

Influence of Scientific Aptitude on Mental Health of IX Grade ICSE Students

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Abstract

Scientific Aptitude refers to a person's inherent or developed ability to understand, analyze, and apply scientific principles and methods effectively. It involves critical thinking, problem-solving skills, logical reasoning, and a curiosity-driven mindset towards exploring the natural world scientific aptitude not only helps in solving problems but also develops intellectual ability and help to develop scientific temperament. Such individuals where scientific aptitude is more are found to be much involved in different constructivist activities. This research paper elaborated how scientific aptitude influence mental health ability and most recent and thoughtful topic of study. Researcher conducted a study to assess the **scientific aptitude and mental health of Class IX ICSE Board students** using standardized tools. The **Scientific Aptitude Test (SAT)** by Nagappa P. Shahpur and Dr. C.R. Rao was used to measure scientific aptitude, and the **Mental Health Battery** by Arun Kumar Singh and Alpana Sen Gupta was used for mental health assessment. A sample of **130 students** (boys and girls) was tested following standard procedures and scoring methods. Statistical analysis, including **t-test** and **ANOVA**, was applied to examine gender differences and the relationship between scientific aptitude and mental health. The results revealed **no significant influence** of Scientific aptitude on the mental Health abilities of Class IX ICSE students.

Keywords: Scientific Aptitude, Mental Health, Class IX students, ICSE Board.

Introduction:

Aptitude refers to the inherent qualities or capabilities of an individual that can be developed through appropriate training. It represents the **potential ability** of a person — that is, what an individual can achieve **without prior specific learning or experience**. Aptitude encompasses a set of abilities that are expressed through performance and is the result of the **interaction between heredity and environmental influences**. Individuals are born with certain innate potentialities, which are either nurtured or inhibited by their surrounding environment.

Aptitude tests, therefore, are designed to assess an individual's potential capabilities and are widely used to forecast success in various domains.

In the present study, the focus is on examining the **Scientific Aptitude** of **Class IX students** studying under the **ICSE board**, with the aim of understanding their potential to acquire and process scientific knowledge and skills.

Scientific Aptitude:

Scientific aptitude refers to a person's inherent or developed ability to understand, analyze, and apply

scientific principles and methods effectively. It involves critical thinking, problem-solving skills, logical reasoning, and a curiosity-driven mindset towards exploring the natural world.

According to Rao 1996, “Scientific aptitude is a complex of interacting hereditary and environmental determinants producing predisposition or ability in science .through these abilities, it is possible to predict future accomplishment of a person in science”

Scientific aptitude embodies a collection of essential traits that collectively nurture the **scientific temperament** of students. These traits — including **self-awareness, emotional stability, resilience, problem-solving skills, adaptability, empathy, stress management ability, and optimism** — form the foundation of a scientifically inclined mind. Scientific aptitude, at its core, is a **specialized ability** that empowers individuals to acquire, process, and understand scientific knowledge through active teaching and learning experiences.

By harnessing these traits, **constructivist approaches** in education foster **active learning, inquiry, reflection, and meaningful concept formation**. They promote **social interaction** and **collaboration among learners**, emphasizing the development of scientific processes and critical skills. Ultimately, these combined factors not only enhance an individual’s academic growth but also play a crucial role in shaping them into **smart, responsible citizens** equipped to meet the challenges of the modern world..

Mental Health : According to WHO Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It is an integral component of health and well-being that underpins our individual and collective abilities to make decisions, build relationships and shape the world we live in.

Individual psychological and biological factors such as emotional skills, substance use and genetics can make people more vulnerable to mental health problems.

The construct of **mental health** encompasses an individual’s capacity to establish and sustain affectionate interpersonal relationships, to competently perform culturally normative social roles, and to navigate transitions and challenges with adaptability. It further entails the ability to recognize, internalize, and articulate positive cognitions and behaviors, as well as to regulate emotional experiences such as sadness. Mental health confers upon the individual a profound sense of self-worth, agency, and a coherent understanding of both intrapersonal and environmental dynamics. According to the Society for Health Education and Promotion Specialties (SHEPS, 1997), optimal mental health is additionally characterized by positive self-regard, affirmative perceptions of others, and the experiential capacity for joy, contentment, and love.

Definition of term used:

Scientific Aptitude: Scientific aptitude refers to a student's inherent or developed ability to understand, analyze, and apply scientific concepts and principles. It includes logical reasoning, problem-solving skills, and comprehension of scientific information and processes.

Mental Health: Mental health is the state of emotional, psychological, and social well-being in which an individual can cope with daily stresses, maintain productive relationships, and function effectively in various aspects of life.

Class IX Students: This refers to students enrolled in the ninth grade of secondary school education, typically aged between 13 to 15 years, as per the Indian school system.

ICSE Board: The Indian Certificate of Secondary Education (ICSE) is an examination conducted by the Council for the Indian School Certificate Examinations, which follows a detailed and structured English-medium curriculum with a strong emphasis on science and humanities

Objective of the Study:

To study the influence of Scientific Aptitude of students on their Mental Health.

Hypothesis of the Research:

H₀ There is no significant influence of Scientific Aptitude of students on their Mental Health.

Delimitation of the study: The proposed study has been delimited in the following ways:

1. The study will be confined to students of Class IX of ICSE students only.
2. The study will be confined to only ICSE school (English Medium) that follows ICSE syllabus in Indore city.

Review of related literature

Sivaprakasam (2019) examined the interplay between scientific aptitude, mental health, and academic achievement in biology among higher secondary students. The study found a statistically significant difference between male and female students with respect to scientific aptitude and its associated dimensions. This suggests that gender may serve as a moderating factor in the development of scientific capabilities among secondary students. While the study highlights important gender-based distinctions, it would benefit from deeper exploration into the sociocultural influences that may contribute to these differences.

Similarly, Gupta and Rekha (2019) investigated the effects of scientific aptitude, academic anxiety, and study habits on academic achievement in science among secondary school students. Their findings indicated that students with higher levels of scientific aptitude significantly outperformed those with lower aptitude levels. Furthermore, a positive relationship was observed between effective study habits and academic achievement in science. This study underscores the importance of fostering both cognitive skills and academic behaviors for improving student outcomes. However, the correlational nature of the study leaves open the question of causality between study habits and academic success.

Shveta A Joshi (2023) conducted a study titled "*A Study of Scientific Aptitude and Achievement among Higher School Students of Sabarkantha District*," examining the interaction effects of socio-economic status, gender, and area of residence on various dimensions of scientific aptitude, including reasoning ability, numerical ability, scientific information, science vocabulary, and overall scientific aptitude. The study revealed that urban students demonstrated significantly better reasoning abilities compared to their rural counterparts. This finding suggests that environmental factors, such as access to better educational resources and exposure to enriched learning environments, might contribute to higher cognitive performance. However, the study did not fully explore the causal mechanisms behind these urban-rural disparities, leaving a gap for future research to address.

The studies revealed that Learning of science and understanding the concepts of science needs a special bent of mind of students which can be developed by creating an environment which can help them to study the subject willingly and not as a burden to score marks. At initial stages of studying of science, developing scientific attitude and scientific aptitude hold paramount importance.

Research Methodology

Design: The research design refers to the overall strategy that we choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring researcher will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data.

The study employed a **Descriptive Survey Method**, which is well-suited for exploring existing conditions and relationships among variables. This design was appropriate for collecting quantitative data on students' scientific aptitude and mental health levels using standardized tools.

Population

The population for the study comprised all Class IX students enrolled in ICSE board schools of Indore city.

Sample: A **non-probability convenience sampling technique** was adopted for selecting participants. A sample of **130 students** was selected through Purposive and convenient sampling method. Care was taken to ensure diversity in terms of gender and socio-economic background to enhance the representativeness of the sample.

The sample for the current study represents students of IX grade studying in ICSE schools of Indore city M.P.

The school was chosen based on accessibility and willingness to cooperate, and students were selected based on their availability during the scheduled test periods.

The sample for the current study represents students of IX grade of ICSE schools of Indore (M.P.). The school follows ICSE Science curriculum. Where, total number of Boys and Girls are as under:

Total number of Boys: 70

Total number of Girls: 60

Variable: Dependent Variable: Mental Health

Independent Variable: Scientific Aptitude

Tools used: The following tools were used for the study:

1. Scientific Aptitude Test (SAT) designed by Dr. Nagappa P. Shahpur and Dr. C.R. Rao
2. Mental Health Battery by Arun Kumar Singh and Alpana Sen Gupta

Reliability and Validity of the Scientific Aptitude test: Reliability coefficient was **0.8518**, which was found to be statistically significant at the $p < 0.05$ level. The **validity** of the Scientific Aptitude Test was established through both **content validity** and **intrinsic validity** measures.

Together, these findings provide strong evidence of the test's **psychometric robustness**, supporting its use in the current research for assessing scientific aptitude among secondary school students.

Reliability and Validity of the Mental Health: The values suggest the tool has satisfactory to high reliability, making it suitable for assessing the mental health of secondary school students. Test-Retest reliability range is from .876 to .823.

The Mental Health Battery has also demonstrated acceptable levels of **concurrent** and **construct validity**, confirming that it measures the intended psychological constructs. The validity coefficients are as follows:

Procedure of Data Collection

The research was conducted in **two phases**, on dates pre-approved by the school:

- **Phase 1:** Administration of the Scientific Aptitude Test.

- **Phase 2:** Administration of the Mental Health Battery.

Testing took place in a controlled classroom environment to minimize distractions. Each session was closely supervised by trained **invigilators**, who were instructed to guide students on how to correctly fill in the **OMR sheets**, resolve any doubts, and ensure smooth conduct of the session. Time was allotted as per the instructions in the manuals of the tools.

Organization and Scoring of the Data

Upon completion of the testing sessions, all OMR sheets were systematically collected, verified for completeness, and arranged roll number–wise to ensure proper organization. The scoring of the responses was conducted using the official scoring keys provided in the respective **test manuals** for both the **Scientific Aptitude Test** and the **Mental Health Assessment Battery**. This ensured consistency and accuracy in score interpretation.

The raw scores obtained from each student were carefully recorded into **Microsoft Excel spreadsheets**, maintaining a structured format that allowed for clear identification and comparison. Separate sheets were maintained for scientific aptitude scores and mental health scores to facilitate distinct analyses of each variable.

Following data entry, the dataset underwent a **cleaning and coding process** to eliminate any inconsistencies, address missing values, and prepare the data for statistical analysis. Coding was applied where necessary to categorize variables for further analysis. This organized dataset served as the foundation for conducting various **statistical procedures**, including *t-tests* and *ANOVA*, which were employed to test the stated hypotheses and examine the relationship between **scientific aptitude** and **mental health** among Class IX students.

Analysis and Interpretation:

The data collected from the pre-test and post-test scores was analyzed by calculating the mean values, SD, T-test and ANOVA

Table No. 1: Mean Square, Sum of Squares, df and f values for students of Class IX studying in ICSE board schools.

Mental Health * Scientific Aptitude	Sum of Squares	Mean Square	df	Fvalue	Sig.
Between Groups	3054.89	1527.44	2	12.17	.00
Within Groups	16054.76	125.42	128		

On the basis of table, it can be said that there was no significant influence of scientific aptitude on the mental health of class IX students studying in ICSE board. The F value at 12.17 which is not significant at 0.05 level of significance. Therefore, the null hypothesis ‘There is no significant influence of scientific aptitude on mental health of IX grade students studying in ICSE board’ is not rejected.

Results and Conclusion:

The study found no statistically significant influence of scientific aptitude on the mental health of Class IX students studying in ICSE board schools in Indore district. This indicates that the level of scientific aptitude among students does not have a measurable impact on their overall mental health status within the parameters of this study.

The absence of a significant relationship between scientific aptitude and mental health implies that a student's cognitive ability in scientific reasoning, problem-solving and related skills may not directly contribute to their emotional well-being, psychological stability or mental resilience. This highlights the multifaceted nature of mental health, which may be more strongly influenced by social, familial, emotional, and environmental factors rather than by academic or intellectual aptitudes alone.

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