

Mathematical Aptitude of Secondary School Students of Mizoram

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Abstract

This research paper has aimed to study the mathematical aptitude of secondary school students of Mizoram. The sample taken for the study is 137 students reading 10th standard in different school in Aizawl and its outskirt. Mathematical aptitude test developed and standardized by the researcher was used as a research tool. The findings indicated that the mathematical aptitude of secondary school students of Mizoram is low. It was also found that there are some significant differences between mathematical aptitude based on type of management of school but no difference concerning gender.

Key words: *Aptitude, mathematical aptitude test, gender, management.*

Introduction

Mathematics education is always a matter of big concerns in Mizoram since many students has poor performance in mathematics. Mizoram has literacy rate of 91.3% (2011 census), the third highest in India. But in spite of high literacy rate, there are still many low achievers in mathematics among students in each school stages and mathematics subject is the most dreadful subject. But this may not mean that low achiever students are not capable of learning mathematics. It is believed that many students have ability and potential to learn mathematics in spite of their poor academic performance in mathematics. At the same time, students with good marks in mathematics may not have ability to pursue further studies in mathematics related courses. Therefore, it is necessary to find the mathematical aptitude of secondary school students to know their exact position for their ability to learn mathematics.

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Mathematics Education

NCF 2023 stated that, “Mathematics education involves learning creative and logical thinking through fundamental concepts such as numbers and operations, geometry, algebra, probability, and statistics. It also aims to nurture the fundamental mathematical capacities of finding patterns, making conjectures, providing explanations through logical reasoning, creativity, problem-solving, computational thinking, and logical communication”. Mathematics Education is not only about learning how to master computing and calculation of numbers, but it is also about learning how to use our mind by inculcating logical thinking and brain storming.

The word ‘Mathematics’ is derived from the Greek word ‘**mathema**’ which means ‘that which is learnt’. According to Cambridge dictionary, “Mathematics is the study of numbers, shapes and space using reason, and usually a special system of symbols and rules for organizing them”. Mathematics involves measurement, counting, calculation, imagination, thinking, analysis, structuring and arrangement of numbers, quantities and physical objects. It includes the study of relation, formulas, space, abstracts, structure and changes of quantities. Mathematics involves logical reasoning which includes inductive and deductive reasoning. It uses creative thinking to create new knowledge and ideas. Mathematics can be considered as an art which is the expression of human mind by making use of numbers, symbols and logical reasoning. According to Courant and Robbins (1941), “Mathematics as an expression of the human mind reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality”.

Mathematics is an exact science. It is traditionally defined as the science of measurement, quantity, numbers and relations. Webster dictionary defined mathematics as, “the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their structure, measurement, transformations, and generalizations”. Some of the famous philosopher and mathematician give the definition of mathematics as follows:

Aristotle defined mathematics as “The science of quantity”.

August Comte (1851) defined mathematics as “The science of indirect measurement”.

Carl Friedrich Gauss (1777 – 1855) referred to mathematics as “The Queen of Sciences”.

Benjamin Pierce (1809 – 1880) called mathematics “the science that draws necessary conclusions”

From the above definition mathematics can be considered as science which deals with quantity, relations and reasoning which helps us to understand the world around us and to draw conclusion of certain problems.

Importance of mathematics

Mathematics has always occupied an important position in any school curriculum. It is the most important subject in the school because of its utility values. Actually, modern life is not possible without basic knowledge of mathematics. Basic knowledge in mathematics like counting, measuring, weighing, simple calculation, reasoning and structuring is important in day to day life in various walks of life. Each and every person starts a day by using mathematics with knowing or without knowing it. Every person use mathematics in their various occupations no matter what kind of job it is. From cook to engineer, rich and poor, low class and high class, literate and illiterate, mathematics is used in day to day interaction and it serve as a very important tool in various activities.

According to the National Curriculum Framework (NCF 2005), the main aim of mathematics in school is ‘the mathematisation of a child’s thinking’. Mathematics helps a child to think logically, to reason mathematically, to perceive and visualize abstract structure and pattern. Developing mathematical thinking is the heart of mathematics education. Mathematics helps in the development of mental capacity and it sharpens the mind to think precisely, logically, analytically and creatively. Kothari Commission (1964–66) recommended that science and mathematics should be an integral part of general education and should be taught on a compulsory basis till the end of school stage. It is included in the school curriculum because of its importance in day-to-day life and in developing intellectual power. It also helps to study other subjects easier as it is related to various subjects. Mathematics is considered as an important tool for learning science and it is the basis for all science. It helps in the development of scientific thinking. Learning mathematics in the school helps student to think decisively and rationally, and it inculcate problem solving skills among students to apply in their daily life.

Mathematical Aptitude

The word ‘aptitude’ is described as a ‘natural ability’ and also ‘a capacity for learning’ in Merriam Webster Dictionary. Mangal (2019) described aptitude as a special ability or specific capacity distinct from general intellectual ability which helps a person to acquire the required degree of achievement or success in a specific area. Aptitude is the ease with which a person will obtain a new skills or capacities. An individual is said to have an aptitude for a particular skill if he or she learns that skill more rapidly and with more ease than other persons with the same previous knowledge (Hayes & Straton, 2012). Some believes that aptitude refers to one’s inherited ability where as other believe that it refers to present ability or ease of acquisition of some skill (Chaube & Chaube, 2011).

Aptitude is an innate ability that can be facilitate or enhance for the future success. A person may not have current abilities to perform certain task but may have inborn ability to

be successful in the future. For example, a person may not be able to play piano but may have an aptitude for playing piano or any musical instrument which makes him/her to be good musician in the future if he/she receives proper training and guidance. So, aptitude has future implication and tries to predict the possibility of an individual's success in the future in the specific areas. An individual may not have an ability to perform certain unfamiliar task but may have ability in performing others task which is related to previous task. This shows that there is a chance that he/she has an ability to perform that particular task. For example, Lalremnga, a participant in Olympic archery for India has never shoot an arrow before he received training. But he has a great skill in using slingshot to shoot birds from his childhood which is a traditional weapon of tribal people of northeast India. Even though he didn't know how to use bow and arrow but Sport Authority of India (SAI) have seen his ability and believed that he would have skill in archery. So, SAI decided to give training for archery for which they have seen his future ability.

So, mathematical aptitude maybe explained as a natural ability to solve mathematical problems. It may also mean a capacity to learn mathematics. To have high mathematical aptitude is not the same as scoring good marks in mathematics or high achievement in mathematics. Student scoring good marks in mathematics may not have high mathematical aptitude. High achievement in mathematics may depend on one's study habits, high computational skills, learning styles, completing all the required works, memorizing theorem etc. whereas mathematical aptitude depends on a person's inborn potential and ability toward mathematics. So, mathematical aptitude cannot be enclosed to only computational skills (Dhyani, 2014). Mathematical aptitude refers to a person's potential toward mathematics to perform different mathematical operations. It may be an ability to visualize shape and structure, ability of abstraction to understand certain relationship, capacity of quick numerical calculation, logical thinking and reasoning. Mathematical aptitude refers to the qualities of an individual being able to learn mathematics or solve mathematical problem. It may be a natural ability or acquired capacity. According to Warrier and Baron-Cohen (2016), mathematical aptitude refers to normative variance in mathematical ability which includes several different components such as numerical ability and number processing, shape processing, mathematical modeling and non-numerical processes.

Mathematical aptitude is a natural ability that indicates a person's competency and proficiency in handling abstract mathematical ideas and it is an indicator of success in mathematics and other related field (Chauhan & Ranjan, 2024). So, mathematical aptitude refers to the qualities of an individual being able to learn mathematics or solve mathematical problem. It may be a natural ability or acquired capacity. According to Warrier & Baron-Cohen (2016), mathematical aptitude refers to normative variance in mathematical ability which includes several different components such as numerical ability and number processing, shape processing, mathematical modeling and non-numerical processes. To have high

mathematical aptitude is not same as scoring good marks in mathematics. Student who scores good marks in mathematics can have low mathematical aptitude. So, mathematical aptitude cannot be enclosed to only computational skills (Dhyani, 2014).

When given a right treatment under the right condition, an individual with high mathematical aptitude can have success in the field of mathematics and its related subjects. Therefore, it is important to assess the mathematical aptitude of an individual from an early age.

Review of Related Literature

Sonar and Patankar (2013) examined the mathematical aptitude of secondary school students with the test tools developed and standardized by the researchers. It was observed that most of the tested students have middle level mathematical aptitude. The study found that the mathematical aptitude of boys and girls is not different. It was also found that secondary school students in urban area have more level of mathematical aptitude than those in rural area.

Dhyani (2014) conducted a study on mathematical aptitude in relation to intellectual and problem solving abilities of secondary level students. The result showed that the mathematical aptitude was positively and significantly related with intellectual and problem solving abilities. The results also revealed that public school shows a positive significant role in determining the three variables. The science stream is found to possess highest mathematical aptitude level, intellectual abilities and problem solving abilities which indicates that stream has a significant impact on the three variables.

Bala (2014) studied the relationship between mathematical aptitude and mathematical achievement. Mathematical aptitude test, developed and standardized by the investigator, was used for the investigation. The study found that mathematical aptitude plays an important role as a predictor of mathematical achievement. It was also found that students of science stream have more mathematical aptitude than arts stream. Boys and girls do not differ much in mathematical aptitude whereas urban students have more mathematical aptitude than rural students.

Kaur (2016) investigated the contribution of creativity, learning styles and mathematical aptitude on academic achievement of high school students in mathematics. The results of the study showed that there is a positive significant relationship between mathematical aptitude and academic achievement in mathematics. It was also found that male and female do not differ significantly with regard to academic achievement in mathematics, creativity, learning styles and mathematical aptitude. It was found that academic achievement, creativity, and mathematical aptitude of Government and Private school differ significantly in which student of Private School showed higher creativity, academic achievement in mathematics and mathematical aptitude as compared to students of Government School. On the other hand, learning styles of Government and Private School do not differ significantly.

Kumaravelu (2018) conducted a study on information processing skills and mathematical aptitude of higher secondary school students. He studied the role of mathematical aptitude when incorporated with information processing skills, in building the linkage between student's mathematical ability and achievement. The study found that there is a positive relationship between academic achievement in mathematics and general mathematical aptitude. It was also found that there is a positive relationship between information processing skills and general mathematical aptitude of secondary school students.

Manikandan & Ambedkar (2022) studied the mathematical aptitude of secondary school students in Salem District. The sample consisted of 100 students, 50 male and 50 female from similar background. The results showed that students have good mathematical aptitude which was above average. The results also showed that the mathematical aptitude of secondary school students was unaffected by gender, geographical location and type of management of school.

Chauhan & Ranjan (2023) tried to find the mathematical aptitude of future teacher. The study was conducted among teacher trainees of different colleges under Indian Institute of Teacher Education. The sample consisted of 168 prospective teachers. The study found that male and female teacher trainees do not have same Mathematical aptitude. It was also found that DIET and Govt. college trainees have same mathematical aptitude.

Objectives of the Study

1. To find out the mathematical aptitude of secondary school students in Aizawl district, India.
2. To compare the mathematical aptitude of secondary school students of Aizawl district with respect to
 - a. Gender
 - b. Type of management of the school

Hypotheses

1. There is no significant difference in mathematical aptitude among secondary school students of Aizawl district of male and female.
2. There is no significant difference in mathematical aptitude among secondary school students of Aizawl district of Private school and Government School.

Delimitation of the Study:

1. The study is delimited to 10th standard of secondary school students only.
2. The study is delimited in secondary schools of Aizawl District.

Method of Study

The study was conducted on secondary school students studying 10th Standard. There were 137 respondents who were participated in this study. The respondents were students from secondary schools in Aizawl district, Mizoram. All the respondents were standard – X from private schools and government schools. The respondents were given mathematical aptitude test which was developed by the researcher. There were 20 test items which were multiple choice questions and it was based on six dimensions namely numerical ability, ability to use symbol and formula, verbal skills, spatial sense, problem solving skills, logical reasoning and abstract reasoning. It consisted of arithmetic, algebra, geometry and reasoning.

Analysis and Interpretation of Data

Table No. 1: Mathematical Aptitude of Secondary School

No. of Student	Minimum Score	Maximum Score	Mean	S.D
137	2	18	8.3	3.9

Observation: From Table No.1 it is observed that –

1. The minimum score of secondary school students in Mathematical Aptitude test is 2 whereas the maximum score is 18.
2. The mean score of secondary school students in mathematical aptitude test is 8.3 and SD is 3.9

Interpretation: From Table No.1 it can be seen that the mean score of students in mathematical aptitude is 8.3 which indicates that the mathematical aptitude of secondary school students in Mizoram is quiet low.

Table No.2 : Level of Mathematical Aptitude of Students

Total No. of Students	Level	No. of Student as per level	Percentage
137	Low (1 to 7)	64	46.7
	Average (8 to 12)	51	37.2
	High (13 to 20)	22	16.1

Observation: It is observed from Table 2 that about 64 students have low level of Mathematical Aptitude which comprised of 46.7%. There were 51 students who have average level of Mathematical Aptitude which comprised of 37.2%. About 22 students, which is 16.1%, have high level of Mathematical Aptitude.

Hypothesis No.1: *There is no significant difference between male and female of secondary school students in their mathematical aptitude.*

Table No.3: Comparison of Male and Female secondary school students of Mizoram in their Mathematical Aptitude

Groups	Number	Mean	SD	Df	t-value	Level of Significance
Male	61	9.049	4.36	114	-1.925	0.05
Female	76	7.724	3.51			

Observation: It is observed from table No.3 that -

- 1) The mean value of Mathematical Aptitude of secondary school male students is 9.049 and SD is 4.36
- 2) The mean value of Mathematical Aptitude of secondary school female students is 7.724 and SD is 3.512
- 3) The calculated 't' value is found to be -1.925 which is less than the critical value 1.98 at 0.05 level of significance.
- 4) Therefore, the hypothesis No.1 is accepted at 0.05 significant level.

Interpretation: Thus, from the above observation it may be inferred that the mathematical aptitude of male and female secondary school students of Aizawl District is not different.

Hypothesis No.2: *There is no significant difference between male and female of secondary school students in their mathematical aptitude.*

Table No.4**Comparison of Government and Private secondary school students of Aizawl District in their Mathematical Aptitude**

Groups	Number	Mean	SD	df	t-value	Level of Significance
Govt. School	37	5.784	3.23	75	5.357	0.05
Private School	100	9.28	3.79			

Observation: It is observed from table No.4 that -

- 1) The mean value of Mathematical Aptitude of Govt. secondary school students is 5.784 and SD is 3.232
- 2) The mean value of Mathematical Aptitude of Private secondary school students is 9.28 and SD is 3.787
- 3) The calculated 't' value is found to be 5.357 which is less than the critical value 1.99 at 0.05 level of significance.
- 4) Therefore, the hypothesis No.2 is rejected at 0.05 significant level.

Interpretation: Thus, from the above observation it can be interpreted that there is a significant difference in mathematical aptitude of Govt. and Private secondary school students of Aizawl District.

Conclusion

The study concluded that mathematical aptitude play an important role in knowing capacity of students in mathematics and predicting future career. The study revealed that students have low level of mathematical aptitude. There is a significant difference between mathematical aptitude of Private school and Government school but no difference between male and female.

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