

Effect of Experiential Learning on Students' Academic Achievement at Elementary Level in the Subject of General Science

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Article Info

Article History

Received:
June 13, 2021

Accepted:
January 17, 2022

Keywords :

Learning, Students,
Teachers, Curriculum
Developer, Policy
Makers

DOI:

10.5281/zenodo.5866769

Abstract

The present study was designed to explore the effect of experiential learning on students' academic achievement at elementary level in the subject of General Science. The study main objectives were to (i) find the effect of experiential learning method on students' academic achievement in the subject of General Science, (ii) to compare high achievers of experimental and control groups in General Science using experiential learning, and (iii) to compare low achievers of experimental and control groups in General Science using experiential learning. All the students of 5th grade in elementary schools were the population of the study. The students in the 5th grade of WAPDA Senior Model School Tarbela Dam Project were randomly selected as the study's sample. The research was experimental. The Equivalent Group Design with Pre-test and Post-test was employed. On the basis of researcher-made, pre-test the sample was divided into experimental and control group. Both groups were given the same training, but their learning styles were very different. For the experimental group, an experiential learning method was used for a six-week period. As data collection tool, the researcher planned pre-test, post-test, and observation sheets. The collected data was analyzed with the help of percentage, mean, median, standard deviation, t-test and ANOVA. Data analysis demonstrated that students in the experimental group perform much better in post-test than students in the control group. Experiential learning was found to be useful in the teaching of science in primary school. In the post-test, there was a significant difference in academic achievement between the experimental and control group. Experiential learning method was more effective than the traditional methods of teaching. It is therefore recommended that the experience learning method should be applied for all students to increase the academic achievement of the students. Teachers should be encouraged to apply the experiential learning approach. The curriculum should also be revised. The study will be beneficial for students, teachers, curriculum developer and policy makers.

Introduction

Teaching methods play very important role to increase the academic achievement of the students. Traditional method of teaching is being used in many educational institutions in Pakistan at elementary level. Comparatively few teachers use experiential method of teaching.

Academic achievement refers to the degree to which a student has met particular objectives set by the school, college, or university for the students' educational activities. Those with a high level of education are the most competent and successful.

Students' academic performance is also critical. Academic success has a significant impact on a student's drive and determination. Students with weak academic achievement are unlikely to be accepted into higher education institutions. Students' dropout rates are rising as a result of bad grades. As a result, academic achievement of pupils has always piqued the interest of scholars and educators (Jayanthi et al., 2014). To get good achievements, every government provides numerous facilities for students' learning and education.

Experiential education is defined as a technique of engaging learners in direct experience and personal reflection in order to improve knowledge, develop skills, clarify values, and strengthen one's potential to contribute to the local community (Association of Experiential Education, 2014; Mohan, 2016).

The use of experiential learning-based instructional materials promotes student-centered learning. As a result, students can construct their own knowledge based on their experiences during the learning process. Experiential learning is more concerned with the process than with the outcome. Students are intimately involved in the learning process. It is consistent with Geh (2014) assertion that learning becomes meaningful when someone learns from his or her own experience.

Experiential learning encourages students to think, investigate, ask questions, make decisions, and use what they've learned in their daily activities. Experiential learning-based teaching materials take a student-centered approach, based on the premise that people learn best via experience. There have been numerous attempts to increase students' student achievement. Every teacher and parent has always wished for their students and kids to attain the greatest level of success possible. Many teachers feel that in order to thrive academically, pupils must have a good attitude. In order to determine one's academic strengths, one's learning style is usually identified.

A nation's education plays a critical role in its destiny, and any attention on it is insufficient (Rakisheva et al., 2018). The country's potential and performance in a variety of disciplines are dependent on how well-informed, intelligent, and educated the general populace is, both qualitatively and quantitatively, because great and future leaders do not fall from the sky, but rather arise from these common people (Orhan & Altay, 2018).

The goal of science education should be to familiarise students with the broad outlines of major scientific concepts and the ways in which common events illustrate them, as well as their application to new situations in which they might best serve humanity. Scientific education is critical for both developed and emerging countries in encouraging technological innovation, global economic competitiveness, and economic prosperity (Perera, Bomhoff, & Lee, 2014).

Kolb, Kolb, Passarelli, and Sharma (2014) are of the view that, “experiential education is a complex relational process that involves balancing attention to the learner and to the subject matter while also balancing reflection on the deep meaning of ideas with the skill of applying them”. Hence, an experiential activity is holistic in nature. It completes a full circle where there is activity, the learner and the instructor and the focus is upon the knowledge that the learner constructs through the given activity, linking the activity to the theory that he/she learns under the guidance of an instructor.

In most Pakistani business schools, teacher-centered learning is the norm, and experiential learning is discouraged. Although varied levels of effort are being made to implement project-based learning and research-oriented tasks, there is still a need to monitor and test the efficiency of experiential learning in teaching diverse courses. There is a dearth of study on the theory's application and practicality, which has to be investigated (Javed, 2015).

Teachers design better learning because the design of learning has an effect on the progress of student achievement (Al-Agili, et al; 2012, Sa'ad, Adamu, &Sadiq, 2014). Teachers explain the subject matter with a good approach, because not good learning approaches result in less successful lessons (Ariani & Mirdad, 2016). Every instructor, on the other hand, must review his or her instructional techniques, teaching methods, and experimental procedures that he or she will use in the classroom.

Experiential learning can facilitate the learners to make a link between theory and real-world applications, motivation, and retention of learning. Learners participate in a concrete experience (do), reflect on that experience and other information (reflect), develop theories based on experiences and knowledge (think), and formulate a conclusion or solve a problem (apply). It is important to emphasize the role of experience in solving problems (Bernik & Žnidaršič, 2012).

According to Ezeagba (2014) and Mohammed (2011), the widespread use of traditional teaching methods, in which the teacher dominates the class and does not encourage students to engage in the learning process, is a major factor contributing to students' failure. Students have negative perceptions of the learning process, and their involvement in learning is typically minimal (Ayub, 2010).

Related Researches

Experiential learning theory focuses upon how individuals learn and how individuals perceive situations differently and hence react to them accordingly (Yardley, Teunissen, & Dornan, 2012). The concept of learning in the experiential learning theory is explained by Yardley, Teunissen and Dornan (2012) through the following points. Firstly, learning is considered as situated, which means that it is associated with its context in a social setting. To develop transferable learning, it is important to fully grasp the understanding of the context where the learning is to happen. Secondly, learning can either be individual or collective. They stress that even when the learning is individual; it nevertheless is derived from its context. Thirdly, the learning is triggered by ‘authentic practice based experience’ where people gain experiences in real world settings.

Yoon et al., (2013) investigated how experiential learning places such as museums might reinforce middle school students' science learning. They came to the conclusion that it is critical to strike a balance between scheduled learning and informal activities in order to improve conceptual knowledge and scientific inquiry. Field trips have also been credited with providing youngsters with meaningful learning opportunities and a sense of belonging (Aikenhead, 2001; Ferreira et al., 2012).

A study, made by Sarwar¹, Bashir, Khan, and Khan, 2009, revealed that the high achievers have better study orientation, study habits and attitude, than the low achievers. The researchers discovered that prior planning and preparation, pedagogy employed during the field trip, and relating the field trip to children's everyday experiences were all essential factors in fostering children's learning.

Sikhwari (2014) found a substantial association between motivation and academic accomplishment in a study on the relationship between motivation, self-concept, and student academic achievement. According to the findings, intrinsic motivation is positively associated to students' academic accomplishment, whereas extrinsic motivation is negatively related to their achievement. According to study conducted by Matias and Gonzalez (2017) & Arthur and Raine (2017), Experiential learning can provide a fantastic chance for students, and students will be interested in the learning process because they are provided real examples in everyday life.

The research carried out by Amir, et al (2015), proves that the learning which uses the teaching material can improve the student learning result. In addition, the research conducted by Sholihah (2016) also proves that the positive effects of experiential learning are created since it can attract and challenge someone to learning so it also creates the motivation that further will affect the learning process. The students using experiential learning-based teaching material in Mathematics in their schools tend to have the higher cognitive ability than the students that do not use experiential learning-based teaching material in mathematics in their school. To be successful in learning, especially in solving problems, students use their experiences (Fitri, 2017). They search from many viewpoints about the problem before attempting to solve it.

Syed, Abiodullah and Yousuf (2014) have concluded in their research that traditional pedagogies in Pakistan have proved unsuccessful to develop critical and creative thinking in the students.

A study conducted by Buzdar et al. (2017) determined that students' academic achievement has a favorable and significant relationship with their intrinsic and extrinsic motivation.

All these studies have addressed different aspects about academic achievement of the students taught through experiential learning method in the context of their own countries. The present study was conducted in Pakistani context.

Statement of the Problem

The study explored the effect of experiential learning on students' academic achievement at elementary level in the subject of general science. This research will be helpful for curriculum developers, researchers, teachers, and students.

Major Objectives of the Study

Major objectives of the study were the following:

- To measure the effect of experiential learning on student's academic achievement in the subject of 5th grade General Science.
- To compare high achievers of experimental and control groups in the subject of 5th grade General Science.
- To compare low achievers of experimental and control groups in 5th grade General Science.

METHOD AND PROCEDURE

Population

The study's participants were all 5th grade students of elementary schools studying the subject of General Science.

Sample

Forty students from the WAPDA Senior Model School Tarbela Dam Project, were the sample of the study.

Research Design

This research was experimental in nature. The participants were divided into two groups that were experimental group and control group. According to Farooq and Tabassum (2017) the pre-test and post-test equivalent group design was applied to measure the effectiveness of treatment. The symbolic representation of research design is as under:

$R_E = O_1$	T	O_2
$dR_E = O_2 - O_1$		
$D = dR_E - dR_C$		

Where

- R_E = Randomly Selected Experimental Group
- R_C = Randomly Selected Control Group
- O_1 & O_3 = observation of pre test
- O_2 & O_4 = observation of Post-tests
- T = Treatment (teaching by experiential learning method)
- d = difference between mean scores of Pre-test and Post-test

Tools of Research

Data was gathered through pre-test and post-test.

The researcher herself developed pre-test and post-test from 5th grade general science text book. Both tests were developed on the basis of the cognitive domain.

Treatment

Two teachers with similar experience and qualifications were deputed, one for the experimental group and the other for the control group. Four lessons from the General Science 5th grade book were taught to sample students.

Both the groups were taught for six weeks. Lesson plans were prepared separately for both experimental and control group. The experimental group was taught with the help of experiential learning method. The researcher observed by the control group was treated using traditional lecture method. Both groups were taught the same course content. All sample students were given a post-test at the end of the six-week teaching.

Procedure

Two sets of lesson plans both for experiment and control group were developed by the researcher. In a week five lessons were taught to both the experimental and control group. The experiment lasted for six weeks. Overall 40 lesson plans were planned and delivered to both experimental and control groups. In experimental group both teacher and students used the experiential learning methodology in all of their activities. The students' activities were carried out with the assistance of the teacher. In fact, the teacher was promoting instructional approaches and practices that encourage students to engage in hands-on learning. The teacher of the experimental group used experiential learning style at various stages throughout the educational process. While the control group teacher used lecture method of teaching.

Data Collection

Before the treatment a teacher made pre-test was conducted to divide the sample students into experimental and control group. After the treatment of six weeks the post test was conducted for both the groups. All pre and post tests contained 50 items having four options A to D. Each student scores were categorized on the basis of their level of achievement.

Analysis of Data

The collected data was analyzed with the help of percentage, mean, median, standard deviation, t-test and ANOVA. Overall performance of both the groups was measured by calculating mean scores. The significance difference in pre-test and post-test was determined by applying t-test. For calculating the difference of four groups for high and low achievers, ANOVA was applied.

RESULTS AND DISCUSSION

Pre-test Scores

Table 1: Frequency distribution of Pretest scores of experimental and control groups

Class Intervals	Frequencies of Experimental group	Frequencies of Control group
3—5	4	2
6—8	4	6
9—11	6	6
12—14	5	4
15—17	1	2
18—20	0	0
21—23	0	0
24—26	0	0
Total	20	20
Mean	9.10	9.50

Table 1 shows that mean value of both the groups were almost equal and frequencies were normally distributed. The ranges of the pre-test scores were from 3 to 26 of experimental and control groups which shows groups equivalently before treatment. The pre-test score of the experimental and control groups are shown graphically (Fig.1).

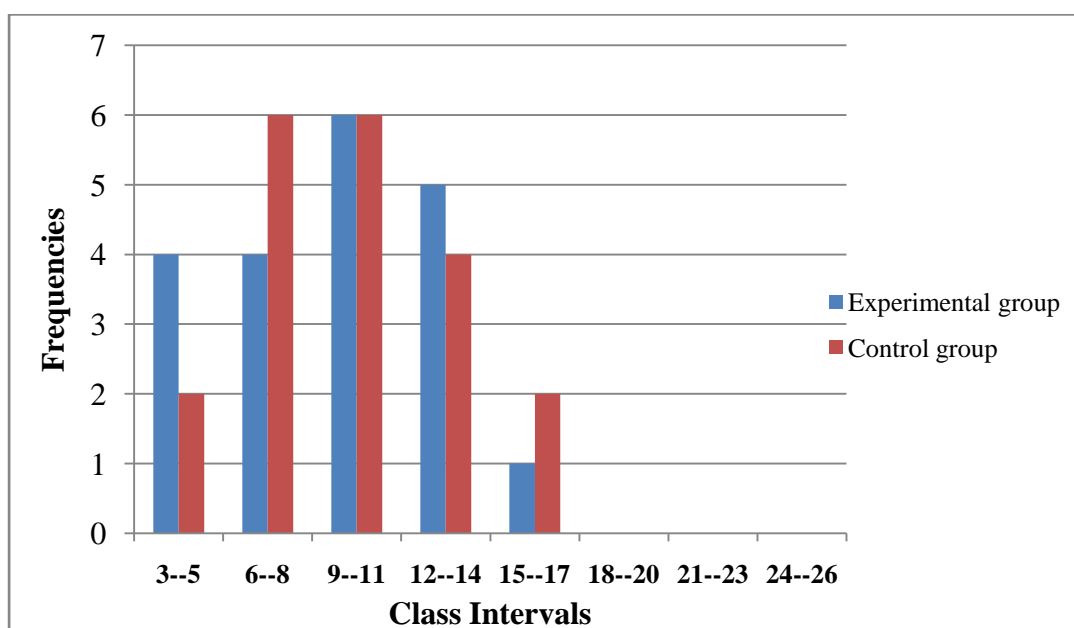


Fig.1. Frequency distribution of pretest score

Ho₁: There is no significant difference between the mean score of experimental and control groups using experiential learning

Table 2. t-test results and difference in mean scores of pretest between experimental and control groups

Groups	N	Mean	SD	SE _D	t value
Experimental	20	9.10	3.417	1.081	0.370
Control	20	9.50	3.426		

df = 38 Table value at 0.05 level = 2.042

Table 2 indicates that there was statistically no significant difference between the pre-test scores of both the groups of the students' achievement in general science. The critical value (0.370) was less than the table value at 0.05 levels which supported the null hypothesis. On the basis of pre-test results, mean and SD shows that both the experimental and control groups were equivalent before treatment.

Table 3: Frequency distribution of high achievers of experimental and control groups in pre-test

Class Intervals	Frequencies of Experimental group	Frequencies of Control group
8—10	3	4
11—13	5	6
14—16	2	2
17—19	0	0
20—22	0	0
23—25	0	0
Total	10	10
Mean	11.90	11.83

Table 3 shows that mean value of both the groups were almost equal and frequencies were normally distributed. The ranges of the pre-test scores were from 8 to 25 of experimental and control groups which shows their equivalently before treatment. The pre-test score of the experimental and control groups are shown graphically in the given figure.

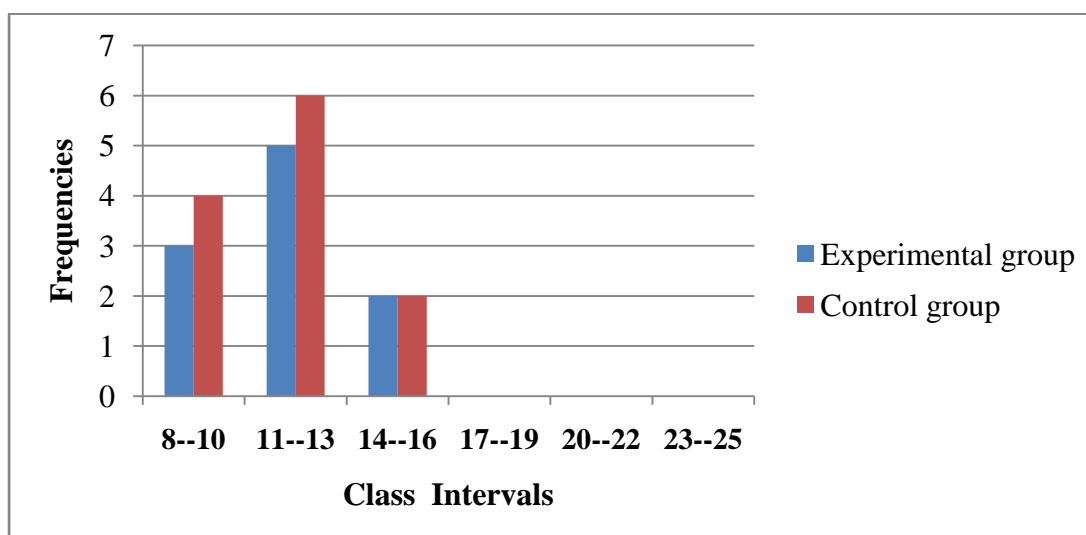


Fig.3. Frequency distribution of pretest score (high achievers)

Ho₁: There is no significant difference between the mean score of experimental and control groups using experiential learning

Table 4. t-test results and difference in mean scores of high achievers of pretest between experimental and control groups

Groups	N	Mean	SD	SE _D	t value
Experimental	10	11.90	1.729	0.80	0.083
Control	12	11.83	1.992		

df = 20 Table value at 0.05 level = 2.086

Table 4 indicates that there was statistically no significant difference between the pre-test scores of both the groups of the students' achievement in general science and critical value (0.083) was less than the table value at 0.05 levels which supported the null hypothesis. On the basis of pre-test results, mean and SD shows that both the experimental and control groups were equivalent before treatment.

Table 5: Frequency distribution of low achievers of experimental and control groups

Class Intervals	Frequencies of Experimental group	Frequencies of Control group
2--4	2	1
5--7	5	6
8--10	3	1
11--13	0	0
14--16	0	0
17--19	0	0
Total	10	08
Mean	6.30	6.00

Table 5 shows that mean value of both the groups were almost equal and frequencies were normally distributed. The ranges of the pre-test scores were from 2 to 19 of experimental and control groups which shows equivalent before treatment. The pre-test score of the experimental and control groups are shown graphically in the following figure.

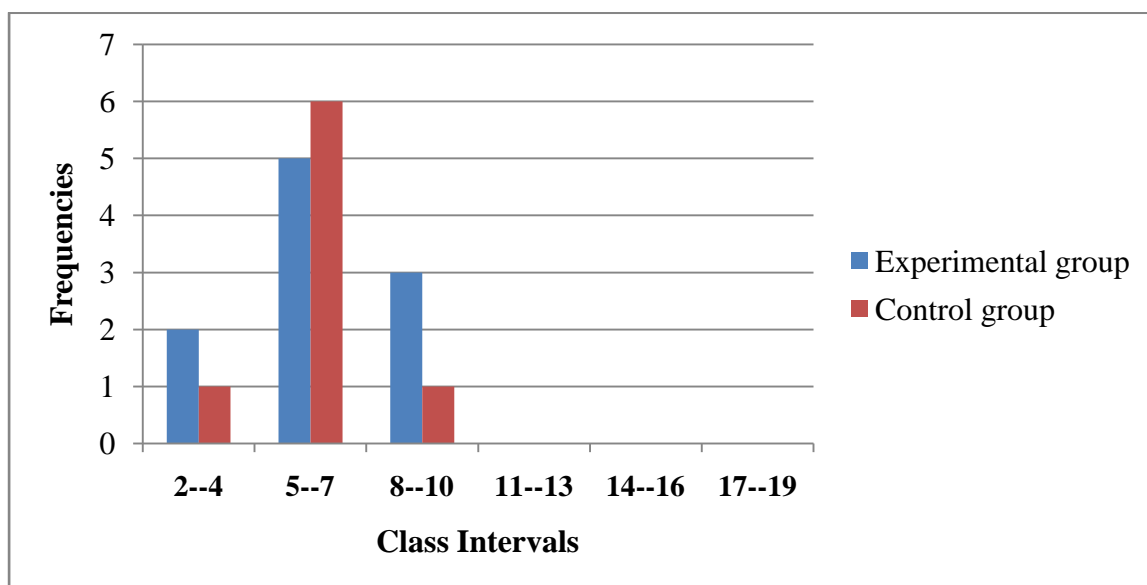


Fig.5. Frequency distribution of pretest score (low achievers)

Ho₁: There is no significant difference between the mean score of experimental and control groups using experiential learning

Table 6. t-test results and difference in mean scores of low achievers of pretest between experimental and control groups

Groups	N	Mean	SD	SE _D	t value
Experimental	10	6.30	2.057	0.872	0.344
Control	08	6.00	1.510		

df = 16 Table value at 0.05 level = 2.12

Table 6 indicates that there was statistically no significant difference between the pre-test scores of both the groups of the students' achievement in general science and critical value (0.344) was less than the table value (2.12) at 0.05 levels which supported the null hypothesis. On the basis of pre-test results, mean and SD shows that both the experimental and control groups were equivalent before treatment.

Interpretation of Post-Test Scores

Table 7: Frequency distribution of post-test scores of experimental and control groups

Class Intervals	Frequencies of Experimental group	Frequencies of Control group
3--5	0	3
6--8	2	2
9--11	4	4
12--14	2	2
15--17	1	5
18--20	4	3
21--23	3	0
24--26	4	1
Total	20	20
Mean	16.85	12.50

Table 7 shows the frequency distribution of post-test scores. The mean value of experimental group was higher than the mean value of control group. The ranges of the post-test scores started from 3 to 26 of experimental and control groups which showed mean difference among both the groups. The mean value of experimental group was 16.85 while the mean value of control group was 12.50. It shows that the performance of experimental group in post-test was much better than control group. The post-test scores of experimental and control groups are shown graphically in the following figure.

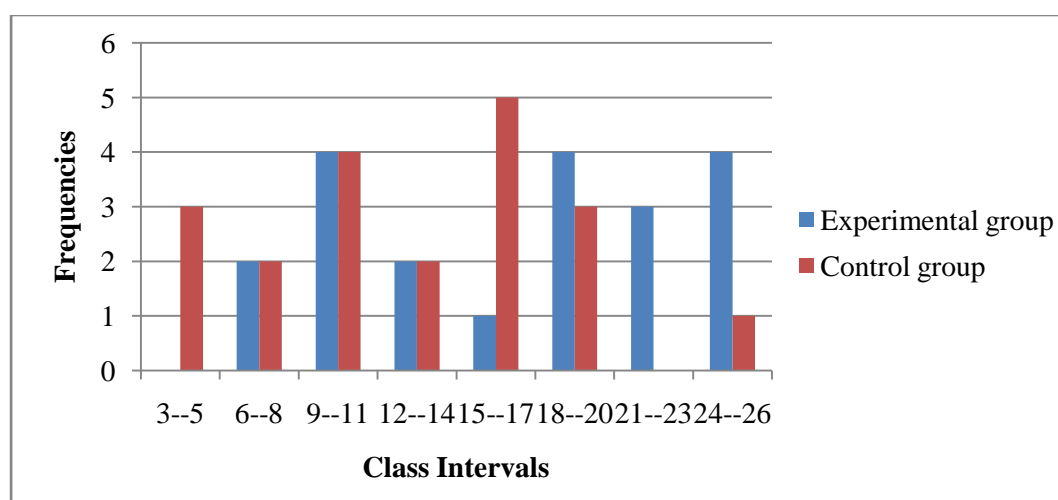


Fig.7. Frequency distribution of post-test score

Ho₁: There is no significant difference between the mean score of experimental and control groups using experiential learning

Table 8. t-test results and difference in mean scores of post-test scores of experimental and control groups

Groups	N	Mean	SD	SE _D	t value
Experimental	20	16.85	6.277	1.852	2.349
Control	20	12.50	5.405		

df = 38 Table value at 0.05 level = 2.042

Table 8 indicates that there was statistically significant difference between the post-test scores of experimental and control groups of the students' achievement in general science. The calculated t-value (2.349) was greater than the table value at 0.05 level which rejected the null hypothesis. On the basis of post-test results, mean and SD showed the significant difference between experimental and control groups. The table value shows that the experiential learning is significantly better than traditional learning.

Table 9: Frequency distribution of high achievers (post-test scores) of experimental and control groups

Class Intervals	Frequencies of Experimental group	Frequencies of Control group
8—10	0	0
11—13	0	1
14—16	0	4
17—19	3	4
20—22	3	0
23—25	5	1
Total	11	09
Mean	21.82	17.00

Table 9 illustrates the frequencies of post-test scores in which the mean value of the experimental group's high achievers was greater than the mean value of the control group's high achievers. The post-test scores of high achievers ranged from 8 to 25 in both the experimental and control groups, indicating a difference in mean value between the two groups. It refers to the pupils' performance after being taught through experiential learning. The experimental and control groups' post-test scores are graphically depicted in the figure below.

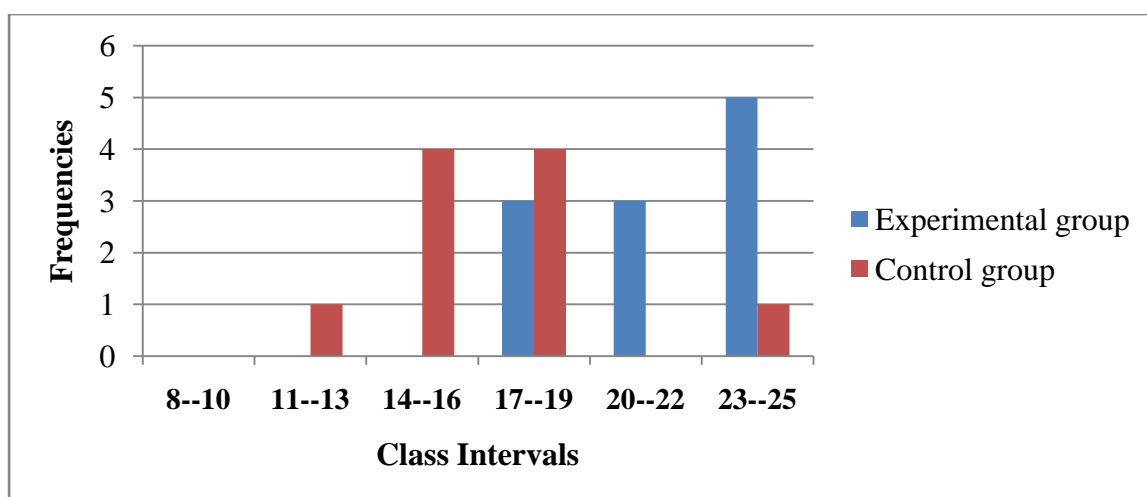


Fig.9. Frequency distribution of post-test scores of high achievers

Ho₂: There is no significant difference between the mean scores(high achievers) of experimental and control groups using experiential learning

Table 10.t-test results and difference in mean scores of high achievers of post-test between experimental and control groups

Groups	N	Mean	SD	SE _D	t value
Experimental	10	21.82	6.277	1.270	3.781
Control	12	17.00	5.404		

df = 19 Table value at 0.05 level = 2.093

Table 10 indicates that there was statistically significant difference in post-test scores of high achievers of experimental group and control group of the students' achievement in general science. The calculated t-value (3.781) was greater than the table value 2.093 at 0.05 levels which rejected the null hypothesis. On the basis of post-test results, mean and SD showed the significant difference in experimental and control groups. It means that the performance of experimental group was better than control group. The mean and SD of post-test scores are shown graphically in the Fig.10 below.

Table 11: Frequency distribution of low achievers (post-test scores) of experimental and control groups

Class Intervals	Frequencies of Experimental group	Frequencies of Control group
2--4	0	1
5--7	1	3
8--10	3	4
11--13	3	2
14--16	2	0
17--19	0	0
Total	09	10
Mean	10.78	8.00

Table 11 shows the frequencies of post-test scores that mean value of low achievers of experiment group was higher than low achievers of control group. The ranges of the post-test scores were from 2 to 19 of experimental and control groups which showed difference in mean value of both the groups. It means that the performance of experimental group was much better than the control group. The post-test score of low achievers of the experimental and control groups are shown graphically in the figure 11.

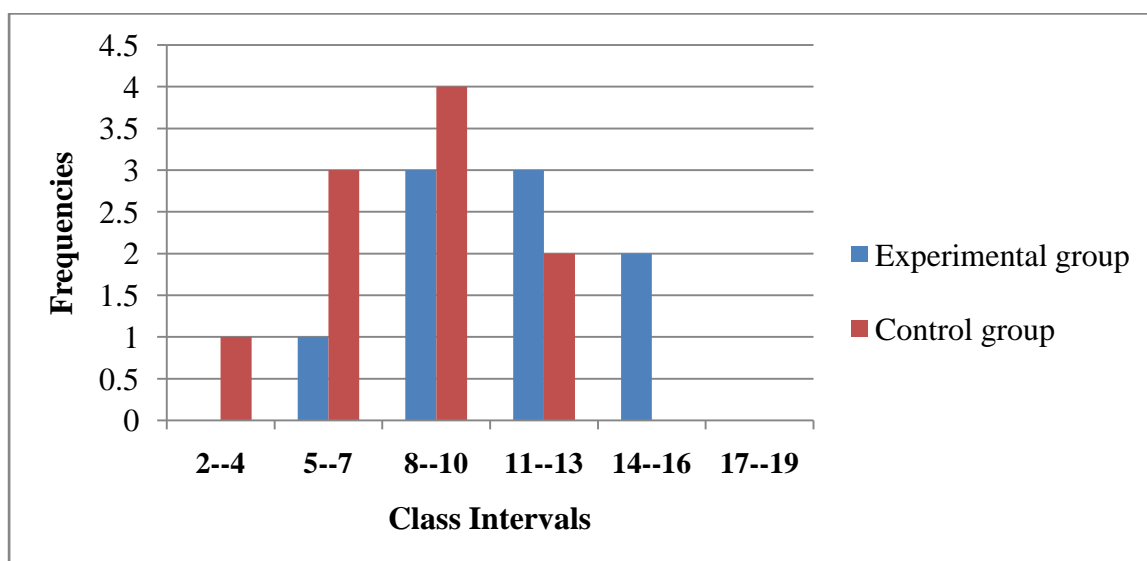


Fig.11. Frequency distribution of post-test scores of low achievers

Ho₃: There is no significant difference between the mean scores(low achievers) of experimental and control groups using experiential learning

On the basis of findings of the study, following conclusions were drawn:

- There were statistically no differences between the pre-test scores of both the groups. Both the groups were identical before the treatment. The scores of high achievers of experimental and control groups showed almost equal performance in pre-test. Likewise regarding low achievers, there was statistically no significance difference between the pre-test scores of both the groups in the subject of general science.
- In post-test the mean value of scores of experimental group was much better than the control groups. There was a significance difference between the scores of experimental and control group in post-test. It showed that the experiential learning was much better than the traditional learning. Similarly there was statistically significant difference for high achiever and low achievers of experimental and control group. The performance of high and low achievers of experimental group was much better than the control group.

Recommendations

The study showed that the academic performance of the students taught through experiential method of teacher was much better than the academic performance of the students taught through traditional methods of teaching. High achievers and low achievers of experimental group showed better performance than control group. It is therefore, recommended that traditional method of teaching should be switch off to experiential method of teaching. In this way performance of maximum students can be increased. For practical implementation of experiential method of teaching, it is recommended that necessary infrastructure should be provided by the management of the school. The curriculum should also be changed keeping in view the experiential method of teaching. Teachers should be provided necessary training to use experiential teaching method. In this the academic performance of high achievers and low achievers will be increased.

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