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IMPACT OF BLENDED LEARNING APPROACH ON THE ACADEMIC ACHIEVEMENT OF STUDENTS IN SCIENCE

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Abstract

Blended learning is a relatively new technology-based teaching approach. Few attempts have been made to use this approach in science education in India. The aim of this study was to assess the effectiveness of blended learning approach on academic achievement in science of students of elementary VII class. This quantitative experimental study involved 70 VII class students, from two schools of Noida region of Uttar Pradesh, India. The students were randomly divided into two groups: 30 were taught by the traditional approach (face-to-face) and 40 taught by blended learning approach (both electronic and face-to-face). The effect of blended learning was evaluated from students' performance in the achievement test. It was found that the achievement of the students taught through blended learning was statistically significantly better than traditional learning. The findings suggest that elementary students, are open to new methods of learning. The blended learning approach is an effective method for teaching science and may be applicable to other school subjects.

INTRODUCTION

The rapid advances in information and communications technologies (ICTs) have acted as a catalyst for educational transformation in recent years the world over (Nichol & Watson, 2003). India is also attempting to take advantage of this technological revolution in order to make strides in the advancement of education. These technologies offer tremendous hope towards meeting the present day educational challenges of lack of access to quality higher education.

Technological advances have become integral parts of our lives and changed them forever, increasingly with each new generation. Such changes mean that schools must adopt new teaching methods, while maintaining excellence in education. The new methods include electronic (e-learning), on-line or web-based and problem-solving-based learning. These methods shift teaching from a largely teacher-centered, product-based activity to a more student-centered, process-based activity. This strategy encourages students to be active in the experience of learning rather than being passive learners. Ford et al. stated that "integrating teaching, learning and technology is a mandate, not an option, and doing any less would border on professional irresponsibility." While cost is a significant barrier, such innovations can have a large impact on self-directed learning, especially when human resources are scarce.

The concept of "blended learning", came into existence back in 2000. Blended learning has transformed from a theory into an essential part of mainstream education employing technological

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tools, devices and concepts. Blended learning has several names but the most commonly used term is 'hybrid'. Blended learning is also known as flexible learning. Blended learning is the fusion of modes, methods, and ways employed for teaching and learning. It is the combination of face to face learning merged with online learning.

According to **(Vaughan, 2007; Duhaney, 2004)** 'Proving it to be a useful tool in the classroom in different activities and lessons with multiple ways the use of information technology is forming interest in the concept of blended learning.'

Blended learning is an approach employed for more effective instruction where the presence of technology has created more scope for individual attention to learner, flexibility giving students complete control over time, place and pace of learning.

The Clayton Christensen Institute, one of the most well-known thought leaders on blended learning, defines it as "a formal education program in which the student learns in part through online learning, and partly in a supervised brick-and-mortar location away from home."

Murphy, Qwston and Wideman (2008) explained blended learning as a fusion of face-to-face and online teaching and learning experiences keeping in mind the needs of individual learner. Blended learning approach is being used in some form or the other engaging the learner in online activities like threaded discussions, e-books and online assignments using smart boards, tablets, overhead projectors and laptops. In addition to the online written communication component, everyone engaging in blended learning can maximize the use of other appropriate digital elements, e.g., audio, video, etc., which are now easily accessible via Internet.

Blended learning, which once referred to use of computer and web-based training in class, has now evolved into a humongous education program that merges traditional classroom based instruction with technology enhancements such as smart boards, digital textbooks, e-books, software and online access to various resources. The method of 'blended learning', is gaining popularity as increasing numbers of schools use the Internet as the digital repository of teaching and learning forums.

Many studies tried to investigate the effectiveness of blended learning in teaching the students:

Yapici, I. U. & Akbayin, H. (2012) investigated the effect of blended learning on achievement scores and attitude of the Grade 9 Biology students in two different schools. For the study, 107 participants were randomly selected, 47 being in experimental group and 60 in control group. The duration of the study was 11 weeks teaching the experimental group through blended learning by moodle model and control group was taught through traditional face to face method. The study concluded that blended learning was a better contributor and facilitator of knowledge than a traditional setting.

Kazua, I. Y. & Demirkolb, M. (2014) investigated the effect of blended learning on the grade 12 students learning Biology. Their overall marks of grade 10, 11 (Biology) and pretest marks were considered to check their performance. This quantitative study was conducted selecting randomly 54 participants of which experimental and control group consisted of 27 students each. Each group consisted of 19 males and 8 females. Pretest was conducted and then after the treatment posttest was conducted on both groups. The study was also based on gender as another dependent variable. Data was formed by Cluster Analysis technique and was analysed by using SPSS16.0 in Windows. The grades of students from their class 10 & 11 were compared between the two groups. Data was collected

and analysed by using arithmetical mean, standard deviation, item discrimination index, KR20, percentage and frequency and cluster analysis. Pretest of both the groups was compared. Posttest was compared with pretest for both the groups separately and later compared also on the basis of gender. It was concluded that there was not much difference in the achievement tests of the two groups. The females scored higher than the males in the pretest and final test in both the environments.

Chang, C., Shu, K., Liang, C., Tseng, J. & Hsu, Y.S. (2014) explored through the question on whether blended learning with e learning is better than traditional classes for students in 11th standard. The participants being 65 students were randomly selected, 33 students for experimental group and 32 students for the control group. Both the groups were taught by the same teacher who had an expertise in traditional teaching and blended learning as well. Pretest Post test was conducted on the participants. It was a quasi- experimental study. Tools employed were achievement test questionnaire and self-assessment questionnaire. The activities employed in the blended learning were taken from the eight learning phases proposed by Baldwin-Evans, Bielawski and Metcalf. Interaction by email, familiarization of students with blended learning, teacher led online course practice and online was the method for instruction through blended learning for the experimental group. Validity and reliability of both tests was tested using Cronbach's, Kaiser-Meyer-Olkin index. For the results, ANCOVA, Levene's test was employed. It was concluded that the achievement scores of the students did not reveal any significant difference between blended learning and traditional learning but the self- assessment scores significantly differed in favour of blended learning.

Almasaeid, T. F. (2014) investigated on the use of blended learning to teach, 45 students of Science of grade 9 .The study was a quasi-experimental study including both quantitative and qualitative study. Experimental and control group were formed. Pretest and posttest was conducted on the students before and after the treatment. The findings concluded that blended learning method was one of the most effective method of teaching and learning Science in an interesting and motivational way.

Fakhir, Z. (2015) conducted a study on how effective blended learning is when implemented in class of grade 6 students being taught English. She also investigated on the effect of blended learning on the achievement scores as well as attitude of the students of grade 6. For the quasi-experimental study, 50 female participants were selected from two schools data was collected using Achievement test and attitude scale. The results showed significant difference in the two groups being in favour of experimental group. It was concluded that blended learning was an effective strategy for teaching English to grade 6 students.

Cracraft, L. (2015) researched on the effectiveness of blended learning on the elementary and secondary school students. The objective of the study was to find the impact of technology used in teaching physics to 12 th class students through blended learning model using experimental research. The results indicated that there was not much significant difference between the achievement scores under both the models.

Lin, Y. W., Tseng, C. & Chiang, P. (2015) researched the effect of blended learning on the achievement level of the 57 participants from grade 7 students in mathematics course. It was a quasi-experimental study as it included quantitative as well as qualitative analysis. For experimental group Moodle for Mathematics was employed and online assignments and assessments were given for a

duration of 11 weeks. The study found that Blended learning was motivating for the students to achieve higher scores.

Ceylan, V. K. & Kesici, A. E. (2017) researched on the effect of blended learning on the achievement scores of middle school students. The study was conducted on 53 students of grade 6 divided into experimental and control group. Tools that were employed for the study were academic achievement test and product evaluation scale. Beyazpano.com was used to work with learning management system participating in chat rooms and discussion forums online. ANOVA test and Scheffe test, The Cohen d value were used to calculate the significant differences to prove the hypothesis. There was a significant difference between pretest and posttest scores. From the analysis, it was concluded that blended learning was more effective in case of the experimental group in comparison to the control group.

Review of the studies shows that most of the researches on blended learning have taken place in the developed countries but a few have attempted to conduct research on this topic in India. In India there has been limited research on the appropriate use of blended learning for teaching science at elementary school stage. More over very less studies have been done in Noida region therefore the researcher undertook the study. The purpose of this study, was to determine the effectiveness of a blended learning approach on the academic achievement of students in science at elementary level, by comparing it with delivery of the same course face-to-face by the same teacher.

STUDY DESIGN

The present study is experimental in nature. It is a quantitative study which was carried out at two private elementary schools at Noida area of Uttar Pradesh, India, in the year 2018-19. The study was approved by the school management committee, and all participating students gave informed consent.

SAMPLING

In the present study purposive sampling method derived from the non-probability sampling was adopted to select 70 participants in non-equivalent groups. Students were randomly divided into two groups: 30 students followed the traditional (face-to-face) method and 40 students who followed the course with a blended learning strategy (e-learning plus face-to-face learning). After the treatment an achievement test was administered to both the groups. The data of the achievement test was analyzed and interpreted.

HYPOTHESIS:

The study was undertaken to test the following hypothesis:

- No significant difference exists between the academic achievement of the experimental group and control group before the treatment in science.
- No significant difference exists between the academic achievement of the experimental group and control group after the treatment in science.
- No significant difference exists between the academic achievement of the experimental group before and after the treatment in science.
- No significant difference exists between the academic achievement of the control group before and after the treatment in science.

TOOLS OF THE STUDY

Achievement tests were administered for pre-test and post-test. It was a test given on the topic of Science for VII class that had subjective/ objective type questions. In all, there were 21 items in the questionnaire. The test was of 54 marks and time duration was 30 minutes. All questions were attempted by the students. It was administered on both the groups as a pre-test and a parallel test was given as post-test. The reliability of the test was checked by test retest method calculating Pearson correlation coefficient.

ANALYSIS OF THE DATA

The data was analyzed by employing mean, median, mode, standard deviation, z scores and t test to find the difference in the means of the experimental and control group. The statistical tools by which the results were calculated for data analysis was EXCELSTAT feature within the excel sheet.

Hypothesis H_0^1 No significant difference exists between the academic achievement of the experimental group and control group before the treatment in the Science.

To analyze this hypothesis, a pretest in the academic achievement in Science was administered on the experimental group and control group. The data was analyzed and is represented in the Table 1

Table 1: Academic achievement (Pretest) of the experimental and control group in Science.

Variable (Achievement Tests)	N	Mean	SD	Z scores mean	df	Observed T- value	Table T Value	Significant/ Non-Significant
Experimental Group	40	20.82	5.17	-0.42	68	1.62	1.99	Non-Significant
Control Group	30	22.74	4.48	0.37				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom

Figure 1: Academic achievement (Pretest) of the experimental and control group in Science

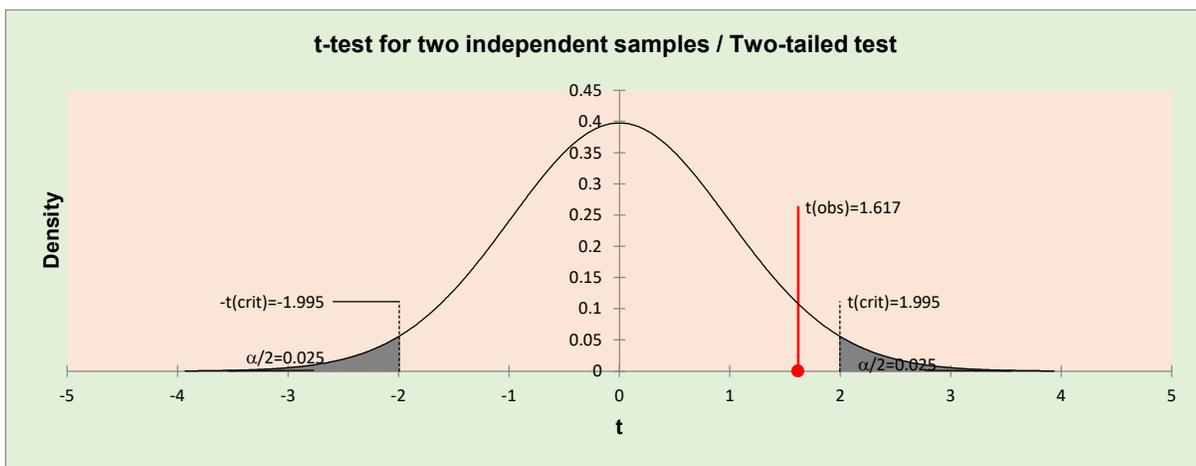


Figure 2: Academic achievement (Pretest) of the experimental and control group in Science



Interpretation:

With reference to Table 1, the mean value of the achievement of experimental group is 20.82 and the control group is 22.7. The SD is 5.17, the median is 21 and mode is 17 for the experimental group whereas the SD for the control group is 4.48, the median is 23 and mode is 23. From the Figure 2, it is evident that the achievement of the students of experimental group is higher than the control group but there is not much difference.

Moreover, referring to Figure 1, the table value of t is 1.99, the observed t value is 1.62. The degree of freedom is 68. According to the normal probability curve, the observed t value is less than the table value of 1.995 at 0.05 level of significance where the hypothesis stands accepted.

Therefore, it proves that there is no significant difference between the achievement of the experimental and control group before the treatment in the Science.

Hypothesis H_0^2 No significant difference exists between the academic achievement of the experimental group and control group after the treatment in the Science.

To analyze this hypothesis, a posttest in the academic achievement in Science was administered on the experimental group and control group. The data was analyzed and represented in the Table 2.

Table 2: Academic achievement (Posttest) of the experimental and control group in Science

Variable (Achievement Tests)	N	Mean	SD	Z scores mean	df	Observed T- value	Table T Value	Significant/ Non-Significant
Experimental Group	40	43.80	8.97	0.00027	68	7.74	1.99	Significant
Control Group	30	28.60	6.86	4.39				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom

Figure 3: Academic achievement (Posttest) of the experimental and control group in Science

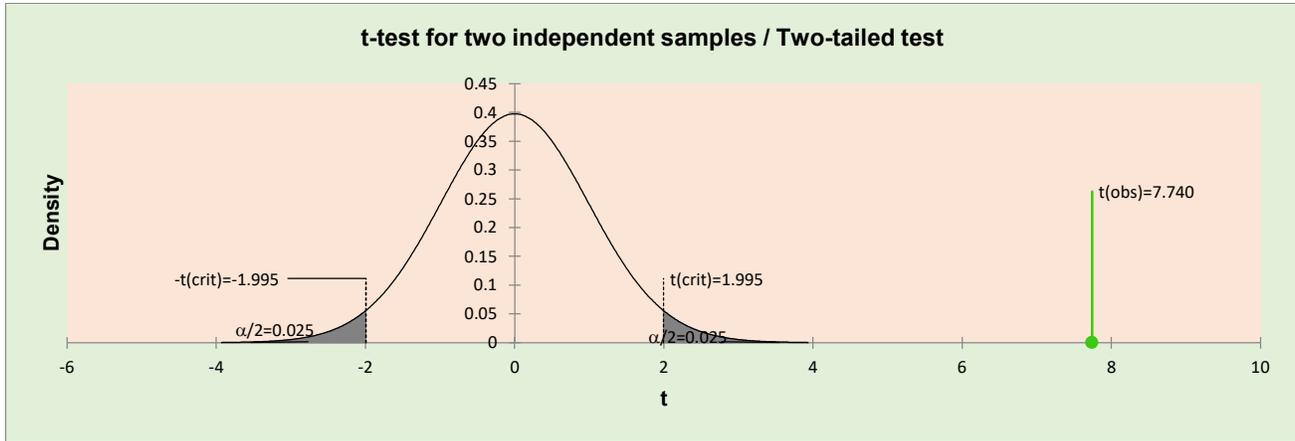
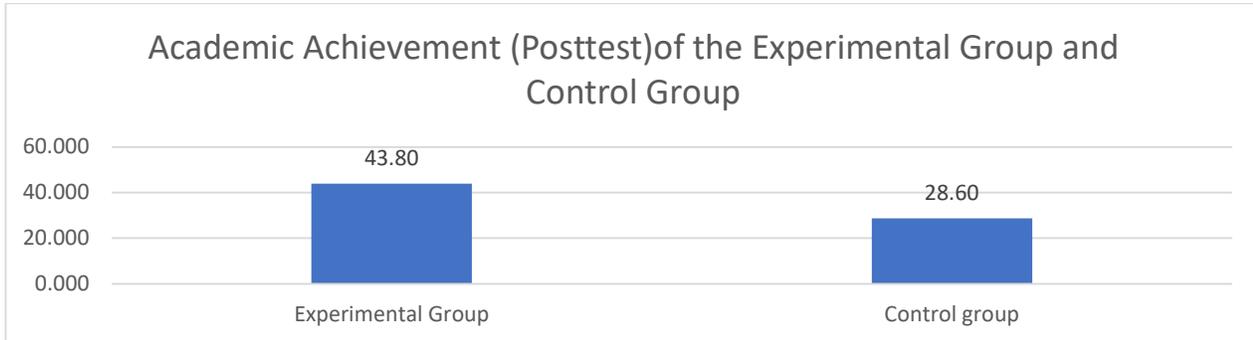


Figure 4: Academic achievement (Posttest) of the experimental and control group in Science



Interpretation:

With reference to Table 2, the mean value of the achievement of experimental group is 43.80 and the control group is 26.60. The SD is 8.97, the median is 47 and mode is 50 for the experimental group whereas the SD for the control group is 6.86, the median is 28 and mode is 28. From the Figure 4, it is evident that the achievement of the students of experimental group is much higher than the control group.

Moreover, referring to Figure 3, the table value of t is 1.99, the observed t value is 7.74. The degree of freedom is 68. According to the normal probability curve, the observed t value is more than the table value of 1.99 at 0.05 level of significance where the null hypothesis stands rejected and the alternate hypothesis is accepted.

Therefore, it is proved that there is a significant difference between the achievement of the experimental and control group after the treatment in the Science.

Hypothesis H_0^3 No significant difference exists between the academic achievement of the experimental group before and after the treatment in the Science.

To analyze this hypothesis, a pretest and posttest in the academic achievement in Science was administered on the experimental group. The data was analyzed and represented in the Table 3.

Table 3: Academic Achievement (Pretest & Posttest) of the experimental group in Science

Variable (Achievement Tests)	N	Mean	Standard Deviation	Z-Scores	df	Observed T- value	Table T Value	Significant/ Non-Significant
Pre-test	40	20.83	5.17	-0.26	78	14.04	1.99	Significant
Post- test	40	43.80	8.97	0.06				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom

Figure 5: Academic Achievement (Pretest & Posttest) of the experimental group in Science

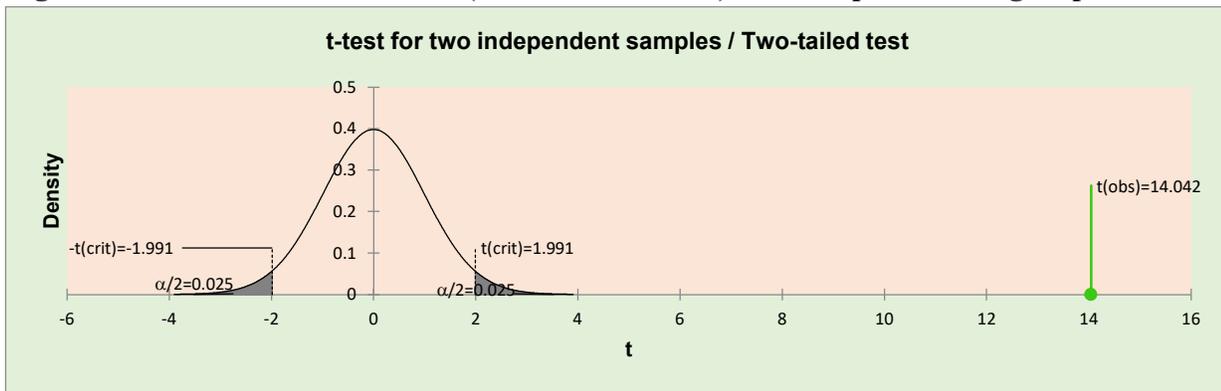


Figure 6: Academic Achievement (Pretest & Posttest) of the experimental group in Science



Interpretation:

With reference to Table 3, the mean value of the achievement of experimental group before the treatment is 43.80 and the after the treatment is 20.83. The SD is 5.17, the median is 21 and mode is 17 for the experimental group before the treatment whereas the SD after the treatment is 8.97, the median is 47 and mode is 50. From the Figure 6, it is evident that the achievement of the students of experimental group before the treatment was much lower than their achievement after the treatment was given.

Moreover, referring to Figure 5, the table value of t is 1.99, the observed t value is 14.04. The degree of freedom is 78. According to the normal probability curve, the observed t value is more than the

table value of 1.995 at 0.05 level of significance where the null hypothesis stands rejected and the alternate hypothesis is accepted.

Therefore, the alternative hypothesis that there is a significant difference in the achievement of the experimental group before and after the treatment in the Science is accepted.

Hypothesis H₀⁴

- No significant difference exists between the academic achievement of the control group before and after the treatment in science

To analyze this hypothesis, a pretest and posttest in the academic achievement in science was administered on the control group. The data was analyzed and represented in the Table 4

Table 4 Academic Achievement (Pretest & Posttest) of the control group in science

Variable (Achievement Tests)	N	Mean	Standard Deviation	Z-Scores	df	Observed T- value	Table T Value	Significant/ Non-Significant
Pre-test	30	22.74	4.48	0.0007	58	4.22	2.00	Significant
Post- test	30	29.33	7.36	9.57				

*N= Number of students, SD= Standard Deviation, df= Degree of freedom

Figure 7: Academic Achievement (Pretest & Posttest) of the control group in science

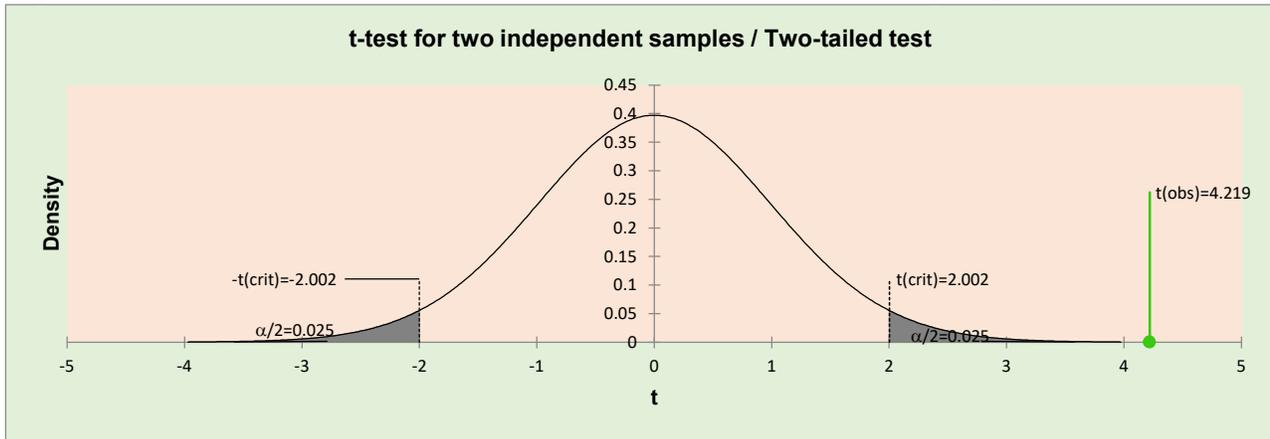
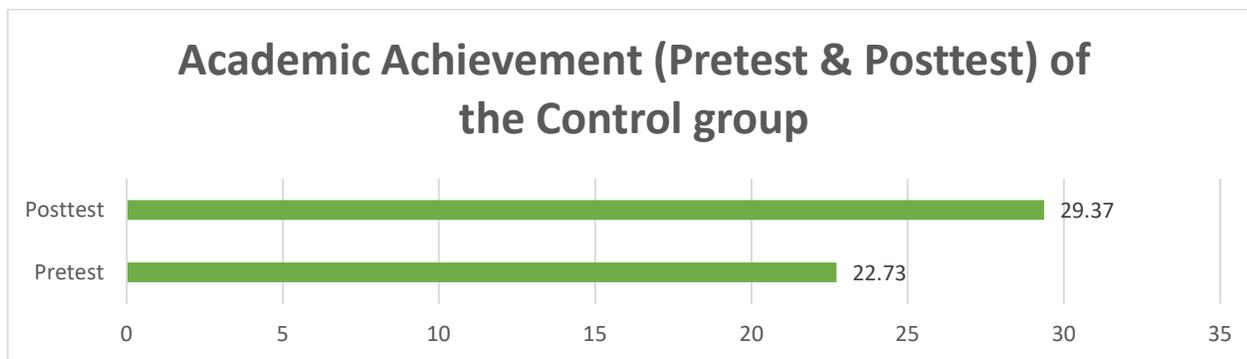


Figure 8: Academic Achievement (Pretest & Posttest) of the control group in science



Interpretation:

With reference to Table 4, the mean value of the achievement of control group before the treatment is 22.73 and the after the treatment is 29.37. The SD is 4.48, the median is 23 and mode is 23 for the control group before the treatment whereas the SD after the treatment is 7.36, the median is 28 and mode is 28. From the figure 8, it is evident that the achievement of the students of control group before the treatment is lower than their achievement after the treatment was given but not as much as the experimental group.

Moreover, referring to Figure 7, the table value of t is 2.00, the observed t value is 4.22. The degree of freedom is 58. According to the normal probability curve, the observed t value is more than the table value of 2.00 at 0.05 level of significance where the null hypothesis stands rejected and the alternate hypothesis is accepted.

Therefore, it is proved that there is a significant difference in the achievement of the control group before and after the treatment in science.

CONCLUSION

From the findings of the present study, it is evident that employing a blended learning approach in the elementary class has proved to be an effective strategy in comparison to the traditional method of teaching and learning.

Although blended learning was originally promoted to save costs and increase efficiency, it was found to enhance learning, information dissemination, creation of learners' communities and networking and to support learners in choosing the ideal content. Blended learning allows adaptive, collaborative learning and transforms the role of the teacher from a disseminator of knowledge to a facilitator. Therefore, a combination of traditional and on-line learning in particular or blended in general creates a more integrated approach for both instructors and learners.

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