APTITUDE FOR MATHEMATICS AS PREDICTOR OF MATHEMATICAL ACHIEVEMENT

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Abstract

An aptitude is the potentiality a personto succeed in an occupation and school attainments. Mathematical aptitude is, however, a present condition, a pattern of traits deemed to be indicative of his/her future potentialities. The present paper includes the study of aptitude for mathematics as predictor of mathematical achievement,the relationship between mathematical aptitude and achievement in mathematics; and comparison of the mathematical aptitude in arts and science; male and female; urban and rural groups. Random sampling technique was used to study the present problem. Sample was collected in two stages. 756 students of 10+1 class of Arts and Science faculties from different schools situated in rural and urban area of boys and girls of Punjab state. Mathematical Aptitude Test constructed and standardized by the investigator was used as a research tool. Major findings of the study were mathematical aptitude of arts and science groups differ significantly; Boys and girls do not differ much in mathematical aptitude and there is significant difference in the mathematical aptitude of rural and urban groups.

Keywords : *Mathematical Aptitude, Mathematical Achievement*

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 (Courant and Robbins,1941). According to Chamber's Twentieth Century Dictionary (1970), "Mathematics is the science of magnitude and numbers and of all their relations." A large variety of occupations are available these days to persons having a degree or post-graduate qualifications in mathematics. There are four broad areas in which the services of mathematicians are generally needed. These are :

(a) Teaching in schools, colleges and universities;
(b) Application of Mathematics, Mathematical Statistics and Operational Research ;
(c) Computer programming;
(d) Actuary Mathematics.

An aptitude is a unique combination of abilities and personality characteristics which predisposes a person to do one kind of work better than another and increases his chances of success in it. An aptitude, therefore, is not a unitary trait of human personality. For example, aptitude for mathematics involves basic intellectual qualities like logical learning, abstract thinking, arithmetical reasoning, certain temperamental qualities like interest in experimentation and initiative for invention, personality characteristics like persistence and hard work. An aptitude is largely acquired, though in many cases it has an innate basis. Aptitude of an individual at a particular moment is in all the probability, dependent upon both heredity and environment.

An aptitude test is one, designed to measure a person's potential ability in an activity of a specialized kind within a restricted range. There are various aptitude tests at present for a number of areas of performance such as those involved in various occupations in trades and industries, various broad areas of performance commonly deals within the school. The various types of aptitude tests largely possess in common characteristics of testing i.e. the individual's potentialities in terms of specific abilities resulting from inheritance and general experience.

There are many specialized aptitude tests for measuring the aptitude for various traits like clerical aptitude tests, differential aptitude tests, musical aptitude tests and scientific aptitude tests. Aptitude also plays a very important role in the development of the personality of an individual. Hence it becomes one of the most important function of the counselor to find a particular aptitude in child.

As our society becomes more and more dependent on high levels of computer-based technology, it becomes increasingly important that children should grow up with a basic competence and familiarity with numbers, and they should feel at home in the world of calculation and computation. Of course, there are many children who easily develop a familiarity with numbers, yet there are also many

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children who think that mathematics is like learning a foreign language and approach numerical problems with a mixture of confusion and helplessness. Some of these children manage to grasp the concepts in school, by picking up a collection of techniques, tricks and rules of thumb. These may suffice them to get through the exams, but they may be only hazily understood. Other children do not do this, and remain totally at sea. Pedagogical psychology has proved that aptitude of the children and youth are shaped and developed in the process of activity, requiring the utilization of those qualities of a personality which form abilities to this kind of activity. The experts of the UNESCO Planning Mission (1985) found that in many schools of India the work is under way in developing the abilities of pupils. A number of schools organize, during and out of classes activities; in which the pupils show aptitude. Here is an example of Bombay Multipurpose School 'Amulakh Amirchand' which launched various creative activities for pupils in its club.

Mathematics is one of three R's (Reading, Writing and Arithmetic). Knowledge, skill and attitudes as objectives to achieve are vital for each student. Pupils possess different intelligence and diverse learning styles. In any classroom, there are highly motivated pupils who work hard and do well in attaining vital goals. At the same time there are less motivated pupils and their attention remains divided between the lesson and distractions in the classroom. Learners need quality objectives, learning opportunities and evaluation procedure to achieve as optimally as possible in mathematics. Difference in mathematical achievement among pupils may be due to many factors.

Mathematics in not just for the gifted and talented pupils, but each and every pupil needs to develop proficiency in the use of above said objectives to gain higher mathematical achievement. By knowing the mathematical aptitude of the child, he can be guided to adopt such a profession which requires the mathematical knowledge and mathematical insight. It is said that mathematical aptitude is related to academic achievement. In other words, mathematical achievement of a child to a great extent depends upon his mathematical aptitude.

Objectives of the Study

1 To develop and standardize Mathematical Aptitude Test.
2 To study the relationship of mathematical aptitude and achievement of students in mathematics.
3 To compare the mathematical aptitude of arts and science; male and female; urban and rural groups.

Sample and Sampling Technique

Samples were drawn in two stages. Stage I- At this stage of sampling, the sub-samples were selected for different steps of standardization of Mathematical Aptitude Test: Preliminary try out of the Mathematical Aptitude Test was done on a sample of 40 students. Then final try out of Mathematical Aptitude Test was done on a sample of 200 students and reliability of the scale was found on a sample of 30 students. Stage II- At the second stage of study, a multi staged randomization technique of sampling was employed. Out of all the districts of Punjab random selection of sample resulted in the selection of 756 students.

Procedure

Collection of data was completed in two stages. In the first stage, data was collected for the construction and standardization of mathematical aptitude test. After having standardization of mathematical aptitude test, it was administered to students of 10+1 class of Arts and Science faculties from different schools situated in rural and urban area of boys and girls of Punjab state. Pearson's Product Moment Coefficient of Correlation was used to find out relationship of mathematical aptitude with academic achievement of students in mathematics. t-ratio technique was used to compare different groups of students-arts and science students, male and female students, rural and urban students on mathematical aptitude.

Measures

Mathematical Aptitude Test (constructed and standardized by the investigator). Academic achievement has been measured by the marks obtained by the students in the subject of mathematics in the X class final examination conducted by Punjab School Education Board, Mohali.

Results and Discussion

Table 1.

The values of coefficient of correlation between independent variable of mathematical aptitude and dependent variable of mathematical achievement

Independent Variables	The values of coefficient of correlation with dependent variable of Mathematical Achievement.
Mathematical Aptitude	0.424

The variable of mathematical aptitude was positively significantly correlated with the dependent variable of mathematical achievement of the students at 0.01 level of significance (r=0.424). In other words, the result of the present study clearly reveals that mathematical aptitude and mathematical achievement of students go hand in hand with each other and mathematical aptitude is a powerful determinant of deciding their mathematical achievement.

Table 2.
Values of mean, standard deviation and t-ratio to locate the difference in mathematical aptitude of students due to faculty differences

Name of Variable	Group	N	M	SD	SE_D	t-ratio	Level of Significance
Mathematical	Arts	383	14.68	4.67	0.36	5.50**	.01
Aptitude	Science	373	16.66	5.18			

** Significant at 0.01 level.

Table 2 shows that significant difference in the mean scores of students due to faculty differences was found at 0.01 level (t=5.50). After comparing the mean scores on mathematical aptitude test, it is found that mean score and standard deviation of science students (M=16.66, SD=5.18) is more as compared to mean score and standard deviation of arts students (M=14.68, SD=4.67). It means that the students of science group has more mathematical attitude than students of arts group.

Table 3.
Values of mean, standard deviation and t-ratio to locate the difference in mathematical aptitude of students due to sex differences

Name of Variable	Group	N	M	SD	SE_D	t-ratio	Level of Significance
Mathematical	Male	383	15.71	5.44	0.36	3.53**	Not
Aptitude	Female	373	15.60	4.56			Significant

Table 3 shows that there is no significant difference in the mean scores of students of male and female group (t= 0.30). It means boys and girls do not differ much in mathematical aptitude although after comparing the mean scores, it is found that mean score and standard deviation of males(M=15.71, SD=5.44) are slightly higher as compared to mean score and standard deviation of females (M=15.60, SD=4.56) on the variable of mathematical aptitude.

Table 4.
Values of mean, standard deviation and t-ratio to locate the differences in mathematical aptitude of students due to rural urban differences

Name of Variable	Group	N	M	SD	SE_D	t-ratio	Level of Significance
Mathematical	Rural	369	15.00	5.03	0.36	3.53**	.01
Aptitude	Urban	387	16.28	4.94			

** Significant at 0.01 level.

Table 4 shows that significant difference in the mean score of rural and urban group was observed on the variable of mathematical aptitude (t= 3.53). It depicts that though urban students differ significantly from rural students at 0.01 level on mathematical aptitude test but the mean value of urban students (M=16.28) is on higher side than rural students (M=15.00). It means urban students have more mathematical aptitude than rural students. Whereas, the value of standard deviation of rural students (SD=5.03) is more as compared to urban students (SD=4.94).

Conclusions

1. Mathematical aptitude plays significant role in the achievement of the students in mathematics.

2. There is significant difference in the mathematical aptitude of arts and science groups.

3. Boys and girls do not differ much in mathematical aptitude.

4. There is significant difference in the mathematical aptitude of rural and urban groups.

Educational implications

1. To ensure that teachers should apply valuable ideas in classroom teaching for pupils to achieve higher in mathematics.
2. As our society has become more and more dependent on high levels of computer-based technology, therefore, it has become is important that children should grow up with a basic competence and familiarity with numbers as Mathematical achievement of a child to a great extent depends upon his mathematical aptitude.
3. It is essential to organize during and out of classes activities in schools in which the pupils show mathematical aptitude.

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