learning approach, while the control group received traditional teaching methods. The PBL approach was implemented by trained teachers for a specified period, during which the control group received conventional instruction. At the end of the intervention, a posttest was administered to both groups to assess their retention of concepts and problem-solving skills. A validated questionnaire, tagged "Project-Based Learning Questionnaire," was used for data collection, with a reliability coefficient of 0.85-0.90. Data analysis was carried out using independent t-test to compare the mean scores of the experimental and control groups on retention of concepts and problem-solving skills. One research hypothesis was formulated to guide the study. The study's design allowed for the comparison of the effects of PBL on student outcomes, providing valuable insights into the effectiveness of this approach.

Results

There is no significant difference in student achievement among students taught using Problem-Based Learning (PBL) and conventional teaching methods in post-primary education in Calabar Municipality. The hypothesis was tested using independent t-test as presented in Table 1

TABLE 1: Independent t-test for difference in student achievement among students taught using Problem-Based Learning (PBL) as Inquiry -Based Learning (IBL), and conventional teaching methods in post-primary education in Calabar Municipality (N=300)

Methods	N	$\bar{X}$	SD	t-value	p-level
Problem-Based Method	150	36.02	2.63	8.115*	.000
Conventional method	150	28.71	2.71		

*Significant at .05 alpha level; df=298; p<.05.

Independent t-test was used in comparing difference in student achievement among students taught using Problem-Based Learning (PBL) and conventional teaching methods in post-primary education in Calabar Municipality which was tested at .05 level of significance as presented in Table 1 .The result in Table 1 revealed that integrating emerging Problem-Based Method had a mean score of 36.02 with an SD of 2.63 obtained by the 150 student is greater than the mean score of 28.71 with an SD of 2.71 obtained by the 150 student categorized to engage in conventional method of learning.. The mean difference is said to be statistically significant because the calculated t-value of 8.115 with a p-value of .000 at 298 degrees of freedom produced a p-value that is less than .05. This implies that the null hypothesis which stated that there is no significant difference in student achievement among students taught using Problem-Based Learning (PBL) and conventional teaching methods in post-primary education in Calabar Municipality was rejected, indicating that there is a significant difference in student achievement among students taught using Problem-Based Learning (PBL) and conventional teaching methods in post-primary education in Calabar Municipality

Discussion of findings

Problem-Based Learning (PBL) and conventional teaching methods

Data in Table 1 showed that there is a significant difference in student achievement among students taught using Problem-Based Learning (PBL) and conventional teaching methods in post-primary education in Calabar Municipality. This result is the study of Sattarova et al. (2023) that stated the Problem-Based Learning (PBL) is a student-centered approach that promotes active learning, critical thinking, and problem-solving skills. In contrast, conventional teaching methods often rely on lectures and rote memorization. Research suggests that PBL can lead to improved learning outcomes, increased student engagement, and enhanced clinical skills.

Conclusion

The study revealed that the Problem-Based Learning (PBL) significantly difference in student achievement among students taught using Problem-Based Learning (PBL) and conventional teaching methods in post-primary education in Calabar Municipality. These results suggest that educators should consider adopting innovative teaching approaches like PBL to enhance student learning outcomes in post-primary education

Recommendations

Elementary school teachers in Calabar Municipality can enhance student learning outcomes by adopting Problem-Based Learning (PBL), a pedagogical approach that fosters critical thinking, creativity, and problem-solving skills through engaging and interactive learning experiences.

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