ACADEMIA International Journal for Social Sciences
Volume 4, Issue 3, 2025 ISSN-L (Online): 3006-6638

Effect of Activity Based Method on Students Academic Achievements in General Science at Elementary Level

Arsalan Qayyum
Arslan.qayyum.786@gmail.com
M.Phil Scholar, Department of Education and Research Muslim Youth University Islamabad

Dr. Safdar Hussain
Safdar.hussain@myu.edu.pk
Assistant Professor, Department of Education and Research Muslim Youth University Islamabad.

Babar Ishtiaq
babarishtiaqmyu@gmail.com
M.Phil Scholar, Department of Education and Research Muslim Youth University Islamabad

Corresponding Author: Arsalan Qayyum Arslan.qayyum.786@gmail.com

Received: 27-08-2025 **Revised:** 18-09-2025 **Accepted:** 30-09-2025 **Published:** 18-10-2025

ABSTRACT

The purpose of this study was to investigate the effect of the Activity Based Teaching Method on the academic achievement of elementary school students in General Science. Activity based learning focuses on engaging students through hands on experiments, inquiry based activities, and collaborative tasks that promote active participation in the learning process. A quasi experimental design was used, comprising an experimental group taught using activity based instruction and a control group taught through conventional lecture based methods. The study involved 60 Grade 7th students. A science achievement test was administered before and after the intervention to assess changes in students' academic performance. The theoretical foundation of the study was based on constructivist learning theory, which posits that scientific knowledge is constructed through active exploration and interaction with the environment. The results demonstrated that students exposed to activity based learning showed significantly greater improvement in posttest scores than those taught using traditional methods. These findings suggest that activity based instruction is an effective approach for enhancing conceptual understanding and academic achievement in General Science. The study recommends incorporating activity based teaching strategies into elementary science curricula to foster meaningful learning and improved educational outcomes.

Keywords: *Activity Based Learning, , Academic Achievement, Elementary Education, Experimental Study, Student Engagement. Constructivist Learning, Pakistan*

INTRODUCTION

Education plays a vital role in transforming individuals and society, and effective teaching strategies at the elementary level are essential for improving students' academic achievement. In science education, traditional lecture based and rote learning approaches have long been used in classrooms; however, these methods often fail to develop students' critical thinking, inquiry skills, and conceptual understanding. Passive learning environments limit students' opportunities to explore scientific ideas actively and apply them to real life situations.

Activity based learning (ABL) has emerged as an effective alternative instructional approach, particularly in science education. This method emphasizes hands on experiments, group discussions, problem solving activities, and real world applications, enabling students to actively participate in the learning process.

According to Gupta (2023), traditional methods are less effective in fostering higher order thinking skills, whereas activity based strategies enhance engagement and understanding through active involvement. Science, as an inquiry driven subject, benefits significantly from experiential learning, where students observe, experiment, and construct knowledge through direct experience.

Empirical studies support the effectiveness of activity based learning in improving science achievement. Albalawi and Al Harbi (2017) reported that students taught using activity based strategies demonstrated significantly higher performance in science compared to those taught through traditional methods. Additionally, activity based learning aligns with constructivist learning theory, which emphasizes active knowledge construction through interaction and experience (Tadesse & Gillies, 2015). Beyond academic gains, ABL also promotes problem solving skills, collaboration, creativity, and student motivation.

Despite substantial international evidence, limited research has examined the impact of activity based learning in government elementary schools in Rawalpindi, particularly at the Grade 7 level. Therefore, this study investigates the effect of activity based teaching methods on the academic achievement of Grade 7 science students at Government Boys' Elementary School Dadhar Najjar, Rawalpindi. The findings aim to provide context specific evidence to support improved science teaching practices in government school settings.

Meaning of Activity

An activity refers to purposeful engagement involving physical, mental, or social action. In educational contexts, it is understood as:

- A state of being actively involved in a task or process.
- A specific action or set of behaviors performed by an individual or group.
- A structured task that requires learners' direct participation and engagement.
- An experiential learning task designed to promote understanding through doing rather than passive reception.
- A meaningful pursuit in which learners actively construct knowledge through interaction with materials, peers, or real life situations.

Meaning of Activity Based Teaching

Activity Based Teaching (ABT) is an instructional approach in which learning occurs through purposeful activities rather than through lectures alone. It emphasizes:

- The use of structured learning activities to facilitate understanding and skill development.
- Learning through and from activities that involve direct student participation.
- The integration of hands on tasks, experiments, discussions, and problem solving exercises as the foundation of instruction.

- A learner centered process where activities serve as the primary medium for concept acquisition and application.

According to Pakistan Social Sciences Review (PSSR, 2022), activity based learning involves the deliberate incorporation of activities by teachers to enhance student engagement and promote meaningful learning outcomes. In this approach, activities function as the central framework upon which learning is built.

Historical Background of Activity Based Teaching

The origins of Activity Based Teaching can be traced back to educational reforms during the mid 20th century, particularly around the period of World War II, when traditional rote based instruction began to be questioned. David Horsburgh is widely recognized as a pioneer of the activity based education system. He established the Neel Bagh School in Kolar, India, which implemented an innovative curriculum integrating academic subjects with practical activities such as music, carpentry, sewing, and gardening.

In this model, teaching materials were carefully designed and systematically organized around diverse learning activities to promote holistic development. Horsburgh's work laid the foundation for learner centered and experiential pedagogies, emphasizing that students learn more effectively when actively involved in meaningful tasks rather than passively receiving information.

Statement of Problem

Teaching methodology plays a crucial role in shaping students' understanding of scientific concepts, particularly at the elementary level where learners exhibit natural curiosity and a strong desire to explore their environment. General Science is best learned through inquiry, experimentation, and direct interaction with scientific phenomena. Research suggests that science instruction becomes more effective when students actively engage in hands on experiments and reflective thinking processes rather than relying solely on passive listening (Tadesse & Gillies, 2015).

Despite strong evidence supporting activity based approaches, science teaching in many elementary schools continues to rely heavily on traditional lecture based methods. Such methods often limit students' opportunities for exploration, inquiry, and meaningful concept formation. As a result, students may struggle to develop scientific reasoning, conceptual clarity, and long term retention of knowledge.

Objectives of the Study

The objectives of study were:

1. To examine the effect of Traditional method on academic achievement in the subject of General Science.

2. To examine the effect of Activity based method on students academic achievement in the subject of General Science.

3. To compare the traditional and Activity based method in subject of General Science.

Research Questions of the Study

The research questions of the study were:

- What is the effect of the traditional teaching method on the academic achievement of 7th grade students in General Science?
- What is the effect of the activity based method on the academic achievement of 7th grade students in General Science?
- How does the academic performance of students taught with activity based method compare to those taught with traditional methods in General Science?

Hypotheses of the Study

The hypotheses of the study were:

- Ho1. There is no significant effect of traditional method on students academic achievement in general science.
- Ho2. There is no significant effect of activity based method on students academic achievement in general science.
- Ho5. There is no significant difference in General Science achievement between traditional and activity based methods.

Significance of the Study

The quality of science education plays a vital role in developing students' scientific thinking, inquiry skills, and understanding of real world phenomena. Traditional lecture based teaching methods often limit students' active participation and fail to promote higher order cognitive skills. Activity Based Learning offers an effective alternative by engaging students in hands on experiments, inquiry based tasks, and collaborative learning experiences.

This study is significant as it provides empirical evidence on the effectiveness of Activity Based Learning in improving the academic achievement of Grade 7 students in General Science within Pakistani government schools, where limited research exists. By incorporating Bloom's Taxonomy, the study highlights how structured activities can enhance students' cognitive development from basic knowledge acquisition to analysis and evaluation. The findings are expected to support science teachers, curriculum developers, and policymakers in adopting student centered instructional strategies that promote deeper understanding, retention, and scientific reasoning in elementary classrooms.

LITERATURE REVIEW

Activity Based Learning and Academic Achievement in Science

Activity based learning (ABL) has gained increasing attention as an effective instructional strategy in science education due to its emphasis on active participation, inquiry, and experiential engagement. Traditional lecture based methods, though widely used, often position students as passive recipients of information, limiting the development of higher order thinking and conceptual understanding. In contrast, ABL encourages students to engage directly with scientific phenomena through experiments, problem solving tasks, and collaborative learning activities.

Empirical studies consistently demonstrate the positive impact of activity based approaches on students' academic achievement in science. Gupta (2023) found that activity based instruction significantly improved students' problem solving abilities and conceptual understanding compared to traditional methods. Similarly, Samanta (2016) reported higher achievement in physical science among secondary school students taught using activity based methods than those taught through lectures. These findings emphasize the importance of experiential engagement in science learning.

Several studies conducted in Pakistan further support the effectiveness of ABL in science classrooms. Rana, Mehmood, and Hussain (2023) examined Grade 7 students' achievement in general science and reported significantly higher post test scores for students taught using activity based methods. Qamar et al. (2022) found that ABL enhanced students' performance across all cognitive domains of Bloom's taxonomy, highlighting its role in developing higher order thinking skills. Choudhary and Khushnood (2021) also demonstrated that activity based approaches at the primary level led to superior learning outcomes compared to traditional instruction.

International research reinforces these findings. Hussain et al. (2011) and Rashid (2020) reported that peer group and activity based learning significantly improved physics achievement and higher order skills. Odutuyi (2019) and Green (2024) found that students exposed to activity based instruction in basic science outperformed those taught through expository methods, regardless of gender differences. These studies collectively suggest that ABL fosters deeper understanding, motivation, and retention in science learning.

Theoretical Foundations Supporting Activity Based Science Learning

The effectiveness of activity based science instruction is strongly grounded in constructivist learning theory. Piaget's cognitive constructivism emphasizes learning through interaction with the environment, while Vygotsky's social constructivism highlights the role of collaboration and guided learning within the Zone of Proximal Development. Activity based science learning aligns with these principles by allowing students to explore, experiment, and construct knowledge through hands on and collaborative activities.

Experiential learning theory, proposed by Kolb (1984), further supports activity based science instruction. The experiential learning cycle—concrete experience, reflective observation, abstract conceptualization, and active experimentation—mirrors the structure of science activities such as laboratory experiments and real life simulations. Research indicates that experiential approaches enhance retention, conceptual clarity, and scientific reasoning, particularly among middle school students.

Behaviorist principles also contribute to activity based science learning by reinforcing correct responses through feedback and repetition. Structured activities, quizzes, and interactive tasks provide immediate reinforcement, supporting skill mastery. However, behaviorism alone is insufficient for promoting conceptual understanding, highlighting the need for an integrated theoretical approach.

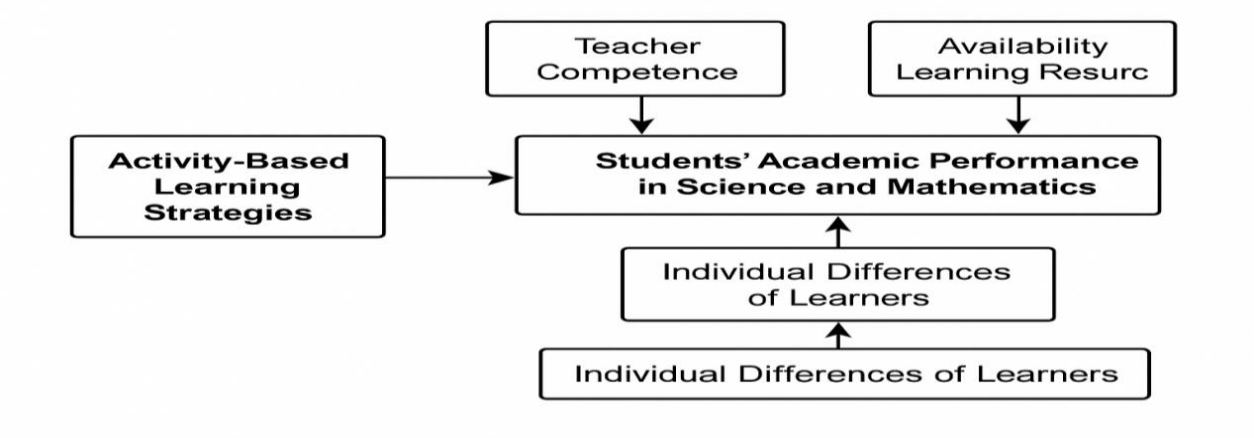

Fig 2.1: Conceptual framework of Activity based Learning

Research Gaps

Despite extensive evidence supporting activity based science instruction, limited research has focused on government elementary schools in Rawalpindi, particularly at the Grade 7 level. Moreover, few studies examine both academic achievement and contextual implementation challenges within public school settings. Addressing this gap, the present study investigates the effect of activity based learning on Grade 7 students' science achievement in a government school context, contributing localized empirical evidence to the existing literature.

RESEARCH METHODOLOGY

Research Design

This study followed a quantitative experimental research design with a pretest–posttest equivalent groups model to investigate the effect of the Activity Based Method on students' academic achievement in General Science.

Population and Sampling

The population comprised Grade 7 students studying in government elementary schools of District Rawalpindi. Government Boys Elementary School Dadhar Najjar was randomly selected, and 60 students were included as the sample.

Using matched pair sampling, students were paired according to their pretest science scores and randomly assigned to experimental (n = 30) and control (n = 30) groups.

Research Instrument

A researcher developed, MCQs based General Science achievement test was used as both pretest and posttest and was validated by subject experts.

The intervention lasted eight weeks. The experimental group was taught selected science units Waves and Energy, Heat and Temperature, Technology in Everyday Life, and Earth and Space through activity based

instruction, while the control group was taught using traditional methods. An independent samples t test was applied to analyze posttest scores and determine the impact of the Activity Based Method.

DATA ANALYSIS

This section presents the analysis of data collected to examine the effect of the Activity Based Teaching Method on students' academic achievement in General Science. Pretest and posttest scores of the experimental and control groups were analyzed using an independent samples t test to determine whether statistically significant differences existed between the two groups after the intervention. The analysis aimed to assess the effectiveness of activity based instruction in improving students' science achievement at the elementary level.

Table 1: Demographic profile of Teacher

Variable	Details
Gender	Male
Subject Taught	General Science
Academic Qualification	M.Sc Physics
Professional Qualification	M.Ed
Teaching Experience	Eight Years
Institution Type	Public
Location	Rawalpindi

Table 1 shows the background details of the teacher participating in the study. A male teacher from the elementary school teaches Science and Mathematics which are the relevant subjects for the research. He has earned an M.Sc in Physics, demonstrating knowledge in his field and an M.Ed which means he is trained in teaching methods. The experience of the teacher with teaching for 8 years probable means they are well skilled in instruction and classroom control. He teaches at a public school in a rural area which may change the teaching learning process because of things like fewer resources or student diversity. This profile is important for understanding why and how activity based learning is used in the research.

Table 2: Demographic profile of Students

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	60	100
Location	Rural	60	100
Age Group	11–13 Years	35	58.3
	14–16 Years	25	41.7
Grade Level	Grade 7	60	100
School Type	Public	60	100
Socioeconomic Status	Low Income	42	70
	Middle Income	18	30
	High Income	0	0

Table 2 Shows a summary of the demographics of the participating students. Every student, (all 60) is male and they all come from rural regions, so the sample is diverse only in terms of age. The age group with the highest number of students (58.3%) is 11 to 13 years and the second group, making up 41.7%, is from 14 to 16 years old. Every student in the study is enrolled in Grade 7 so that the focus can be followed. The

students are assigned an ordinary public school which shows another aspect of uniformity. From a socioeconomic perspective, about 70% of the students come from low income families and the rest (30%) are from middle income households; none are from high income families. It gives valuable information about the group being taught and supports understanding of what affects their reactions to and results from learning activities.

Table 3: Independent sample T test Comparing pretest Academic Achievement in General Science (N=60)

Group	N	Mean (M)	Standard Deviation (SD)	t value	p value
Experimental	30	42.86	19.44	0.594	0.056
Control	30	45.83	19.22	—	—

P > 0.05

Table 3 shows the result of the independent samples T test comparing the pretest academic achievement scores in Science between the both groups show no significant difference. The control group had a mean score of 45.83 (SD = 19.22) and the experimental group had a mean score of 42.86 (SD = 19.44). The t value was 0.594, and the p value was 0.56, which is much higher than significance level of 0.05. Based on the mean scores and t value, it was discovered that there is no significant difference between control and experimental group on pretest so the null hypothesis is accepted.

Table 4: Independent sample T test Comparing posttest Academic Achievement in General Science (N=60)

Group	N	Mean (M)	Standard Deviation (SD)	t value	p value
Experimental	30	64.56	12.62	5.70	0.000
Control	30	45.20	13.66	—	—

P <0.05

Table 4 displays the results of an independent samples T test comparing the posttest academic achievement scores between the experimental and control groups, revealing a significant difference. The experimental group had a mean score of 64.56 (SD = 12.62), while the control group had a mean score of 45.20 (SD = 13.66). This significant difference is further supported by a t value of 3.88 and a p value of .000. So, the null hypothesis, which states, "There is no significant difference between the students' academic achievement of experimental and control groups on posttest in General Science,"is rejected.

Table 5:Paired sample T test on Students' Academic Achievement of Experimental Group in General Science (N=60)

Experimental Group	N	Mean (M)	Standard Deviation (SD)	t value	p value
Pretest	30	42.87	19.45	5.48	0.000
Posttest	30	64.57	13.66	—	—

P < 0.05

Table 5 reveals the outcomes of the paired samples T test comparing the pretest and posttest mean scores of the experimental group in General Science subject. The calculated t value is 5.48 and p value is 0.000 , with the experimental group scoring a mean of 42.87 on the pretest and 64.57 on the posttest. The T test results indicate that the students' performance levels in the experimental group significantly improved from the pretest to the posttest. The substantial difference in posttest scores compared to pretest scores highlights

this improvement. Additionally, the p value which is 0.000 confirms a significant difference in the achievement levels of the experimental group between the pretest and posttest. This demonstrates the positive effect of the experimental intervention.

Table 6:Paired sample T test on Students' Academic Achievement of Control Group in General Science (N=60)

Control Group	N	Mean (M)	Standard Deviation (SD)	t value	p value
Pretest	30	45.83	19.22	0.23	0.82
Posttest	30	45.20	12.61	—	—

P > 0.05

Table 4.6 display a detailed comparison of the control group's academic performance in General Science subject before and after the implementation of the traditional teaching method. Specifically, the activity based learning highlights the mean scores on a pretest and a posttest, which serve as indicators of academic achievement over the period of study. The activity based learning results show the control group's pretest and posttest mean scores was 45.833 (SD = 19.22) on the pretest to 45.20 (SD = 12.61) on the posttest. The t value of 0.23 and the p value of 0.82 indicate that the improvement in scores is not statistically significant. Therefore, the traditional teaching method did not result in a noteworthy change in the academic achievement of the control group.

FINDINGS

1. The pretest of Science Subject in which values of the both groups were not significantly different, with mean scores of 45.83 of Control group and 42.86 of experimental group , respectively, and a p value of 0.56 . This shows that both groups started at a similar academic level, allowing for a fair comparison in the study.

2. The posttest of Science Subject in which values among the experimental group (mean = 64.56) and the control group (mean = 45.20). The p value of 0.000 confirms this difference is statistically significant, showing the positive effect of Activity based method on students' academic achievement.

3. There is a significant improvement in the experimental group's scores in Science from the pretest (mean = 42.87) to the posttest (mean = 64.57), with a p value of 0.000. This suggests that the Activity based intervention significantly boosted students' academic achievement.

4. The control group's scores increased from the pretest (mean = 42.83) to the posttest (mean = 45.20), this improvement was not statistically significant (p value = 0.82). Thus, traditional teaching methods did not significantly enhance students' academic achievement.

CONCLUSION

The results of the study reveal that students in both the experimental and control groups initially possessed similar levels of academic achievement in General Science. Following the intervention, a noticeable improvement was observed among students taught using the Activity Based Teaching Method, while the control group exhibited comparatively minimal gains.

The findings demonstrate that activity based instruction significantly enhances students' academic achievement in General Science. The interactive and participatory nature of the method increased student engagement, facilitated conceptual understanding, and improved retention of scientific concepts. By involving students in experiments, discussions, and hands on learning experiences, activity based teaching enabled learners to develop a deeper and more meaningful understanding of scientific phenomena.

The study concludes that Activity Based Teaching is an effective instructional strategy for science education and supports its implementation in classroom practice. Teachers and curriculum developers are encouraged to incorporate activity based approaches to create dynamic learning environments that foster curiosity, understanding, and improved academic performance in General Science.

RECOMMENDATIONS

In light of the study's findings, the following recommendations are suggested for science educators, school administrators, and educational policymakers:

Strengthen Professional Training for Science Teachers

Regular training workshops should be conducted to help science teachers effectively implement activity based teaching strategies, including conducting experiments, guiding inquiry based discussions, and managing collaborative scientific investigations.

Provide Adequate Scientific Resources and Facilities

Classrooms and laboratories should be equipped with essential science kits, laboratory apparatus, models, charts, and digital resources to facilitate hands on and experimental learning. Schools should allocate sufficient funds to support such instructional needs.

Foster a Constructivist Learning Environment in Science

Science instruction should emphasize inquiry, exploration, and experimentation. Teachers should encourage students to investigate scientific phenomena, engage in group work, and apply scientific concepts to real life situations.

Adopt Differentiated and Multiple Intelligence Based Instruction

Science teachers should consider students' diverse learning preferences and design activities that support visual, auditory, kinesthetic, and interpersonal learners.

Promote Further Research and Policy Support

Future research should examine the long term impact of activity based learning on scientific understanding and retention, its application in other subject areas, and the integration of technology supported activity based resources. At the policy level, education authorities should develop frameworks that encourage and support the implementation of learner centered, evidence based teaching approaches such as activity based learning.

REFERENCES

Albalawi, S. S., & Al Harbi, A. M. (2017). The impact of activity based learning on science achievement in elementary school students. Journal of Education and Learning, 6(3), 54–62.

Ali, A. (2021). Experiential learning and its implications in science and mathematics classrooms. Journal of Science Education, 10(2), 77–89.

Ali, S., & Javed, M. (2022). Role of home support in student academic success in science and mathematics. Pakistan Journal of Social Sciences, 42(1), 119–131.

Choudhary, F., & Khushnood, S. (2021). Effectiveness of low cost activity based learning in primary level general science education. Journal of Elementary Education, 31(2), 1–15.

Schema, I. U., Ahmed, T., & Bello, M. (2021). Comparative impact of activity based and textbook based instruction on sixth grade science achievement. International Journal of Science Education, 43(5), 742–758.

Green, B. (2024). Activity based learning and academic performance in basic science. Journal of Science Teaching and Learning, 18(1), 12–26.

Hussain, S., Anwar, S., & Majoka, M. I. (2011). Peer group learning and physics achievement in secondary students. International Journal of Academic Research, 3(1), 113–118.

Iqbal, M., & Shafiq, M. (2017). Activity based teaching and science achievement in Pakistani classrooms. Journal of Educational Research, 20(2), 85–97.

Khan, M., Shah, K., & Saba, P. (2020). The effectiveness of activity based teaching in physics education. Journal of Science Education and Practice, 4(1), 44–56.

Kumar, R., & Ahmad, M. (2022). Constructivist strategies in science education. International Journal of Science Pedagogy, 7(2), 60–72.

Nasir, M., & Fatima, S. (2021). Comparative study of activity based and lecture based methods in enhancing science achievement. Bulletin of Education and Research, 43(2), 35–50.

Odutuyi, M. O. (2019). Comparative analysis of expository and activity based methods in science education. Journal of Science Education Research, 15(3), 201–214.

Qamar, A. M., Nadeem, H. A., Naseer, N., & Perveen, R. (2022). Effectiveness of activity based learning in general science using Bloom's taxonomy. Journal of Educational Sciences, 9(1), 23–38.

Rana, R., Mehmood, Z., & Hussain, S. (2023). Impact of activity based teaching on general science achievement of seventh grade students. Journal of Research in Science Education, 6(1), 14–28.

Rashid, R. (2020). Effects of activity based learning on secondary school students' physics achievement. Journal of Physics Education Research, 12(2), 91–103.

Samanta, S. (2016). Impact of activity based instruction on students' achievement in physical science. International Journal of Science Education, 38(9), 1467–1482.

Piaget, J. (1973). To understand is to invent: The future of education. Grossman.

Skinner, B. F. (1974). About behaviorism. Knopf.

Tadesse, S., & Gillies, R. M. (2015). Active learning and constructivism in middle school education. International Journal of Educational Research, 74, 28–37.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.