Indus Journal of Social Sciences
Online ISSN: 2960-219X
Print ISSN: 2960-2203
Volume 3, Number 2, 2025, Pages 296 – 302
Journal Home Page
https://induspublishers.com/IJSS/about

Comparing traditional Teaching Methods with PBL in Science and their Impact on Students' Achievement at Elementary Level

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ARTICLE INFO

Article History:

Received:	*March*	*05, 2025*
Revised:	*April*	*17, 2025*
Accepted:	*April*	*25, 2025*
Available Online:	*May*	*01, 2025*

Keywords:

Traditional Teaching methods, PBL

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ABSTRACT

The designed study was used to compare traditional teaching methods with PBL in science and their impact on achievement of eighth graders. The objectives of the study were to assess achievement of the student's, to practice problem based learning through activities, and to evaluate student's achievement after problem based activities. The study population was encompassed all students of 8th grade (21150) within District Muzaffar Garh. Sample size was 60 students from the same district. Thirty students out of 35 were selected from Government Boys Elementary School Waan Pitafi by using simple random technique as experimental group. Thirty students out of 40 were selected from Government Boys Elementary School Ishaq Wala by using simple random technique as control group. The research design was pretest-posttest and Quasi experimental in nature. Problem based learning treatment was applied. The experimental group was treated with problem based learning and the control group was taught through traditional lecture-based methods. Data was collected from the control and experiment groups before and after 9 month problem-based learning through pre-test and posttest. After collection of data, analysis of the data was done through descriptive statistics by finding out means. The findings of the study revealed that achievement scores of experimental group were better as compared to scores of control group. The difference in means of experimental and control group in pretest is very small than difference in means of experimental group and control groups in post-test. It depicts through problem based learning students' achievement scores are improved.

Introduction

Learning process comprises of transformation i.e., acquiring a new skill, understanding scientific principles and changing one's attitude. Learning is a constant process that includes sensible and thoughtful efforts (Sequira, 2012). Learning methods are of three types. First one is cognitive mean

relevant to the mind, second is personality mean about psychology and last one is about sensory learning. Reflective learning falls in category of cognitive learning. Extroverts mean confident personalities and introverts means shy personalities are included in personality learning style. Visual, kinesthetic and auditory learning falls in sensory learning (Awla, 2014).

Problem-Based Learning enables to dismantle gender resolutions and raises a complete comprehension of concepts in science. Teachers meet the task of students' guiding by actively involving students in science classroom. Conceptual change theory stress that students' views may be different from scientific data, so teachers should adopt a balanced approach. The primary methods used to evaluate efficiency of problem-based learning to develop student's personal development are interviews, surveys, and observations (Elmas et al., 2018).

For building knowledge and relationships between concepts, scientific knowledge plays major role. Concepts are defined as things, entities or events that cannot be touched. Concept existence is possible only in our feelings and examples about concepts are present in this world. Since their childhood, peoples start to learn their concepts i.e., they start to categorize the ideas and they try to find out relationships between concepts. Throughout our lives, human mind constantly learn and restore information. Abstract thoughts are known as concepts. Many processes relevant to mind are used by the person to improve the concepts (Pekel & Hasenekoglu 2020).

PBL is same as cognitive constructivism. Students learn always from their past understanding and worldview. With the help of PBL, students learn independently. Students evaluate their thoughts and critical thinking's in process of PBL. In process of PBL, Students' learning is done by solving problems by active participation (Savery, 2015; Afaq et al., 2022).

Yew and Goh (2016) highlighted learning elements essential to PBL:

1. Real world problems must be solved by students.
2. Students should learn actively.
3. Students must learn how their thoughts fit others to solve problems.
4. Group understanding must be promoted by every participant. Multiple sources must be cited by participants.
5. Knowledge must be improved by students and they should share their findings with others.

PBL involve students to solve an issue having not so much previous knowledge as the teacher does not provide them much information. Students must examine and observe situation closely and try to reach a solution or they take help of colleagues and friends. They get information and use them to find a solution. Students are given many problems to teach how to solve them. These types of exercises encourage students to ask questions and to learn while solving those real life problems (Wirkala & Kuhn, 2011).

A systematic literature review and bibliometric analysis revealed that in general science education at the elementary level PBL model improves learning outcomes of students and latest 21st century skills like critical thinking, ingenuity and teamwork. This research study stresses that PBL is an effective approach in raising deep understanding and higher-order rational skills among students that make learning of science more expressive and appealing (Ayuni et al. 2024).

A meta-analysis of 55 experimental studies showed that the PBL model in science education produces a high result size on academic achievement of students as compared to traditional teaching methods. The research study indicates that this approach is very useful in many countries

at educational levels in domains of science. This suggests that PBL can be used broadly and healthy impact on science achievement at the elementary level (Uluçınar, U. 2023).

This research study investigates impact of problem-based learning on academic achievement of students in medical education. It urges the K-12 community to implement this student-centered and latest teaching approach in their classrooms. It is obvious from the results of this review study that PBL influence positively on students' academic achievement. The current review study lacks sufficient evidence that favor superiority of PBL over traditional instruction method. However, PBL promotes improvement of knowledge as well as to communicate, to think critically and to work in groups. These skills are highly appreciated in secondary education (Wilder, S. 2014).

Objectives of the study

The research study's objectives were:
1. To examine students' achievement.
2. To Practice problem based learning through activities.
3. To evaluate achievement of students after problem based learning.

Hypotheses of the study

The hypotheses were formulated and tested to achieve the objectives:

Hypothesis 1

H_o: There is no statistical relationship between problem based learning and achievement.

H_1: There is a statistical relationship between problem based learning and achievement.

Hypothesis 2

H_o: There is no statistically significant difference in the performance on achievement test between control and experimental groups in the pretest.

H_1: There is a statistical significant difference in the performance on the achievement test between control and experimental groups in the pretest.

Hypothesis 3

H_o: There is no statistical significant difference between the experimental and the control group performances in the achievement post-test.

H_1: There is a statistical significant difference between the performances of experimental and the control group in the achievement post-test.

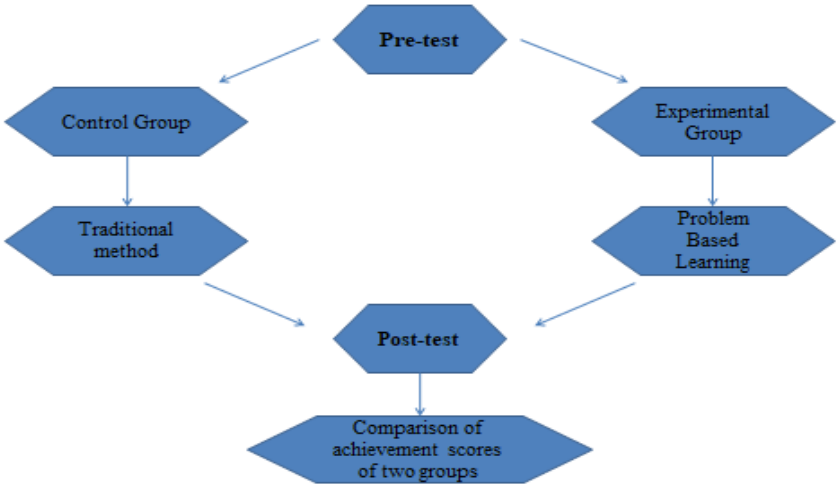
Significance of study

The research study may be useful to assess impact of PBL on achievement of students in science at elementary level. Students exposed to problem based learning strategies can achieve higher scores studying in elementary schools.. It is on record, that PBL strategy results in improved problem solving skills and development of critical thinking and hence achievement. PBL engages students

in learning in a mental and physical sense. PBL encourages the students to work in groups to face and solve real life issues. In view of this, the research study is helpful in sensitizing students to potential future problems and to solve them. The findings of this study are relevant to teachers and educators as they would be in a position to apply problem based strategy which enhances student critical thinking's of students to help them to achieve higher scores in science. Teachers, policy makers and researchers can use these findings to make foundation for future research studies.

Research Methodology

The design of study was pretest-posttest and Quasi experimental in nature. The data was collected in quantitative form. The outcomes were presented in numerical format.



Conceptual Framework

The population consisted of all elementary students within District Muzaffar Garh. There were 21150 students enrolled in 8th class in government schools.

Table 1: Population of the study

Sr. No	Gender	No. of students	Percentage
1	Male	12250	58 %
2	Female	8900	42 %

Source: https://sis.punjab.gov.pk

The study population was encompassed all students of 8th grade (21150) within District Muzaffar Garh. Sample size was 60 students from the same district. Thirty students out of 35 were selected from Government Boys Elementary School Waan Pitafi by using simple random technique as experimental group. Thirty students out of 40 were selected from Government Boys Elementary School Ishaq Wala by using simple random technique as control group.

Table 2: Sample of the study

Sr. No	Group	No. of students	Percentage
1	Experimental	30	50 %
2	Control	30	50 %

Achievement test was used to measure the achievement of 8th grade students in subject of Science adopted from Punjab examination Commission. This tool consisted of 32 multiple-choice questions of 48 marks and 52 marks subjective type questions. Data was collected from the control and experiment groups after 9 months of problem-based learning. Pre-test and post-test was done to collect data. The achievement test was conducted before and after treatment on experimental and control group. Different statistical techniques were applied including mean as a descriptive statistics.

Data Analysis

Data gathered from sixty (60) participants were analyzed using SPSS. The responses of the participants have been summarized using measures such as the mean values. The data is described in descriptive manner.

Table 3: Mean values of experimental group and control group in pre-test

Sr. No	Group	Marks	Mean
1	Experimental	1808.3	58.3
2	Control	1671.93	53.93

The table number 3 shows that experimental group mean value in pre-test was 58.3 while control group mean value in pre-test was 53.93.

Table 4: Mean values of experimental group and control group in post-test

Sr. No	Group	Marks	Mean
1	Experimental	2648	88.26
2	Control	2169	72.3

The table number 4 shows the value of mean of experimental group in post-test was 88.26 while mean value of control group in post-test was 72.3.

Conclusions

Results of study showed that experimental group students' achievement was better than achievement of control group students' in pretest. Statistical analysis of mean of both groups showed that performance of experimental group students was better than the performance of control group in post- test. The experimental group performed better as compared to performance of control group in both pretest and posttest. But the difference in means (4.37) of pretest of experimental and control group is very small than difference in means (15.96) of experimental group and control groups in post-test. It proves through problem based learning students' achievement scores are improved.

Discussion

Statistical analysis of mean of both groups showed that performance of experimental group students was better than the performance of control group in post- test. The experimental group performed better as compared to performance of control group in both pretest and posttest. But the difference in means (4.37) of pretest of experimental and control group is very small than

difference in means (15.96) of experimental group and control groups in post-test. It proves through problem based learning students' achievement scores are improved.

Implementation of the problem based learning strategy in science classes at elementary level can significantly enhance learning outcomes of students. The study showed a distinguished effect size (0.73) and found that students outperformed while taught with PBL as compared to those students' taught with conventional teaching methods. This depicts that PBL model is very effective in promoting critical thinking and achievement in subject of science at elementary level (Sari et al., 2023).

PBL model positively influence students' critical thinking's and achievement in science through learning activities. This is due to fact that students think critically to solve problems in group forms by using problem based learning approaches (Amin et al., 2020). When PBL is applied, there is significant improvement in critical thinking and learning outcomes of students. This also positively improves achievements at academic level (Zhang and Ma 2023).

Recommendations

Following recommendations were made in the light of findings and conclusions:

1. Problem based learning strategy should be used by science teachers while teaching at elementary level. .
2. The researchers should investigate impact of PBL strategy to evaluate achievement of students at secondary level.
3. The researcher should investigate impact of problem base learning on achievement of students in subjects other than science.

References

1. Amin, S., Utaya, S., Bachri, S., Sumarmi, S., et al. (2020). Effect of Problem Based Learning on Critical Thinking Skill and Enviromental Attitude. *Journal for the Education of Gifted Young Scientists*, 8(2), 743-755.
2. Afaq, A., Khan, Q., Arshad, A., Sibt-e-Ali, M., & Malik, A. A. (2022). The job satisfaction of academic staff in higher educational institutes. *Journal of South Asian Studies*, *10*(1), 95-101.
3. Awla, H. A. (2014). Learning styles and their relation to teaching styles. *International journal of language and linguistics*, *2*(3), 241-245.
4. Ayuni, R. S., Putri, S., Purnama, S. R., & Giwangsa, S. F. (2024). Problem Based Learning Model in Natural Science Learning in Elementary Schools: Systematic Literature Review & Bibliometric Analysis. *Widyagogik: Jurnal Pendidikan dan Pembelajaran Sekolah Dasar*, *12*(2), 138-153.
5. Elmas, R., Bodner, G. M., Aydogdu, B., & Saban, Y. (2018). The Inclusion of Science Process Skills in Multiple Choice Questions: Are We Getting Any Better?. *European Journal of Science and Mathematics Education*, *6*(1), 13-23.
6. Pekel, F. O., & Hasenekoglu, İ. (2020). An effective tool to deal with misconceptions: Conceptual change approach. *Advances in Social Science Research*, *59*-82
7. Sari, I. P., & Jusra, H. (2023). Application of Problem-based Learning Models Assisted By Liveworksheets Towards Students' Mathematical Creative Thinking Ability. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, *11*(4), 1076-1083.

8. Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. *Essential readings in problem-based learning: Exploring and extending the legacy of Howard S. Barrows*, *9*(2), 5-15.
9. Sequeira, A. H. (2012). Introduction to concepts of teaching and learning. *Social sciences education e-journal*.
10. Uluçınar, U. (2023). The effect of problem-based learning in science education on academic achievement: a Meta-analytical study. *Science Education International*, *34*(2), 72-85.
11. Wilder, S. (2014). Impact of problem-based learning on academic achievement in high school: a systematic review. *Educational Review*, *67*(4), 414–435.
12. Wirkala, C., & Kuhn, D. (2011). Problem-based learning in K–12 education: Is it effective and how does it achieve its effects?*American Educational Research Journal*, *48*(5), 1157-1186.
13. Yew, E. H., & Goh, K. (2016). Problem-based learning: An overview of its process and impact on learning. *Health professions education*, *2*(2), 75-79.
14. Zhang, L., & Ma, Y. (2023). A study of the impact of project-based learning on student learning effects: A meta-analysis study. *Frontiers in psychology*, *14*, 1202728.