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# EFFECT OF COGNITIVE ACTIVATION ON THE ACADEMIC ACHIEVEMENT OF ELEMENTARY LEVEL STUDENTS

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**Abstract**

This study aimed to examine the effect of the Cognitive Activation Method (CAM) on the academic achievement of elementary-level students in General Science. The objectives of the study were: (i) to examine the effect of Cognitive Activation Method on the academic achievement of elementary-level students in General Science, (ii) to find out the effect of the Lecture Method on the academic achievement of elementary-level students in General Science, (iii) to compare the effects of Cognitive Activation Method and Lecture Method on the academic achievement of elementary-level students in General Science. The design of the study was true experimental. Government Boys Elementary School Palhatar was selected randomly as sample frame. Using simple random sampling technique, 60 students were selected as the study sample. A subject achievement test was administered as a pretest, and based on the pretest marks, students were divided into two equivalent groups: a control group (30 students) and an experimental group (30 students). The control group was taught using the Lecture Method, while the experimental group received instruction through CAM. After eight weeks of treatment, a posttest was conducted. The data were analyzed using SPSS version 25. Descriptive statistics (mean and standard deviation) were used to evaluate the students' academic achievements, while inferential statistics (t-test and partial eta squared) were applied to compare the effects of CAM and LM. The results concluded that the effect of CAM was significantly greater than that of LM on students' academic achievement in General Science. It is recommended that teachers may teach General Science of elementary level through Cognitive Activation Method, rather than relying on the traditional Lecture Method.

**Keywords:** Effect, Cognitive Activation Method, Lecture Method, General Science

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## INTRODUCTION

Education is the key that unlocks one's unlimited potential, shapes minds, and nurtures the future. Education is a means of personal growth and advancement. It empowers individuals by providing them with critical thinking, knowledge, skills, and, which are essential for the development of individuals and society. It empowers people to form well planned assumptions and take control of their lives.

Education opens doors of opportunities and helps in reducing the gaps between different socioeconomic groups. Education is more than just acquiring information; it is also about personal and social development. It encourages intellectual development, emotional intelligence and sense of responsibility among the individuals. Education is the main cause of the separation between human beings and animals. Hence an educated person may take more benefits from this immense universe. Education never ends up at any stage, but continue till death (Alarifi, 2023).

Lipowsky (2015) elucidated that direct observation and quantification of cognitive activation in learners is inherently unfeasible, necessitating the utilization of various indicators to adequately encapsulate this construct. Research predominantly employs two distinct methodologies for the measurement of cognitive activation. Firstly, the pedagogical practices may be examined indirectly through an analysis of the materials and tasks that educators implement within the classroom context. Conversely, it is also feasible to conduct a direct analysis of the instructional process, for instance, through the video documentation of the course, which can subsequently be evaluated utilizing a coding manual or an observational protocol tailored to the course. In both aforementioned methodologies, specific gauges are requisite. These gauges can be identified within instructional performances that possess a substantial prospective for fostering cognitive initiation. Such activities encompass: the formulation of challenging tasks, the instigation of cognitive dissonance, the elucidation of distinctions among content-related thoughts, concepts, explanations, and results, the integration of prior knowledge, the facilitation of reflective discourse, as well as the encouragement of learners to articulate or explicate their thoughts and ideas, which ultimately results in the better performance (PISA, 2020).

Research pertaining to Cognitive Activation within instructional contexts frequently explores the effect of Pedagogical Content Knowledge (PCK) on Cognitive Activation during classroom interactions and its subsequent influence on student academic performance or engagement. The investigation successfully delineated the comprehensive sequence of interactions originating from the educator's PCK. Nonetheless, the research did not incorporate video documentation of the instructional sessions, opting instead for an analysis of the educator's instructional tasks. This latter finding is indeed unexpected, yet it may also be predicated on an assessment of knowledge that is confined to the current instructional unit (Pozo-Rico et al., 2023).

This study seeks to compare the usefulness of the Cognitive Activation Method and the Lecture Method in improving students' academic achievement in General Science. By examining these approaches, the research targets to offer evidence-based understandings into which method better supports student learning outcomes, ultimately paying to the improvement of more active teaching strategies in science education.

Furthermore, the purpose of this study is to develop an innovative approach for the teaching of science subjects. Science education is important as it provides valuable insights into effective teaching strategies, enhances understanding of students to learn complex science concepts. It also contributes to the development of innovative

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approaches for improving academic achievement. Additionally, such researches ensure that science education continues to evolve to meet the needs of the rapidly changing world, providing students with the cognitive thinking and problem-solving skills necessary for their success.

**PROBLEM STATEMENT**

To enhance the effectiveness of the teaching process, a variety of teaching methods are being employed today. In many developing countries, including Pakistan, the Lecture Method is commonly used to teach elementary-level students. According to various studies, teaching science has always been a challenging task for educators, as students often struggle to fully understand scientific concepts when taught through the Lecture Method. The passive role of students is no longer compatible with the modern science curriculum. The paradigm of teaching is shifting from behaviorism to cognitivism, and the students are not supposed to be sitting silently in the classes, but their active role is the demand of the 21st century. Therefore, the researcher is going to conduct research to compare the effects of the Cognitive Activation Method and the Lecture Method on the academic achievement of elementary-level students in General Science.

**OBJECTIVES OF THE STUDY**

The objectives of the study were:

1. To examine the effect of Cognitive Activation Method on the academic achievement of elementary level students in General Science.
2. To find out the effect of Lecture Method on the academic achievement of elementary level students in General Science.
3. To compare the effect of Cognitive Activation Method and Lecture Method on the academic achievement of elementary level students in General Science.

**RESEARCH HYPOTHESES**

Following were the research hypotheses of the study;

$H_{01}$: There is no significant effect of Cognitive Activation Method on the academic achievement of elementary level students in General Science

$H_{02}$: There is no significant effect of Lecture Method on the Academic Achievement of elementary level students in General Science

$H_{03}$: There is no significant difference between the effects of Cognitive Activation Method and Lecture Method on the academic achievement of elementary level students in General Science

**LITERATURE REVIEW**

This literature review aims to evaluate the comparison of two teaching methods; the Cognitive Activation Method and the Lecture Method, highlighting their effectiveness, benefits and potential challenges in different educational settings.

**LECTURE METHOD**

Lecture Method is used for a long time off period. And mostly used around the world. It is because of that this method has also some advantages. Another name which is used for Lecture Method is authoritarian method. That's in this method teacher has a role of authority. He has complete control over class. He delivers lectures as he decides. How to deliver lecture, what are the contents should be delivered to students, this decagons take only teacher. That's teacher has control on everything. In Lecture Method, more information is given to students. Students can get a large quantity of information. Every lecture has lot information every day. Students feel easy when don't have to pay more efforts during lesson. On the part of students, Lecture Method doesn't require more efforts.

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It is very easy for students to make notes and revise it any time. They pay attention only to lessons. A little bit input students pay (Zhao et al., 2023).

Looking the other side of everything, has negative effects. Same case with Lecture Method it has also some disadvantages which are as following. Like a road if it will be one way there will be difficulties for people. Same situation with lesson if it will be one way there will be no interest. Everything in the world can get success if it will be two ways. Those who are against Lecture Method; it is their strong argument against Lecture Method. Students have no way without accepting it. Because they have to take passing grade, it has seen most in most of institutions in our country that these students who are not agree with teacher's statements, sometimes have less grades or even they failed in these subjects. It also be said it is like authoritative method of teaching. Students are not free in thinking and questioning. Students want to talk about something but they can do that, having confusion in their mind. Lecture Method is a one way teaching process and also a passive experience. Students don't learn by their personal experience. They are imposed to listen what are being taught in class. They have no choice in learning process. They can't evaluate the contents critically (Yuldashev, 2021).

In some cases, lecture is not useful for teachers and professors as well. All human beings are not same in nature. Some are expert in any field but maybe he doesn't quality of another field. To convey messages to the people requires best skills of speaking. All teachers and lectures are not same in terms of speaking skills in front of large gathering. If a teacher is expert in his subject, knows up and downs of his subject, but he is week in speaking ability in front of public? He might not be able to prepare his lesson not because he doesn't know his subject but because of the way he doesn't know to convey his message properly (Macharia, 2024).

Despite the difficulties which are face in Lecture Method, there are some alternatives which can be adopted which are as: Discussions: Many universities and colleges arrange discussion forums for students with the assistance of teachers, with the aim of allowing students to share their ideas with each other in an open manner and to be able to articulate their views well. They can clear up misunderstandings about classroom lectures. The power of students in discussions is less than that of lectures, because a forum has at least 10 to 20 students, while lectures have up to 300 students, forming a large class. In these forums, they can ask each other question about the course. If they have any questions later, they are free to ask the teacher again in class (Korkmaz & Mirici, 2023).

**COGNITIVE ACTIVATION METHOD**

Cognitive activation is one of the dominant value features of teaching learning process. By activating the cognition of the student an instructor may achieve the learning products easily. The cognition is considered very crucial in every type of education, but for the teaching of science subjects its significance is beyond the imagination. Lipowsky (2015) pointed out that it is not possible to check whether the cognition of the students is activated or not. Numerous signs are needed to capture this construct. He introduced three key elements of Cognitive Activation: (i) Challenging Questions, (ii) Prior knowledge/ideas, in-depth learning opportunities and cognitive conflicts (iii) Instructional Dialogue. He argued that cognition of the students can be activated by implementing these strategies.

**PHASES OF COGNITIVE ACTIVATION METHOD**

Key elements of Cognitive Activation Method are given below;

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**CHALLENGING QUESTIONS**

The first element of Cognitive Activation Method is the challenging questions. The basic purpose of this phase is to grasp the attention of the students and to make them ready for the further joinery of the lesson. This phase is further divided into three sub stages as described below;

**CHALLENGING PHENOMENA AT THE BEGINNING:** At this sub stage the teacher introduces a challenging or fascinating problems or tasks at the beginning of the lesson. The teacher may show them a picture, model and video or talk about the incredible facts about the topic of that particular day.

**THE QUESTIONING OF THE STUDENTS IS SUPPORTED:** The teacher offers the students time and opportunities to ask their own questions. Teacher motivates the students to be the part of the lesson by asking the questions. The students are encouraged to ask the questions.

**THE TEACHER ASKS COGNITIVE ACTIVATING QUESTIONS:** At this sub stage the teachers asks the questions in order to activate the cognition of the students. These questions require the answers more than yes or no. The teacher will ask the students to think and then answer the questions. At this phase the students are asked to think deeply rather than to give spontaneous response.

**PRIOR KNOWLEDGE/IDEAS, IN-DEPTH LEARNING OPPORTUNITIES AND COGNITIVE CONFLICTS**

It is the second phase of Cognitive Activation Method. The purposes of this phase are; to link the prior knowledge with new one, to provide the students the opportunities of in-depth learning and to generate the cognitive conflicts among them. This phase is further divided into three sub phases as described underneath;

**THE PRIOR KNOWLEDGE AND THE IDEAS OF THE LEARNERS ARE EXPLORED:** At this sub stage the teacher asks the students to make assumptions or encourages the kids to express their doubts.

**IN-DEPTH LEARNING OPPORTUNITIES:** The teacher tries to understand the thinking of the learners by asking how they came up with specific answers or by asking to justify their answers.

**COGNITIVE CONFLICTS ARE GENERATED:** At this phase the teacher confronts the learners with facts, observations or phenomena which contradict their responses.

**INSTRUCTIONAL DIALOGUE**

Third and final stage of the CAM is “Instructional dialogue”. At this stage the students and teacher discus the ideas and errors together. This phase if further subdivided into two stages which are given below;

**DISCUSS IDEAS TOGETHER:** The teacher encourages the exchange among the learners by asking them to relate their contributions to each other. The teacher also guides the students to discuss their assumptions.

**DISCUSSING ERRORS:** The teacher picks up mistakes of the learners and uses them in the further course of the lesson.

**COGNITIVE ACTIVATION IN SCIENCE EDUCATION**

Most studies examining cognitive activation in science instruction and its effects on student achievement and interest have focused on fifth grade and higher. To the best of our knowledge, no research has yet explored the use of cognitive activation in kindergarten or compared its application between kindergarten and elementary school. When educators express interest for the subject matter and use creative methods to convey information,

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students are supposed to motivate to learn and excel in their studies. Regular assessments help identify student strengths and areas for improvement, allowing educators to adjust teaching methods to meet specific learning needs and provide timely feedback. In addition to academic knowledge, effective teaching methods help develop essential life skills such as communication, collaboration and adaptability.

Access to quality education reduces inequality and promotes social mobility. Empowering minds through a comprehensive science education lays the foundation for a future where curiosity inspires discovery, critical thinking drives innovation, and a scientifically literate society navigates the complexities of an evolving world. If this were achieved, cognitively activated teaching in primary schools would already be possible (Schumacher, & Stern, 2023).

Research predominantly employs two distinct methodologies for the measurement of cognitive activation. Firstly, the pedagogical practices may be examined indirectly through an analysis of the materials and tasks that educators implement within the classroom context. Conversely, it is also feasible to conduct a direct analysis of the instructional process, for instance, through the video documentation of the course, which can subsequently be evaluated utilizing a coding manual or an observational protocol tailored to the course. However, the research did not incorporate video documentation of the instructional sessions, opting instead for an analysis of the educator's instructional tasks (Pacaci et al., 2024).

**SIGNIFICANCE OF COGNITIVE ACTIVATION**

A research report from ETS shows that complex academic tasks are crucial in the teaching and learning process as they help students improve their abilities as they reflect more on their real-world connections, which is a good way to relate knowledge to the real and natural world. Get in touch. Students' cognitive level and concept teaching can use the competency model of the National Junior High School Natural Science Education Standard Assessment Project for science teaching. Dimensional cognitive processes describe the four levels of cognition required by students to solve a given task: representation, selection, organization, and integration. Another dimension of complexity involves the number of knowledge elements and their connections required to solve the task, which is mainly described by three levels: facts, relationships and general concepts of science (Rosyidah, 2024).

**COGNITIVE ACTIVATION STRATEGY DURING INSTRUCTIONS**

Because cognitive activation has been shown to support the development of mathematical literacy, the quality teaching methods promote numerous learning skills. Active learning methods such as interactive discussions, practical applications and practical experiences can enhance the retention of knowledge. There are many types of education; one of them is informal education, which includes learning from family members, attending community events, attending workshops or seminars while participating in interests, or through hands-on learning, acquiring knowledge through online resources and social interaction. Effective teaching methods can meet these different needs and ensure that students master and understand the material more thoroughly. Access to quality education reduces inequality and promotes social mobility. Empowering minds through a comprehensive science education lays the foundation for a future where curiosity inspires discovery, critical thinking drives innovation (Sultana, 2024).

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## COGNITIVE ACTIVATION AND PUPIL ABILITY

PISA defines competencies in terms of proficiency, with proficiency levels outlining the skills students are expected to demonstrate and the tasks they are capable of completing (OECD, 2014). Test questions that focus on simple tasks, which involve familiar contexts containing all relevant information, are placed at the lower proficiency levels. In contrast, more challenging questions, requiring students to develop models for complex situations, identify constraints, and define assumptions, are categorized at higher levels (El Haj Chapelet & Moustafa, 2022).

## MATERIAL AND METHODS

The design of the study was true experimental. The students of grade 8 who were studying in district Kotli were the population of the study. Sixty (60) students of 8th class form Government Boys Middle School Palhatar were ere selected randomly as a sample of the study. A Subject Achievement test (SAT) was developed by the researcher was the instrument (Pretest and posttest) of data collection. Pretest was conducted before the start of the experiment. Two equivalent groups (Control and experimental) were formed on the base of the marks of pretest. The students of control group were taught by using Lecture Method while the students of experimental group were instructed through Cognitive Activation Method. After the treatment of eight weeks the posttest was conducted. The results were analyzed by using SPSS version 25.

## RESULTS

***TABLE 1: ACADEMIC ACHIEVEMENTS OF CONTROL AND EXPERIMENTAL GROUP (PRE-TEST)***

| Group | N | M | SD | SEM |
|---|---|---|---|---|
| Control | 30 | 33.27 | 10.044 | 1.834 |
| Experimental | 30 | 32.00 | 9.660 | 1.764 |

N=60

Descriptive statistics (Mean and Standard Deviation) were used to determine the academic achievements of students in General Science before the treatment. The pretest marks of the control group were: N=30, M=33.27, SD=10.044, SEM= 1.834 and pretest marks of experimental group were; N=30, M=32.00, SD=9660, SEM= 1.664. Table 1 shows that there was no significant difference between the marks of presets of control and experimental group.

**TABLE 2:** ***ACADEMIC ACHIEVEMENTS OF CONTROL AND EXPERIMENTAL GROUP (POST-TEST)***

| Group | N | M | SD | SEM |
|---|---|---|---|---|
| Control | 30 | 59.70 | 10.212 | 1.864 |
| Experimental | 30 | 78.70 | 11.818 | 2.158 |

N=60

Descriptive statistics (Mean and Standard Deviation) were used to calculate the academic achievements of students in General Science after the treatment. The posttest marks of control group were: N=30, M=59.70, SD=10.212, SEM= 1.864 and the posttest marks of experimental group were; N=30, M=78.70, SD=11.818, SEM= 2.158. Table 4.1 shows that, the posttest marks of experimental group were significantly more than the posttest marks of control group.

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**TABLE 3:** ***COMPARISON BETWEEN MARKS OF PRETEST OF CONTROL AND EXPERIMENTAL GROUP***

| Pre-test | N | Mean | SD | *Df* | *T* | *p* |
|---|---|---|---|---|---|---|
| Control Group | 30 | 33.27 | 10.444 | 58 | .498 | .933 |
| Experimental Group | 30 | 32.00 | 9.660 | | | |

N=60

Independent sample t-test was used to compare the pretest marks of control and experimental group. The pretest marks of control group were; N= 30, M= 33.27, SD=10.444, and pretest of experimental group were; N=30, M= 32.00, SD= 9.660. t= (58) .498 and p=.933 > 0.05. Table 4.3 shows that, there was no significant difference between the pretest marks of control and experimental group. Hence, there was no significant difference between the academic achievement of control and experimental group before the treatment.

**TABLE 4:** ***COMPARISON BETWEEN PRETEST AND POSTTEST MARKS OF EXPERIMENTAL GROUP***

| Experimental Group | N | Mean | SD | *Df* | *t* | *p* | *ηp2* |
|---|---|---|---|---|---|---|---|
| Post test | 30 | 78.70 | 11.818 | 29 | 21.079 | .000 | .417 |
| Pre-test | 30 | 32.00 | 9.660 | | | | |

N=60

Paired sample t-test was used to find out the difference between pretest and posttest marks of experimental group, and Partial Eta Squared test were applied to determine the effect size. The posttest marks experimental group were; N= 30, M= 78.70, SD=11.818, and marks of pretest of experimental group were; N=30, M= 32.00, SD= 9.660. t= (29) 21.079, p=.000 < 0.05 and ηp2= .417 > 0.14. Table 4.4 indicates a significant difference between the posttest and pretest marks of the experimental group. Furthermore, the effect size of the treatment was also significant. Hence, the Cognitive Activation Method has a significant effect on the academic achievement of the elementary level students in General Science. Therefore, the null Hypothesis "there was no significant effect of CAM on the academic achievement of the elementary-level students" was rejected.

**TABLE 5:** ***COMPARISON BETWEEN MARKS OF PRETEST AND POSTTEST OF CONTROL GROUP***

| Control Group | N | Mean | SD | *Df* | *T* | *p* | *ηp2* |
|---|---|---|---|---|---|---|---|
| Post test | 30 | 59.70 | 10.212 | 29 | 5.360 | .000 | .384 |
| Pre-test | 30 | 44.83 | 19.673 | | | | |

N=60

Paired sample t-test was used to find out the difference between pretest and posttest marks of control group, and Partial Eta Squared test were applied to determine the effect size. The posttest marks of control group were; N= 30, M= 78.70, SD=11.818, and pretest marks were; N=30, M= 32.00, SD= 9.660. t= (29) 21.079, p=.000 < 0.05 and ηp2= .384 > 0.14. Table 4.4 shows a significant difference between the posttest and pretest marks of the control group in General science. Furthermore, the effect size of the treatment was also significant. Hence, there was significant difference pretest and posttest marks of control group. Henceforth, the null hypothesis, "there was no significant effect of LM on the academic achievement of the elementary-level students" was rejected.

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**TABLE 6:** ***COMPARISON BETWEEN THE RESULTS OF POSTTEST OF CONTROL AND EXPERIMENTAL GROUP***

| Test | Group | N | Mean | SD | *df* | *T* | *P* | *ηp2* |
|---|---|---|---|---|---|---|---|---|
| Posttest | Experimental | 30 | 78.70 | 11.818 | 29 | 8.594 | .000 | .347 |
| | Control | 30 | 59.70 | 10.212 | | | | |

N=60

Paired Sample t-test was applied to find out the difference between the marks of the experimental and control group in the posttest. Whereas Partial Eta squared test was used to evaluate the difference between the effects size of the treatments. The marks of posttest of experimental group were; N= 30, M= 78.70, SD=11.818, and marks of pretest of control group were; N=30, M= 59.70, SD= 10.212. t= (58) 8.594, p=.000 < 0.05 and ηp2=.347 > 0.14. Table 4.15 shows that the effect of Cognitive Activation Method is greater than the effect of Lecture Method on the academic achievement of elementary level students in General Science. Moreover, the effect size was also significant. So the null hypothesis "there is no significant difference between the effect of Cognitive Activation Method and Lecture Method on the academic achievement of elementary level students in General Science" was rejected

**FINDINGS**

It was found that;

1. The marks of control group in pretest were slightly more than that of experimental group. The pretest marks of the control group were: N=30, M=33.27, SD=10.044, SEM= 1.834 and pretest marks of experimental group were; N=30, M=32.00, SD=9660, SEM= 1.664 (Table 1)
2. The marks of experimental group in posttest were significantly more than that of control group. The posttest marks of control group were: N=30, M=59.70, SD=10.212, SEM= 1.864 and the posttest marks of experimental group were; N=30, M=78.70, SD=11.818, SEM= 2.158 (Table 2).
3. There was no significant difference between the average marks pretest of control and experimental group. The marks of pretest of control group were; N= 30, M= 33.27, SD=10.444, and marks of pretest of experimental group were; N=30, M= 32.00, SD= 9.660. t= (58) .498 and p=.933 > 0.05 (Table 3).
4. There was a significant difference between the pretest and posttest marks of experimental group. Furthermore, the effect size of the treatment was also significant. Hence, the Cognitive Activation Method has a significant effect on the academic achievement of the elementary level students in General Science. The posttest marks experimental group were; N= 30, M= 78.70, SD=11.818, and marks of pretest of experimental group were; N=30, M= 32.00, SD= 9.660. t= (29) 21.079, p=.000 < 0.05 and ηp2= .417 > 0.14 (Table 4)
5. There was a significant difference between the pretest and posttest marks of control group. Furthermore, the effect size of the treatment was also significant. Hence, Lecture Method has a significant effect on the academic achievement of the elementary level students in General Science. The posttest marks of control group were; N= 30, M= 78.70, SD=11.818, and pretest marks were; N=30, M= 32.00, SD= 9.660. t= (29) 21.079, p=.000 < 0.05 and ηp2= .384 > 0.14 (Table 5)
6. The effect of Cognitive Activation Method is greater than the effect of Lecture Method on the academic achievement of elementary level students in General Science.

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Moreover, the effect size was also significant. The marks of posttest of experimental group were; N= 30, M= 78.70, SD=11.818, and marks of pretest of control group were; N=30, M= 59.70, SD= 10.212. t= (58) 8.594, p=.000 < 0.05 and ηp2=.347 > 0.14. (Table 6).

**DISCUSSION**

This study aims to compare the effect of two teaching methods: Cognitive Activation Method and Lecture Method on the academic performance of elementary school students. The study was conducted under controlled conditions, where the researchers attempted to manage the threat of external variables.

First objective of the study was to find out the effect of Cognitive Activation Method on the academic achievement of elementary level students. It was found that Cognitive Activation Method has significant effect on the academic achievement of the students in General Science. The similar study conducted by Laura (2015) in Colombia to determine the relationship between the cognitive activity and the academic performance. It was an experimental study and the 60 students of 10$^{th}$ class were the sample of the study. The cognitive activity was measured by: focusing and sustaining attention, cognitive flexibility and inhibitory control, displaying visual memory, and visual constructive praxis whereas the academic performance was evaluated from the school records. The results indicated that there was statistically significant relationship between the cognitive activity and academic performance of the students.

Another study was conducted by Yue Qi (2022) from the School of Humanities and Social Sciences, University of Science and Technology Beijing. One of the aims of the study was to assess the impact of cognitive abilities on students' academic performance. They ruled out the influence of five cognitive abilities: logical reasoning ability, information processing ability, representation ability, thinking conversion ability and memory ability. Structural equation modeling techniques were used to analyze the impact of cognitive abilities on students' academic performance. The results show that cognitive ability has a significant and positive impact on academic performance.

The second objective of the study was to find out the effect of Lecture Method on the academic achievement of the elementary level students. It was evaluated that academic achievement was significantly affected by the strategies of Lecture Method. Numerous studies have been conducted around the world to evaluate the impact of Lecture Method on student academic performance.

Another study was conducted by Lukman (2022), Department of Science Education, Nigeria Agency for Science and Technology, which explored the effectiveness of lecture and discussion methods in teaching physics in secondary schools. A sample of 48 students was selected using random sampling. The post-test results of both groups were better than the pre-test. It can be seen that both methods are effective in physics teaching, but the discussion method is more effective in physics teaching.

The third objective of the study was to compare the retention level of elementary level students treated with Cognitive Activation Method and Lecture Method. David Agwu Udu (2022) conducted a research survey to evaluate the effectiveness of innovative teaching methods, specifically Learning Activity Packages (LAP), to enhance students' retention of knowledge in science subjects within secondary education institutions, where gender as a Moderating variable, it was found that Learning Innovation Pedagogy (LAP) significantly improved students' knowledge retention in science subjects compared to the traditional Lecture Method.

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David Agwu Udu (2022) also explored the potential interaction effect of gender on knowledge retention when employing various teaching strategies. Findings revealed that there was no significant interaction between teaching method and gender on students' retention of science domain knowledge, F (1, 203) = 2.47, p = .12, exceeding the 0.05 threshold.

## CONCLUSIONS

On the basis of the findings, it is concluded that;

1. Cognitive Activation Method has significant effect on the academic achievement of elementary level students in General Science.
2. Lecture Method has significant effect on the academic achievement of elementary level students in General Science.
3. The effect of Cognitive Activation Method is significantly greater than the effect of Lecture Method on the academic achievement of elementary level students in General Science.

## RECOMMENDATIONS

Following recommendations were made;

1. It is recommended that the teachers may engage students by giving them a task or challenging questions at the start in order to get them ready for the lesson being delivered. The teachers may give the students a fascinating problem in order to make them interested in the lesson.
2. The teachers may give time and opportunities to the students to ask the questions. The teachers may encourage the questioning of the students in order to grasp their attention and motivate them for the learning.
3. It is recommended that the teachers may ask cognitive activating questions to the students, which require answers more than yes or no. The teachers may give them time to think and response the questions rather than give the answer immediately.
4. It is recommended that; the students may regularly assess the own understanding by reexamining the stimulating questions and pursuing clarification during instructional discourse.
5. It is recommended that the curriculum developers of the teachers training programs may design curricula that contain structured phases of cognitive activation, such as thought-provoking questions, prior knowledge assessment, and opportunities for in-depth learning.

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