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Laboratory Method and Development of Achievement in Science

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ABSTRACT

Present article tried to examine the relative effectiveness of laboratory method and conventional method of teaching science at upper primary school level in the development of academic achievement in science. The subjects of the study were 350 students (200 boys and 150 girls) of class VI of 6 different schools of Malda district of West Bengal selected randomly. Subjects were assigned to two groups. The experimental group was taught by laboratory method and control group was taught by conventional method. After that a post test (achievement test) was administered on both the groups. Researcher then compared the significance of relative effectiveness of the two types of instructional methods. To know the relative effectiveness researcher uses descriptive statistics and t-test. The analysis conducted produces significant result. The result shows that laboratory method tends to provide higher level of achievement in science then conventional method of teaching. Laboratory method also produced higher achievement level among the boy as well as among the girls then the conventional method of teaching. There also exist significant difference in levels of achievement between boys and girls in group taught by laboratory method and in group taught by conventional method.

1. Introduction

Modern educational theory suggests that knowledge is best gained through experience. When a child confronts with a problematic situation they tried to explore it to reach a solution. National focus group on teaching science constituted by NCERT thinks that there exist three fundamental elements of science education viz. learner, science curriculum and learning environments. The general aims of teaching science could be achieved best by arranging the learning environment suitably. The resultants of suitable arrangements of learning environments would be development of students' achievement in science. It is the laboratory which provides such kind of physical, biological and social environments. Usually laboratory implies a classroom having the facility of experimentation. Educationist like **Ufondu (2009)** suggested that it is a most important component to have in school to achieve objectives of the science teaching and learning[1]. It is imperative to have science learned citizen for development. Method of teaching science is one of other factors behind high achievement in science. Different Studies has compared the effect of experimental classrooms with traditional classrooms and thus laboratory method and conventional methods in science achievements. A major drawback of our educational system is the decline of experimentation work in laboratory at school levels. According to **Leonard et al. (1996)** learning through inquiry produces higher educational gains[4]. **The National Science Education Standards (1996**) re-emphasized that inquiry in general in science education is essential in the achievement of scientific literacy and or education[2]. . This study aimed at investigating the roles of the laboratory in development of achievement in science subject.

2. Objectives of the study

1. The objective of the study is to ascertain whether laboratory activity could be utilized as an effective approach for teaching science in primary school.
2. To compare the effectiveness of conventional teaching–learning strategy with that of laboratory teaching-learning method.
3. To study whether laboratory activity could be employed in improving the academic achievement in science at primary school level.

3. Hypothesis

1. H_{01}: There is no significant difference between boys and girls of control group in their academic achievement.
2. H_{02} : There is no significant difference between boys and girls of experimental group in their academic achievement.
3. H_{03} : There is no significant difference between boys and girls of control group and experimental group in their academic achievement.
4. H_{04} : There is no significant difference between control group and experimental group in their academic achievement.

4. Operational definition of the terms

1. **Conventional method of teaching science**- The methods of teaching employed by the teachers in class room other than inquiry based teaching, activity based teaching and laboratory based teaching is considered as conventional method of teaching[3].
2. **Laboratory method of teaching science**- Laboratory method is a way of using systematically the science processes skills and methods of thinking through inquiry, activity and exploration[5].
3. **Academic achievement**- Academic achievement is the outcome of an educational program. The scores obtained in achievement test of science here used as measures of academic achievement in science.

4. Two groups randomized matched subject post-test true experimental design was used in the present study. In this method subjects were assigned to two groups through technique of matching with respect to extraneous variables. Then experimental group were taught by laboratory method and control group were taught by conventional method. After that a post test or achievement test of science was administered on both the groups. Researcher then compared the significance of mean score difference obtained by the groups in that test to know the relative effectiveness of the two types of instructional methods.

5. Population of the Study

The target population of present research is all the students of class VI of West Bengal studying in upper primary level of education. The accessible population of present research is all the students of class VI of Malda districts of West Bengal studying in upper primary level of education.

6. Samples

The researcher selected 6 schools randomly from the schools of Malda Districts. The random selection of 6 schools was done by using lottery method. 350 students of Class VI including 200 boys and 150 girls were selected randomly from the students of Class VI studying in those schools using random number table. Then 350 subjects were assigned to two groups containing 175 subjects in each group through technique of matching with respect to achievement scores obtained in previous examination. Then 175 subjects of experimental group were taught by laboratory method and 175 subjects of control group were taught by conventional method using different lesson transcript on same unit. After that a post test or achievement test) was administered on both the groups. Researcher then compared the significance of mean score difference obtained by the groups to test the relative effectiveness of the two types of instructional methods.

7. Tools

Three tools were used in the study. Researcher used different lesson plan for different group but on the same unit. All the tools were constructed and standardized by researcher. The achievement test prepared by the researcher consisted 25 items with a reliability coefficients of .93 and high face validity, content and item validity, internal and external validity. Three tools are as follows

1. Lesson transcript for control group.
2. Lesson transcript for experimental group.
3. Achievement test for the students

8. Data analysis

The researcher collected the data after administration achievement test of science on the sample of 350 students. The data obtained as above are then subjected to the analysis based on following aspects

1. Descriptive statistics.
2. Gender wise comparison with in experimental group and control group.
3. Group wise comparison among boys and girls.
4. Overall comparison.

9. Descriptive statistics

The researcher obtained descriptive statistics like mean, standard deviation, skewness and kurtosis etc. from the distribution of the scores obtained by the subjects in achievement test of environmental study as follows-

Table -1
Descriptive statistics of the achievement scores of control group and experimental group

	Exp	Cont
N	175	175
Mean	17.46	10.58
Median	17.00	10.00
Std. Deviation	3.154	3.896
Skewness	.111	.156
Std. Error of Skewness	.184	.184
Kurtosis	.053	-.329
Std. Error of Kurtosis	.365	.365

The mean score obtained by the control group in achievement test science is 10.58 with a standard deviation of 3.89. The mean score obtained by the experimental group in achievement test of environmental study is 17.46 with a standard deviation of 3.15. It shows that mean score is higher in experimental group then that of control group. The values of the skewness and kurtosis indicates that the distribution of the scores obtained in achievement test by the control group is slightly positively skewed and leptokurtic. On the other hand the values of the skewness and kurtosis indicates that the distribution of the scores obtained in achievement test by the experimental group is slightly positively skewed and leptokurtic. On the whole the distribution in experimental group and control group has a slight variation from the normality.

10. Gender wise comparison with in experimental group and control group.

In study of gender wise comparison with in experimental group and control group and group wise comparison among boys and girls the researcher used parametric tests like t – test. In the present research the all of these basic assumptions of parametric tests had been checked and found fairly satisfactory in order to use it.

The researcher applied two tailed t- test to understand whether there exist any significant difference between mean scores obtained by boys and girls students of control group in achievement test of science. The result revealed that boys and girls of the control group differed significantly in achievements. The researcher found that t – value equal to 6.646 which is greater than the critical value of t at .05 and .01 level of significance with 173 degrees of freedom (df). The researcher rejected hypothesis H_{01} and inferred that boys have significantly better achievement in science then girls.

The researcher applied two tailed t- test to understand whether there exist any significant difference between mean scores obtained by boys and girls students of experimental group in achievement test of environmental study. The result obtained represents that boys and girls of the experimental group differed significantly in achievements. The researcher found that t – value equals to 12.328 which is greater the the critical value of t at .05 and .01 level of significance with 173 degrees of freedom (df). The researcher rejected hypothesis H_{02} and inferred that boys have significantly better achievement in science then girls.

11. Group wise comparison among boys and girls

The researcher applied two tailed t- test to understand whether there exist any significant difference between mean scores obtained by boys and girls students of control group and experimental group in achievement test of science.

The result obtained represents that boys of the experimental group and control group differed significantly in achievements. The researcher found that t – value equals to 16.854 which is greater than the critical value of t at .05 and .01 level of significance with 173 degrees of freedom (df). The researcher rejected the hypothesis H_{03} and inferred that boys of the experimental group have significantly better achievement in science then that of control group. Again the result obtained represents that girls of the experimental group and control group differed significantly in achievements. The researcher found that t – value equals to 13.744 which is greater than the critical value of t at .05 and .01 level of significance with 173 degrees of freedom (df). The researcher rejected hypothesis H_{03} and inferred that boys of the experimental group have significantly better achievement in science then that of control group.

12. Overall comparison

The researcher applied two tailed t- test to understand whether there exist any significant difference between mean scores obtained by students of control group and experimental group in achievement test of science.

The result obtained represents that students of the experimental group and control group differed significantly in achievements. The researcher found that t – value equals to 18.122 which is greater than the critical value of t at .05 and .01 level of significance with 173 degrees of freedom (df). The researcher rejected **hypothesis H_{04}** inferred that students of experimental group have significantly better achievement in environmental study then that of control group.

13. Conclusion

The result of the study reveals that boys of the control group have higher level of achievement then girls. This is may be because of the fact that boys are more motivated then girls. Boys of the experimental group have higher level of achievement then girls. This is may be because of the fact that boys are more motivated then girls. Boys of the experimental group attained higher level of achievement then boys of control group. As the experimental group is taught by laboratory method and control group by conventional method it can be concluded that laboratory method is more effective than conventional method in enhancing achievement. Girls of the experimental group attained higher level of achievement then girls of control group. As the experimental group is taught by laboratory method and control group by conventional method it can be concluded that laboratory method is more effective than conventional method in enhancing achievement.

Overall students of the experimental group attained higher level of achievement then students of control group. As the experimental group is taught by laboratory method and control group by conventional method it can be concluded that laboratory method is more effective than conventional method in improving achievement in science.

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