

Some Variables of Effective Dimension in Relation to the Achievement in Mathematics at Secondary Stage

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ABSTRACT

In this study two variables of effective dimensions viz. mathematical ability and attitude towards mathematics related to mathematics have been taken and their relation on the achievement in mathematics has been studied to the pupils at secondary stage. A sample of 500 students of standard IX from secondary school of south kamrup district, Assam, participated in the present study, in which the relationship among the achievement in mathematics was most closely related with mathematical ability and attitude towards mathematics. Mathematical ability is the combination of Arithmetic ability, algebraic ability and geometric ability. Result of the study shows that:-

- a) The Relative contribution of arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics is given by the equation $AIM = -9.764 + 0.739 * ARA + 0.780 * ALA + 0.387 * GA + 0.966 * ATM$ Where AIM=Achievement in Mathematics, ARA = Arithmetic Ability, ALA=Algebraic ability, A=Geometric ability, ATM=Attitude towards mathematics
- b) Arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics contributes 36.6%, 38.0%, 27.5%, and 25.9% respectively to the variance in mathematics achievement of the subject having a statistically significant contribution.
- c) The Four independent variables jointly contribute 0.548 (54.8%) to the variance of the achievement in mathematics

Keywords: Mathematical ability, Arithmetic ability, algebraic ability, geometrical ability, Attitude, Achievement

1. INTRODUCTION

Modern cyber era is full of competition. In this age everyone has developed a competitive test to compare with others to achieve life goals. Education, the foremost weapon for social reform, is now forces of changes. In the present educational system more and more importance is given to the achievement of students in their academic and related activities.

Knowledge of basic concepts of mathematics is very important, confidence in learning mathematics, conceptual forerunner to math self efficacy, has consistently been found to predict math-related performance (Hackett, 1985)[1]. The report of the Indian Education Commission (1966) recommended that "Science and mathematics should be taught on a compulsory basis to all pupils as a part of general education during the first ten years of schooling". The commission laid emphasis on science and mathematics on account of these two subjects in the technological age.

The National Policy of Education (1986) [2] has considered the importance of mathematics in general education and suggests that mathematics should be visualized as the vehicle to train the child to think, reason, analytic and articulate logically. Attainment in mathematics is very much based on the mastery of

fundamental skills. The present school curriculum demands rapid learning clear understanding of frequently changing syllabus and new curriculum. Mathematics education in school curriculum, especially at secondary school stage, is very necessary and important. The natural scope of mathematics, and its unique role in solving problems in day-today-activities, mathematics has been considered as one of the core subjects in curriculum at the secondary school level.

Due to the rapid advancement in the field of science and technology, use of computers and other devices there is a more emphasis on mathematics. In modern world, mathematics is being increasingly used in science, technology industry, education, life science etc. Attitude is a general tendency of an individual to act in a certain way under certain conditions. Attitude towards mathematics is the feeling and emotions of mathematics. N.K.Dutt (1978)[3] says "Attitude underlie many of the significant dramatic instances of man's behavior"

The studies carried out in the area of effect on achievement in mathematics to the individual influence of arithmetic ability, algebraic ability, geometrical ability and

attitude towards mathematics. The investigator went through the literature and found that little work was done relating mathematics achievement with the independent variables like arithmetic ability, algebraic ability, geometrical ability and attitude towards mathematics considered individually. But no work was undertaken combining all the above factors and percentage of contribution of each variable in achievement in mathematics.

2.1 Significance of the study

There are many factors, which influence the Achievement in mathematics. It is need of the hour to identify factors related to mathematics learning & teaching which results in "Pupils Achievement in Mathematics". There should be scientific research in this respect.

In India and abroad numbers of studies are done in this respect but in our North East number of studies in this area are very few. Some of these studies already done are mentioned below:

The number of affective variables influencing the learning of mathematics was examined by Reyes (1984)[4]. This variables include self- concept, mathematics anxiety, attribution, and perceived usefulness of mathematics. Davis (1973) suggested that attitude may plays important role in problem solving behavior, and that confidence in one's ability to solve problems often enhances problem solving performance.

Jain S.L. and Burad G.L 1988[5]: Studied "Low results in mathematics at secondary examination in Rajasthan" He found that there are some administrative and academic causes for low results in mathematics. In the academic side he found that non availability of mathematics teacher due to late appointment and frequent transfers, lack of infrastructure, teacher's habit of leaving of classroom etc. are some factors for under achievement in subject mathematics. A low standard in the lower class, non availability of the book, lack of timely correction of home work, overcrowded classrooms, lack of sufficient periods for the subjects were some of the academic causes.

Rosaly.A.1992.[6] Studied "the relationship between attitude of students towards mathematics and achievement." He found that -urban boys and girls had a more positive attitude towards mathematics than rural boys and girls. He also found that girls were higher than boys in their achievement in mathematics. The attitude of high school students towards learning mathematics and their achievement mathematics were related.

. Students of grade IX and X do not significantly in the study habits and attitude towards study.

Patel. Chatur.P.1997[7]: Studied "attitude of secondary

school students towards study of mathematics" In this study he found that sex is a significant factor in developing the attitude towards the study of mathematics. The boys have more +ve attitude than girls. To develop a more +ve attitude towards mathematics, girls must be given various educational programmed and practice in mathematics.

He also found that attitude of urban area students are more positive than that of rural one, towards mathematics. Area and sex have no significant difference in the attitude towards mathematics. Moreover, from the theoretical considerations we may assume that some of the variables play important role in the academic achievement of mathematics. Three variables that affect the achievement in mathematics have been identified for this study: Mathematical ability viz. arithmetic ability, algebraic ability, geometrical ability, and attitude towards mathematics

2.2. Problem of study

In general most of the work on the variables of effective dimensions has been their effect on general academic achievement. But, studying of mathematics and nature of problem solving always depends on these variables.

2.3 Objective of the study

1. To find out the significant relationship between the student's achievement in mathematics and arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics separately and jointly.
2. To study the significant difference achievement in mathematics, arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics to the variance of achievement in mathematics of IX standard students.
3. To determine the relative contribution of the arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics to the prediction of achievement in mathematics.

2.4 Sample

The Normative survey method was used for the present study. For this purpose a sample of 500 secondary school students from secondary schools of South Kamrup district were selected at random from the population of standard IX, selecting 25 students from each school.

2.5 Collection of Data

The data was collected from 20 schools after taking permission from the school authority. The investigator analyzed 500 data with the help of SPSS Software.

2.6 Tools

Five main instruments were used to collect data for the study. They are:-

- (a) Mathematics achievement test: This has its content based on senior secondary mathematics syllabus and contains multiple choice items and validated with the assistance of some senior secondary school teachers.
- (b) Arithmetical ability inventory: This was constructed and validated with the assistance of some senior secondary school teachers.
- (c) Algebraic ability inventory: This was constructed and validated with the assistance of some senior secondary school teachers.
- (d) Geometrical ability inventory: This was constructed and validated with the assistance of some senior secondary school teachers.
- (e) Attitude towards mathematics inventory: To enquire the attitude of the pupils a standardized inventory was used to measure attitude towards mathematics of the pupil.

2.7 Data collection

The investigator collected the data by visiting the schools. Five tools were used for analysis of data.

2.8 Data analysis

Correlation and multiple regressions were used for analysis of data.

2.9 Hypotheses Testing

H1) There is no significant relationship between arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics and academic achievement of mathematics of IX standard students.

H2) There is no significant difference to the variance of arithmetic ability, algebraic ability, geometrical ability and attitude towards Mathematics and achievement in mathematics of IX standard students.

Table-I

r-value for Achievement in Mathematics and Arithmetic ability, Algebraic ability, Geometrical ability and attitude towards mathematics

Sl. No.	Independent Variables	Dependent Variables	r-value	Relation
1	ARA	AIM	.605	Significant
2	ALA	AIM	.616	Significant
3	GA	AIM	.524	Significant
4	ATM	AIM	.618	Significant

NOTE: AIM= Achievement in mathematics, ARA= Arithmetic ability, ALA=Algebraic ability, GA=Geometric ability ATM= Attitude towards mathematics.

Table -II

Mean achievement and S.D of the subjects on ARA, ALA, GA and ATM.

Variables	N	Mean	S.D
AIM	500	38.03	22.37
ARA	500	15.28	8.05
ALA	500	14.99	8.21
AGA	500	11.84	8.44
ATM	500	20.94	6.10

Table-III

ANOVA of regression of achievement in mathematics on ARA, ALA, GA and ATM.

	df	S.S	MS	F-Value	p-Value
Model	4	136837.0	34209.254	150.093	.000
Error	495	112820.5	227.920		
Total	499	249657.5			

Table- IV

R and R2 of regression of achievement in mathematics on ARA, ALA, GA and ATM.

	ARA	ALA	AGA	ATM	ARA+ALA	ARA+ALA+G A	ARA+ALA+GA+AT M
R	.605	.616	.524	.509	.684	.701	.740
R²	.366	.380	.275	.259	.467	.491	.548
Adj. R²	.365	.379	.273	.258	.465	.488	.544

Table-V

The relative contribution of ARA, ALA, GA and ATM to the prediction of achievement in mathematics

	Beta	Sd. Error	T value	p-value
intercept	-9.764	2.483	--3.933	<.0.01
ARA	.739	.112	6.585	<.0.01
ALA	.780	.108	7.223	<.0.01
AGA	.387	.100	3.866	<.0.01
ATM	.966	.122	7.900	<.0.01

(i) From table-I it may be observed that the r-value of Arithmetical ability, Algebraic ability, Geometrical ability and Attitude towards mathematics on achievement in mathematics are 0.605, 0.616, .524 and 0.618 respectively. All these values are much closed to one. So arithmetical ability, algebraic ability, geometrical ability and attitude towards mathematics to the achievement in mathematics are significantly related. So it may be concluded that the student who has the high mathematical ability (i.e. Arithmetical, algebraic and geometrical ability) and high attitude to the subject mathematics imply the high achievement in mathematics.

(ii) From table-(III) it may be observed that the regression is statistically significant with $F = 150.09$ (significant beyond < 0.01). This implies that the three variables ARA, ALA, GA and ATM have contributed significantly to the variance in achievement in mathematics

(iii) From table-(IV) it may be observed that the relative contributions of the independent variable to the variance of achievement in mathematics with the adjusted R2 value of 0.366 (36.6%), 0.380 (38%), .275(27.5%) and .259 (25.9%) for ARA, ALA, GA and ATM respectively. Again the three independent variable ARA, ALA, GA and ATM re-

spectively jointly contribute 0.548 (54.8%) to the variance in the dependent variable achievement in mathematics.

(iv) From table-I it may be observed that the contribution of variables – arithmetical ability (36.6%), algebraic ability(38%), geometrical ability (27.5%) and attitude towards mathematics (25.9%) are statistically significant with t-values of 6.585, 7.223,3.866 and 7.900 respectively. By using the beta values from table 4, the regression equation for the relationship is given as:

(v) $AIM = -9.764 + .739 * ARA + .780 * ALA + .387 * GA + .966 * ATM$

3 FINDINGS OF THE STUDY

1. Mathematical ability (ARA, ALA, and GA) and achievement in mathematics are significantly related.
2. Attitude towards mathematics and achievement in mathematics are significantly related
3. Regression is statistically significant and the four variables ARA, ALA, GA and ATM have significant contribution to the variance of Achievement in Mathematics.
4. The three independent variables jointly contribute .548 (54.8%) to the variance of the achievement in mathematics.
5. The Regression equation for the relationship is given by-
 $AIM = -9.764 + .739 * ARA + .780 * ALA + .387 * GA + .966 * ATM$

4 CONCLUSION

The present study helps to provide a clear picture of contribution of the effective variable to the achievement in mathematics. The entire variable has made significant contribution to the variance in achievement in mathematics of the student. The better individual ability of different branches measures the Excellency in mathematics. From this study we may conclude that favorable attitude towards mathemat-

ics has impact in achievement in mathematics .It is also found that total effect of arithmetical , algebraic and geometrical ability are the variables of effective dimension on the variance in the score of achievement in mathematics of secondary school pupils followed by the attitude.

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