# EFFECT OF MAGNET BRAINS APP ON CRITICAL THINKING AND HIGHER MENTAL ABILITY IN SCIENCE STUDENTS

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## ABSTRACT

*In the present day, technology plays an important part in moulding education. From the introduction of computers to the spread of smartphones and tablets, digital technologies have transformed the way students' study. The internet, in particular, has provided students with previously unfathomable resources, allowing them to access large volumes of material from anywhere. The current study seeks to investigate how mobile applications can help students develop critical thinking skills and higher cognitive functions, notably in the field of scientific education. So, the main objective of study istofind the effect of Magnet Brains App on Critical Thinking in science students and the effect of Magnet Brains App on Higher Mental Ability in science students. To achieve these objectives, the Sample of 50 students from Class IX was selected from Government Girls Model Senior Secondary School, Sector 20B, Chandigarh.The statistical findings showed that the use of the Magnet Brains app led to significant improvements. The statistical findings indicated that the use of the Magnet Brains app resulted in significant improvements in higher mental ability and student's critical thinking, thereby encouraging the integration of technology-based learning in science education.*

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## INTRODUCTION

Educational applications are intended to augment standard teaching techniques by providing additional resources to students. These apps enable students to interact with knowledge outside of the classroom, giving them the freedom to learn at their own speed. The capacity to get to instructive assets whereas on the go has made portable apps critical, since they remove time and geographic limitations, making learning more accessible to students no matter where they are. Mobile apps provide students with the flexibility to study and reinforce their

knowledge anytime they have free time by bringing learning into common environments such as buses, cafes, and homes.

Mobile apps' accessibility contributes to levelling the playing field in education. Studentsin rural or underdeveloped locations have access to the same high-quality educational resourcesas students in more prosperous areas. Educational apps serve to close the gap by giving studentsaccess to tools and content that they may not otherwise have access to in their schools orcommunities. Furthermore, many educational applications are multilingual, making it easierfor students from various linguistic backgrounds to learn in their home language or a new one.Finally, mobile apps have broadened the definition of collaborative learning. Many apps offerfeatures such as social networking, group discussions, and peer evaluations, allowing studentsto collaborate on assignments, share ideas, and provide feedback to one another. This promotesteamwork and communication abilities, which are vital in both scholarly and proficientcircumstances. Students can gain a broader perspective on topics by connecting with classmatesfrom all around the world and being exposed to a variety of opinions and ideas. Mobile apps' accessibility also contributes to levelling the playing field in education. Studentsin rural or underdeveloped locations have access to the same high-quality educational resourcesas students in more prosperous areas. Educational apps serve to close the gap by giving studentsaccess to tools and content that they may not otherwise have access to in their schools orcommunities. Furthermore, many educational applications are multilingual, making it easierfor students from various linguistic backgrounds to learn in their home language or a new one.Finally, mobile apps have broadened the definition of collaborative learning. Many apps offerfeatures such as social networking, group discussions, and peer evaluations, allowing studentsto collaborate on assignments, share ideas, and provide feedback to one another. This promotesteamwork and communication abilities, which are vital in both scholarly and proficientcircumstances. Students can gain a broader perspective on topics by connecting with classmatesfrom all around the world and being exposed to a variety of opinions and ideas.

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scholarly and proficient circumstances. Students can gain a broader perspective on topics by connecting with classmates from all around the world and being exposed to a variety of opinions and ideas.

**Magnet Brains App**

The Magnet Brains Education mobile app is one of the most unique educational resources accessible today. Magnet Brains, created by Dr. Neeraj Agarwal, a renowned educator and cognitive scientist, seeks to give children with a full learning experience that improves both cognitive growth and academic achievement. The app provides a diverse selection of interactive information that promotes critical thinking, memory retention, and problem solving, making it a priceless asset for understudies of all instructive levels.

In present day, technology plays an important part in moulding education. From the introduction of computers to the spread of smartphones and tablets, digital technologies have transformed the way students' study. The internet, in particular, has provided students with previously unfathomable resources, allowing them to access large volumes of material from anywhere. Technology integration in the classroom has revolutionized traditional teaching methods, offering new ways of teaching and learning that are more interactive, engaging, and personal.The software contains discussion boards, study groups, and social learning tools to help students engage with their classmates. These components empower understudies to work together, share thoughts, and learn from each other. Collaborative learning has been found to improve critical thinking by engaging students in debates and problem-solving activities that challenge their ideas and increase their comprehension of complicated concepts

**Critical Thinking**

Critical thinking is essential in education because it allows students to analyse, evaluate, and synthesize knowledge in a systematic and meaningful manner. It teaches students to challenge their preconceptions, identify biases, and make evidence-based decisions. This critical thinking capacity enables students to not only comprehend the content before them, but also to assess its relevance and application in real-world circumstances. In academic settings, critical thinking fosters intellectual curiosity and independence, allowing students to engage thoroughly with the topic rather than relying on memorization and repetition. As a

result, critical thinkers are more likely to succeed academically and develop into lifelong learners who strive to enhance their thinking abilities.

Basic considering could be a cognitive expertise that involves evaluating, assessing, and deciphering data in an orderly and mindful way. Critical thinking is on a very basic level almost tending to circumstances and concepts with an open, inquisitive, and objective mindset, endeavouring to memorize, look at, and survey prove some time recently coming to conclusions. The capacity to think fundamentally empowers individuals to oversee troublesome challenges and make well-reasoned, evidence-based choices.

It is a complicated talent that requires numerous essential cognitive processes. Analysis is one of the initial processes in critical thinking, in which people divide complex material into smaller, more accessible chunks. This method aids in the identification of previously unseen patterns, linkages, and underlying assumptions. After the analysis is completed, students evaluate the credibility, dependability, and relevance of the information they have encountered. This stage permits people to weigh evidence, examine opposing opinions, and make well reasoned decisions. The next step is inference, which involves pupils drawing logical inferences based on the evidence presented. The ultimate level of critical thinking is synthesis,

**Higher Mental Ability**

Higher mental ability is defined as an individual's ability to perform complicated cognitive tasks that require abstract thinking, problem solving, reasoning, and creativity. It entails a collection of higher-order thinking skills that allow people to comprehend and manage difficult circumstances efficiently. These talents extend beyond basic knowledge recall to include activities like critical thinking, strategic planning, and cognitive flexibility.

People with better mental abilities are generally distinguished by their capacity to think rapidly and adapt to new knowledge or changing conditions. They have great analytical skills and can break down difficult problems into digestible chunks, allowing them to develop effective solutions. This cognitive flexibility enables people to approach problems from many perspectives and come up with novel solutions.

Students in high school must learn to think abstractly about scientific topics. Rather than remembering data, they are entrusted with developing scientific models, experimenting with theoretical ideas, and comprehending systems that cannot be immediately observed. This cognitive aptitude is necessary for mastering more sophisticated scientific disciplines, such as chemistry and physics.

Higher mental abilities include the ability to think abstractly. This entails being ability to think beyond the specifics of a situation and explore larger concepts, patterns, and linkages. The development of higher mental abilities is critical in academic and professional settings. Students with superior mental abilities succeed in academic subjects such as mathematics, science, and literature, where they must examine data, think critically, and develop well-reasoned arguments. Individuals with excellent mental agility are generally successful in leadership roles, strategic planning, and decision-making positions, which need them to negotiate complicated challenges and make informed decisions.

Sternberg (1985) describe Higher mental ability as the capacity to adapt to the environment, to think abstractly, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. Sternberg (1985) describe Higher mental ability as the capacity to adapt to the environment, to think abstractly, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought.

**OBJECTIVES OF THE STUDY**

- To study the effect of Magnet Brains App on Critical Thinking in science students
- To study the effect of Magnet Brains App on Higher Mental Ability in science students

**HYPOTHESES**

H01: There is no significant effect of Magnet Brains App on Critical Thinking in science students.

H02: There is no significant effect of Magnet Brains App on Higher Mental Ability in science students.

## TOOLS USED

Following tools were used in the present study:

1.Magnet brains app

2. Critical thinking (Murthy 2015)

3. Higher mental ability in science students (Joshi &Sansanwal 2016)

## LESSON PLAN

The detail of units and content is given below:

**TABLE 1.1**

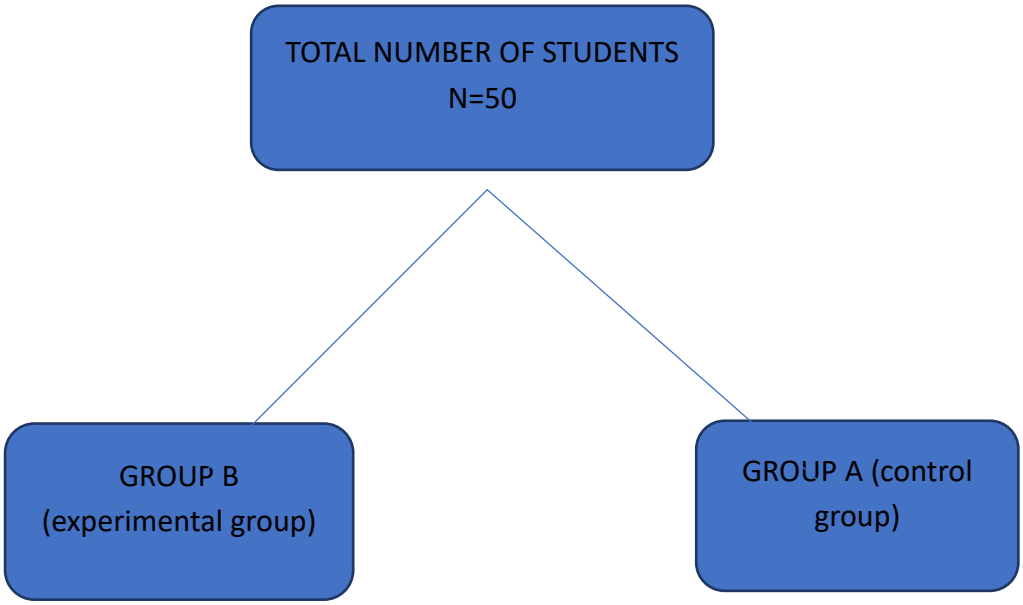
**CONTENT OUTLINE OF THE SELECTED UNITS**

| UNIT | TITLE | | SUB UNITS |
|---|---|---|---|
| 1. | DIVERSITY IN LIVING ORGANISM | 1.1 | CLASSIFICATION OF LIVING ORGANISM |
| | | 1.2 | THE PLANT KINGDOM |
| | | 1.3 | THE ANIMAL KINGDOM |
| 2. | SOUND | 2.1 | 1 PRODUCTION AND PROPAGATION OF SOUND |
| | | 2.2 | REFLECTION OF SOUND |
| 3. | STRUCTURE OF ATOM | 3.1 | ATOMIC MOLECULES |
| | | 3.2 | STRUCTURE OF ATOMS |

**Sampling**

Sampling is the process by which a relatively small number of individuals or events is selectedand analysed in order to find out something about the entire population from which it isselected.it helps to reduce expenditure, save time and energy. It permits measurement of greaterscope or produce greater precision and accuracy. Sampling procedure provide generalization on the basis of a relatively small proportion of the population.

**Fig 1.1 Classification of sample**




In the present study, Government Girls Model Senior Secondary School, Sector 20B was takenpurposively selected out of other schools in the city. Sample of 50 students from Class IX wasselected from Government Girls Model Senior Secondary School, Sector 20B, Chandigarh. The sample was divided into two equal groups using a random sampling method. Group A(control group) consisted of 25 students, and Group B (experimental group) also included 25students.

## PROCEDURE

Prior to the commencement of the study, formal permission was obtained from the Principal ofGovernment Girls Model Senior Secondary School, Sector 20-B, Chandigarh. A writtenapplication was submitted detailing the objectives, methodology, and ethical considerationsofthe research. Upon receiving approval, the researcher proceeded with the study in collaborationwith the school staff.

### Phase 1: Pre-Testing

A total of 50 students from Class IX were randomly selected and divided into two equal groups: The Control Group and the Experimental Group. Before any teaching intervention, both groups were administered pre-tests in Critical Thinking and Higher Mental Ability. These tests aimed to establish the baseline cognitive levels of the students. The assessments were conducted under standardized classroom conditions to ensure fairness and reliability.

The Critical Thinking test was scored by awarding one mark for each correct response. Thetotal raw score obtained by each participant was then used to determine their level of critical thinking ability. Based on the distribution of scores, performance was categorized into four levels: scores below 30 were interpreted as indicating poor critical thinking ability, scores between 30 and 49 were considered average, those between 50 and 69 were classified as good,and scores 70 and above were marked as excellent. This scoring pattern was applied uniformly to both pre-test and post-test data across the control and experimental groups to analyse improvement and effectiveness of the intervention. The Higher Mental Ability Test was scored by assigning one mark for each correct answer.

The total score obtained by participants was used to assess their level of mental ability. Basedon the observed score ranges and patterns in the data, mental ability was interpreted as follows:scores below 12 were categorized as low, scores from 12 to 15 were considered moderate,scores between 16 to 19 were marked as high, and scores 20 and above indicated very highmental ability. These categories helped in analyzing the cognitive impact of the interventionacross control and experimental groups in both pre- and post-test phases

**Phase 2: Intervention**

Instruction was provided on 10 selected topics from the Class IX Science textbook. The Experimental Group was taught using an application-based teaching approach, incorporating digital tools to enhance interactivity and understanding. In contrast, the Control Group received instruction through traditional teaching methods (textbook and lecture-based). The content remained consistent across both groups to isolate the impact of the teaching strategy itself.

**Phase 3: Post-Testing and Data Collection**

Following the instructional period, post-tests were conducted for both groups in Critical Thinking and Higher Mental Ability in Science to measure changes in performance. Tests were administered under controlled conditions, and all necessary precautions were taken to ensurethe accuracy and authenticity of results.Answer sheets were carefully collected and scored. Each correct answer was awarded onemark, and raw scores were interpreted using a defined scoring scale. These scores were thenused to assess the effectiveness of application-based teaching compared to traditional methods.

**TESTING OF HYPOTHESIS I**

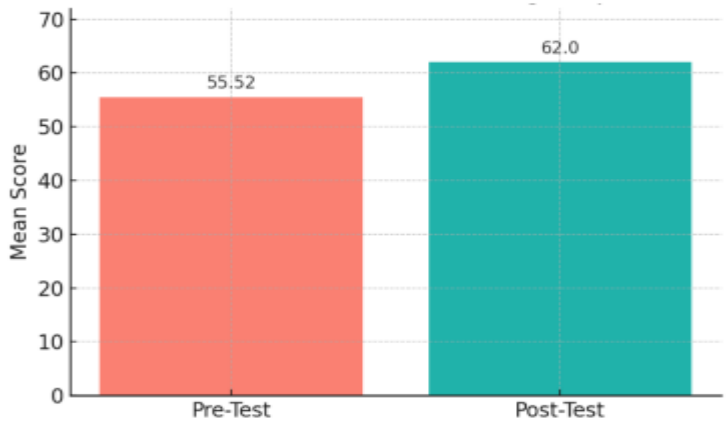
**Table 1.2**

**Comparison of Standard Deviation, t-value, and Degree of Freedom in Pre and Post-test Scores of Critical Thinking (Experimental Group)**

| Measure | Value |
|---|---|
| Standard Deviation (Pre) | 22.34 |
| Standard Deviation (Post) | 21.17 |
| t-value | 2.31* |
| Degrees of Freedom (df) | 24 |

❖ Significant at 0.05 level

**Figure 1.2 Bar Diagram Showing the Mean Scores of Critical Thinking Between Pre-test and Post-test of Experimental Group**




**INTERPRETATION**

As shown in Table 1.2, the standard deviation of the critical thinking scores for the experimental group was 22.34 in the pre-test, which slightly decreased to 21.17 in the post-test. This indicates a minor reduction in score variability following the intervention. In order to assess the statistical significance of this improvement, a paired-samples t-test was performed. The computed t-value of 2.31, with 24 degrees of freedom, is more than table value that is 1.71. Hence t-value for critical thinking is significant at 0.05 level.

Figure 1.2 clearly illustrates the rise in average scores, thereby affirming the beneficial influence of the Magnet Brains App on critical thinking abilities.

So, Hypothesis 1 ($H_{01}$), which states that "There is no significant effect of the Magnet Brains App on Critical Thinking in Science students," is not accepted. The findings indicate a significant effect of the app in enhancing critical thinking skills among the students in the experimental group.Hussein et al. (2019), Kong (2014), Lai and Hwang (2014), Şendağ and Odabaşı (2009), Zoharand Barzilai (2015), and Wu et al. (2012) supported the results of the study.

**TESTING OF HYPOTHESIS II**

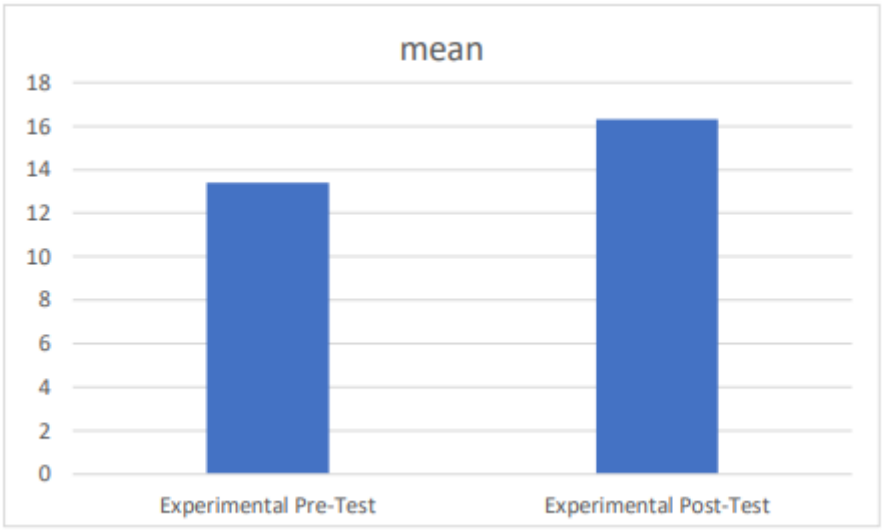
**Table 1.3**

**Comparison of Standard Deviation, t-value, and Degree of Freedom in Pre and Post-test Scores of Higher Mental Ability (Experimental Group)**

| Measure | Value |
|---|---|
| Standard Deviation (Pre-Test) | 5.63 |
| Standard Deviation (Post-Test) | 4.5 |
| t-Value | 5.70* |
| Degrees of Freedom (df) | 24 |

❖ Significant at 0.01 level

**Figure 1.3 Bar Diagram Showing the Mean Scores of Higher Mental Ability Between Pre-test and Post-test of Experimental Group**




**INTERPRETATION**

As illustrated in Table 1.3 and Figure 1.3, the descriptive statistics for the experimental group reveal the mean, median, and skewness of the higher mental ability test scores during both the-pretest and post-test phases. In particular, the mean score for the pre-test was 13.4, whereas the mean score for the post-test showed an improvement to 16.32.

Table 1.3 and Figure 1.3 present the inferential statistics for the experimental group. Thestandard deviation was recorded at 5.63 for the pre-test, which subsequently decreased to 4.5for the post-test, signifying a reduction in score variability following the intervention. The t-value with 24 degrees of freedom is 5.7 that is more than table value that is 2.49 at 0.01level. Hence t-value forHigher Mental Ability is significant at 0.01 level.

This notably important t-value indicates a considerable enhancement in higher mental abilityscores after utilizing the Magnet Brains App. Consequently, the null hypothesis ($Ho_2$), whichasserts that "There is no significant difference in higher mental ability in Science scoresbetween the control and experimental groups in the post-test," is dismissed in light of thesefindings.This significant result demonstrates a marked improvement in higher mental ability scoresamong students who used the Magnet Brains App.

Therefore, Hypothesis 2 ($Ho_2$), which stated that “There is no significant effect of the MagnetBrains App on higher mental ability,” is not accepted.Thus, it can be concluded that

the Magnet Brains App had a highly significant positive effecton the higher mental ability in science students of the experimental group.Barak and Dori (2009), Ifenthaler (2012), Wang (2011), Tsai, Hwang, and Tsai (2012), andYang and Wu (2012). supported the results of the study.

## DISCUSSION AND CONCLUSION

The present study aimed to evaluate the effect of the Magnet Brains App on students' cognitive development, particularly in terms of critical thinking and higher mental ability in science students. Two hypotheses were formulated and tested using both descriptive and inferential statistical methods. Hypothesis I not accepted. The statistical findings showed that the use of the Magnet Brains app led to significant improvements. The calculated t-value for critical thinking was 2.31, indicating a statistically meaningful enhancement. Hypothesis II is not accepted. The statistical findings indicated that the use of the Magnet Brains app resulted in significant improvements in higher mental ability. The calculated t-value for higher mental ability in science of the experimental group was 5.7, demonstrating a highly significant increase in students' Higher mental ability in science. Hence, in this present study on "Effect of Magnet Brains App on Critical Thinking and Higher Mental Ability in Science Students" proved to be significant.

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