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Investing the Benefits of Project Based Learning in Science Education

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Abstract: Scientific literacy is essential for keeping up with technological advances in the twenty-first century. Science education uses educational practices to help students become scientifically literate. One strategy utilised in scientific education is project-based learning (PBL).The study has been carried out to know about the principles of Project Based Learning and to understand how the project based learning matters in science education. It also discusses the benefits of project based learning in the science education. Since this is conceptual study the researcher has followed the secondary sources of information in terms of books, journals etc. In order to achieve this goal, science education aims to help students develop skills such as critical thinking, observation, analysis, and the ability to apply what they have learned in the classroom to real-world situations. Training both future and current educators to react to the need for a project-based learning strategy in scientific education is being seen as a viable option, thanks to the significant and novel learning flexibility that can be achieved via the correct use of PBLA.

Keywords: Science education, literacy, teachers, project-based learning.

Introduction: Project-Based Learning (PBL) "is a groundbreaking approach in education that involves teaching through assembly of strategies and has been promising in the current era dominated by rapidly developing technologies worldwide. This learning approach necessitates students to work cooperatively, collaborate towards fruitful project creation, and come up with research results from their own work. The project based learning involves self-directed learning, investigation and exploration of the concepts, which all facilitate the learning in permanent coding of the concepts that could enhance easy retention and conceptualization process. The project-based learning takes the move of predict-observe-explain-conclude and this foster the students' prediction abilities and critical thinking that support the process of understanding complex concepts presented in science subjects according previous study". (Alfiyanti & Jatmiko 2020). Additionally, "the project-based learning involves problem solving tasks that enhances the student's creativity and innovation which in turn promotes logical capacities in science education (Twahirwa &Twizeyimana.,2020), and involves practical tasks such as manipulating activities that could raise the hands on and minds efficacy".

The successful design and implementation of "project-based learning approach in science subject teachings involves various steps. Some of them are for example, (1) identification of the issue, (2) formulation of the issues and associated hypothesis, (3) searching and gathering related data, (4)

proving the data through experiments to test the reality, (5) resenting and defending the tested reality, (6) clarifying the wrong results, (7) summarizing the process, and drawing conclusion" (Usmeldi ,2018). It follows that instructors have, to some degree, stifled project-based learning owing to a number of limitations. There is a lack of experimental tasks, insufficient teacher training and workshops, an overemphasis on teacher-centered instruction, and not enough time devoted to scientific classes. It should be mentioned that in many schools, a major obstacle to implementing project-based learning techniques is the absence of imagination and originality when it comes to creating supplemental resources.

Research Problem: In addition, learner-centered learning replaces teacher- or subject-centered learning as a result of project-based learning (Handelzalts, 2019; Shin, 2018). In contrast to traditional classroom instruction, a number of earlier research highlighted the value of project-based learning in piqueing students' cognitive interest. Alzahrani, Alshammary, & Alhalafawy, 2022; Guo et al., 2020; Mahasneh & Alwan, 2018; Alanzi & Alhalafawy, 2022b; Alshammary & Alhalafawy, 2023) Nevertheless, there is a lack of information about the effectiveness of project-based learning in developing students' critical thinking abilities in investment optimisation. This makes the question "What is the effectiveness of project-based learning in science education?" a suitable formulation for the study topic.

Objectives of the Study: The purpose of this research was to determine the effects of project based learning in the science education. It also aims to find out the difference of benefits among the students on the basis of gender and residential places.

Hypothesis:

H01: Students can be significantly benefitted from the project based learning.

H02: There will be no significant difference in the effects of project based learning between male and female

H03: There will be no significant difference in the effects of project based learning between Rural and Urban students

Method: In the study, in order to determine if the teaching made in accordance with the Project-Based Learning Method and the one made in accordance with the current program had different effects on students' success, the experimental method with pretest-post test control group.

Research Design: To fulfill the objectives of the study the researcher has followed the cross sectional method.

Population and Sample: The population of the study is composed of the 8th standard in the Paschim Medinipur district of West Bengal. The sample of the study is composed of a total of 72 students studying at different secondary schools of Paschim Medinipur district.

Data Collection: To measure the students' success levels, two identical Achievement Tests were administered in pre-test and post-test sessions. An achievement test of 40 items was prepared. The measurement tool was determined as a multiple-choice test with four alternatives. Result of the test was recorded in the pre test and post test.

Statistical Techniques: Collected data were tabulated and analyzed with the help of Mean, SD and t test in the SPSS 20. Version.

Data Analysis and Interpretation:

Table 1- Descriptive Statistics of the Pre Test and Post Test

Pre Test		Post Test	
Parameters	**Values**	**Parameters**	**Values**
N	72	**N**	72
Minimum	8	**Minimum**	14
Maximum	35	**Maximum**	38
Mean	19.22	**Mean**	26.66
Median	18.5	**Median**	26
SD	6.96	**SD**	5.22
SEM	0.82	**SEM**	0.61
Skewness	0.68	**Skewness**	0.07
Kurtosis	2.92	**Kurtosis**	2.99

The above table shows the descriptive statistics of the pre test and post test results of Project based learning. From the table we can see that in the pre test result the mean score is 19.22 with the minimum of 8 and maximum of 35. But in the post test result the mean score is 26.66 with the minimum of 14 and maximum of 38. Hence it is clear that the project based learning has significant impact on the students since the maximum score as well as the mean score has also increased significantly. The obtained SD in the pre test was 6.96 which transformed to 5.22 in the post result. In the post test result the skewness value is 0.07 and the kurtosis value is 2.99 in the pre test it was 2.92. Hence we can conclude that the students under study have been significantly benifitted from the project based learning.

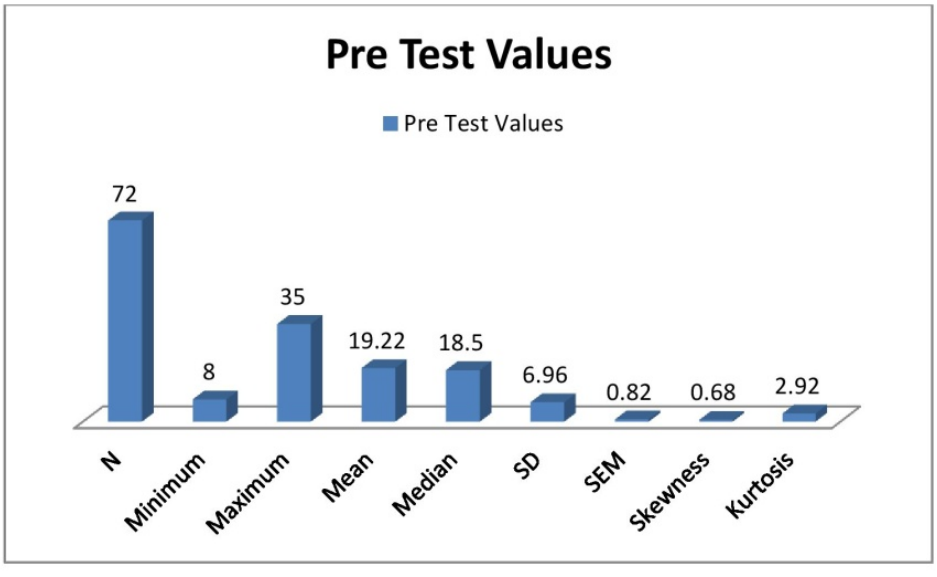

Fig. Showing the Descriptive statistics of the Pre test result.

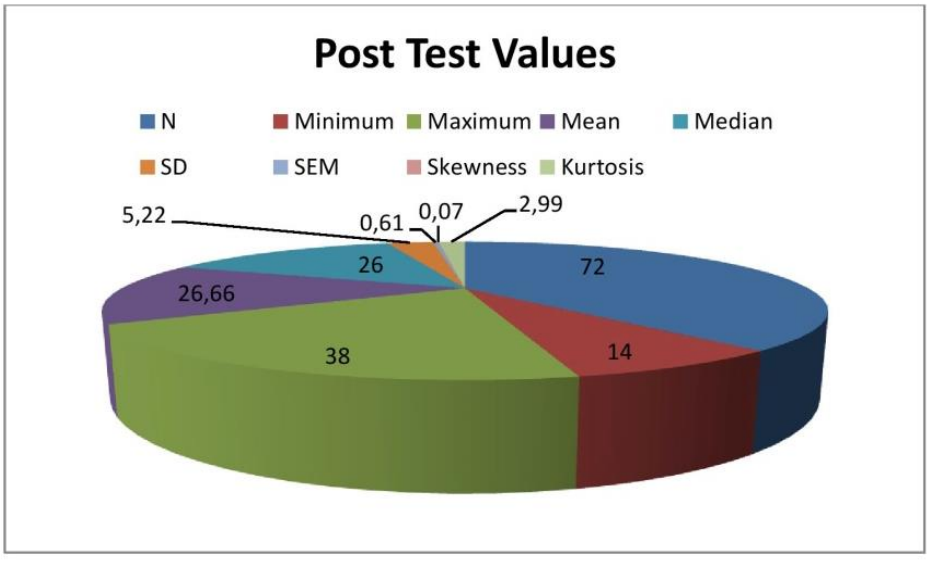

Fig. showing the descriptive statistics of Post Test result.

Table 2-Difference in the benefit of Project based learning between male and female.(Post Test)

Group	N	Mean	SD	SEM	t
Male	38	25.82	5.12	0.50	1.19
Female	34	27.14	5.94	1.01	

't' test has been applied to find out the difference of effects of project based learning in the science education between male and female. From the above table we can see that the mean score of the results of male students is 25.82 and SD is 5.12. Similarly the mean score of the results of female is 27.14 and SD is 5.94. The calculated t value is 1.19 which is less than the table value at 0.05 level of significance. By conventional criteria, this difference is considered to be not statistically significant. Therefore the formulated hypothesis "There will be no significant difference in the effects of project based learning between male and female" is accepted. Hence it is concluded that the male students do not differ from their female counterparts in respect of the effects of Project based learning in science education.

Table 3-Difference in the benefit of Project based learning between Rural and Urban Students.(Post Test)

Group	N	Mean	SD	SEM	t
Rural	28	24.82	5.32	1.00	2.00
Urban	44	27.26	4.85	0.73	

't' test has been applied to find out the difference of effects of project based learning in the science education between Rural and urban students. From the above table we can see that the mean score of the results of rural students is 24.82 and SD is 5.32. Similarly the mean score of the results of urban students is 27.26 and SD is 4.85. The calculated t value is 2.00 which is higher than the table value at 0.05 level of significance. By conventional criteria, this difference is considered to be statistically significant. Therefore the formulated hypothesis "There will be no significant difference in the effects of project based learning between Rural and Urban students" is rejected. Hence it is concluded that the rural students differ significantly from their urban counterparts in respect of the effects of Project based learning in science education.

Findings: After analyzing the collected data the following have been found –

1. Students can be significantly benifitted from the project based learning.
2. The male students do not differ from their female counterparts in respect of the effects of Project based learning in science education
3. The rural students differ significantly from their urban counterparts in respect of the effects of Project based learning in science education

Conclusion: In short, there is a need to debate with the scientific community over the place of project-based learning in science education. Owing to the essential and distinctive potential learning flexibility created by the appropriate application of project-based learning in scientific education, we propose that pre-service and in-service teachers be prepared to react to the requirement for project-based learning approach implementation. Through project-based learning, students are encouraged to build their own knowledge and abilities, which will help them in their future Endeavour.

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