

## SCIENTIFIC APTITUDE AND ACHIEVEMENT IN MATHEMATICS OF STUDENTS IN SIKKIM

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### ABSTRACT

*Aptitude measures the scholastic competence in a specific area. Mathematics is the father of all Sciences and it enjoys a unique status in the School Curriculum. Mathematics is visualized as the vehicle to train a child to think, reason, analyse and articulate logically, concomitant to any subject involving analysis and reasoning. Achievements in Mathematics are considered as the yardstick in the field of Science and Technology. The objectives of the study were to estimate the level of Scientific Aptitude of students in relation to Science stream, gender, locale and to ascertain relationship between Scientific Aptitude and Achievement in Mathematics at Senior Secondary level. The Descriptive method of Normative Study type was adopted. A sample of 100 students was selected by simple random sampling. Scientific Aptitude Test (SAT) tool developed by Shahapur and Rao (2006) was used for the study. The findings of the study were that boys possess more Scientific Aptitude than girls, Scientific Aptitudes of Urban students are more than of rural students and Positive Substantial Correlation exists between Scientific Aptitude and Achievement in Mathematics.*

***Key Words: Aptitude, Scientific Aptitude, Achievement in Mathematics etc.***

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### INTRODUCTION

Aptitude is a combination of abilities or characteristics to develop some proficiency in specific field. Aptitude is always potential whereas intelligence is kinetic. It measures innate or acquired talent all respects. Aptitude measures the scholastic competence in a specific area. According to Gronlund and Thorndike (1991), "The future performance of students can be predicted through the aptitude testing". Standardized Aptitude tests are designed to predict future performance of student's activity. Scientific Aptitude Test (SAT) is intended to measure the potential ability of a person to pursue as course of training in the field of Science related subjects. Scientific Aptitude test combined with the other relevant information received, would help to a greater extent in avoiding considerable wastage of human as well as material resources by placement of individuals in places and lines of work in which they are most likely to be productive. Achievements in Mathematics are considered as the yardstick in the field of Science and Technology.

Mathematics is the father of all Sciences and it enjoys a unique status in the School Curriculum. Mathematics is visualized as the vehicle to train a child to think, reason, analyses and articulate logically, concomitant to any subject involving analysis and reasoning. Achievement in Mathematics helps to inculcate the skills of quantification of experiences around the learners who in turn carry out experiments with numbers and form of Geometry, frame hypotheses and verify them generalize the findings with proof, make decisions applying Mathematics, develop precision, rational and analytical thinking reasoning, competence to solve problems, positive attitudes and aesthetic sense. The concept of achievement involves the interaction of three factors like aptitude, readiness and opportunity of learning. Srivastava (2011) conducted a study of creativity among higher students in relation to scientific aptitude and attitude towards Science and major findings of which showed a relationship between scientific aptitudes and creativity, at the same time significant sex differences in aptitude, creativity

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and attitudes towards science existed. Rao (2012) conducted research study on 'Scientific Attitude, Scientific Aptitude and Achievement', to identify the levels of these three present in secondary school students are with average scientific attitude, scientific aptitude and achievement in Biology. The Scientific Attitude, Scientific Aptitude and Achievement in Biology have a significant positive Inter relationship. Elizabeth (2013) conducted a study, 'Sex differences in intrinsic aptitude for Mathematics and Science: A critical Review' and found that males have a profile of spatial and numerical abilities producing greater Aptitude for Mathematics. Hyde and Linen (2014) conducted a study on Gender similarities' in Mathematics and Science. The major findings of the study were that Boys and Girls have similar psychological traits and cognitive abilities; thus a focus on factors other than gender is needed to help girls in Mathematical and Scientific Career tracks. Zhu Zheng (2015) studied gender differences in mathematical problem solving patterns and major findings were that, there are gender differences in mathematical problem solving favouring males.

#### **RATIONALE OF THE STUDY**

Scientific Aptitude is a compound of abilities. These are developed through learning. These abilities include, suspended Judgment, detection of fallacies and inconsistencies, reasoning logically and originally, drawing correct inductions and deductions. Mathematics being allied topic, demand much more Scientific Aptitude in students. In the context of an overhauling change in the system and demand for inculcation of cognitive abilities in the students, it is indispensable to promote mechanical reasoning, spatial relation and classification analogy, numerical, verbal, pictorial reasoning in students. Because of the high demands in this Science and Technological World, a learned society apt in Mathematics, is required. There has been a pressure on classroom teaching process, whereby the students can be encouraged to develop such abilities. Therefore a research to identify and

evaluate the teaching learning process in Mathematics in our schools has been obligatory. Whether our teaching- learning process is in tune with the inculcation of such abilities with the development of Scientific Aptitude of students are functioning or not, to ascertain this, the present attempt is an endeavour by the investigator.

Therefore, the study was aimed at measuring Scientific Aptitude of Science students offering Mathematics as subject of their study at Senior Secondary level. Because Mathematics incorporate development of reasoning power, draw correct inductions and deductions, detect fallacies and inconsistencies, suspended judgment etc., of students and Scientific aptitude test is based on the characteristics like Experimental bent, Ability to Reason, Detection of Illogical conclusion, Ability to draw conclusion from the given Data, Ability to interpret, Scientific interest, ability to solve general problems accuracy of observation etc. So the investigator had been inclined to undertake the study to find out the relationship between Scientific Aptitude and Achievement in Mathematics. This was the strong rationale for the conduct of the present study. Keeping in view of the above rationale the problem of the study being entitled as, 'Scientific Aptitude and Achievement in Mathematics of students in Sikkim'.

#### **OBJECTIVES OF THE STUDY**

The following objectives had been formulated in relation to the study.

1. To estimate the level of Scientific Aptitude of students studying Science stream at Senior Secondary level.
2. To determine the significant difference in the level of Scientific Aptitude with respect to variables like gender and locale.
3. To ascertain relationship between Scientific Aptitude and Achievement in Mathematics at Senior Secondary level.
4. To compute the interaction effect of gender and locale on Scientific Aptitude and Achievement in Mathematics.

5. To predict scores of Achievement in Mathematics from the scores of Scientific Aptitude of the students. CBSE(X) exam result were consulted for writing marks in Mathematics Achievements.

**FORMULATION OF HYPOTHESES**

- Ho<sub>1</sub>:** The levels of Scientific Aptitudes among Senior Secondary students studying Science are not normally distributed.
- Ho<sub>2</sub>:** There does not exist significant difference in Scientific Aptitude in relation to gender and locale variations.
- Ho<sub>3</sub>:** There does not exist significant difference in achievement in Mathematics at Senior Secondary Level in relation to gender and locale variations.
- Ho<sub>4</sub>:** There does not exist the relationship between Scientific Aptitude and Achievement in Mathematics at Senior Secondary Level.
- Ho<sub>5</sub>:** There does not exist significant difference between high and low Scientific Aptitude on Achievement in Mathematics.
- Ho<sub>6</sub>:** There does not exist significant interaction effect of gender and locale on Scientific Aptitude.
- Ho<sub>7</sub>:** Scientific Aptitude cannot be used as criterion for prediction Achieving scores in Mathematics.

**METHOD OF THE STUDY**

The Descriptive method of Normative Study type was adopted.

**SAMPLE**

A sample of 100 students selected for the study from among the CBSE Affiliated, Senior Secondary schools of East Sikkim.

**TOOLS USED**

Scientific Aptitude Test (SAT) tool developed by Shahapur and Rao (2006) for assessing Scientific Aptitude of students studying Science at Senior Secondary level was used for the study. The dimensions of SAT are Experimental Bent, Ability to reason, Logical conclusion, Ability to draw conclusion, Ability to interpret, Scientific interest, Ability to solve general problems and Accuracy of observation. Tabulation register for

**RESULTS AND DISCUSSIONS**

**Descriptive Measures on SAT Scores**

From the frequency distribution of SAT Scores, descriptive measure of central tendency, standard deviation were calculated for interpretation of result verification of Null hypothesis.

**Table 1: Measures of Central Tendencies and Variation of Scores on SAT scores**

N	Mean	Median	Mode	S.D	Sk	Ku	QD
100	47.36	48.53	50.87	6.69	-0.52	0.233	4.41

P <sub>90</sub>	P <sub>10</sub>	Q <sub>3</sub>	Q <sub>1</sub>	Range	Coefficient of Variation
57.31	38.39	53.3	44.4	30	14.13

On perusal of the frequency distribution table of Sat Scores, it is clear that the mean, median and mode of the SAT distribution scores fall within class interval 45-49 and 50-54 respectively. From the above table it s clear that the scores of SAT slightly diverges from the normal distribution. The scores are massed at the right end of the normality curve and are spread out gradually towards the left end. Since the gap between mean and median very less, the distribution of SAT scores approaches normality with negatively skewed and leptokurtic or slightly peaked.

**Inferential Measures on SAT Scores**

The following statistical inferential measures on Scientific Aptitude Test (SAT) scores are adopted.

**Table 2: Test of significant differences between the mean scores on SAT in relation to Gender and Locale variations**

Variation	Sat Scores					Remarks	
		N	Mean	S.D	SE <sub>m</sub>		t'
Gender	Boys	50	50.4	7.38	1.295	3.24	Significant p < .0
	Girls	50	46.2	5.42			
Locale	Urban	75	50.13	3.96	1.565	4.68	Significant P < .01
	Rural	25	42.8	7.05			

The values of 't' for df= 98 at 0.05 level and 0.01 level of significances are 1.98 and 2.36 respectively obtained from the table of critical values of 't'. On perusal of the above table, it is revealed that the calculated values of 't' are much greater than the tabular values at 0.01 level of significance. Hence 't' ratios are significant on gender and locale variations. Therefore the null hypothesis, "There does not exist significant difference in Scientific Aptitude in relation to gender and locale variations" is rejected. This indicates that Boys possess more Scientific Aptitude than Girls and Urban students are having more Scientific Aptitude than Rural students. There are various factors which might have influenced the result like socio-economic status, various facilities availed, variation on getting the quality education on the basis of nature of management of schools and etc.

**Differences between the mean scores on Achievement in Mathematics of the subsample**

**Table 3: Test of significant differences between the mean scores on Mathematics Achievement in relation to Gender and Locale variations.**

Variation	Sub-samples	N	Mean	S.D	SE <sub>m</sub>	t'	Remarks
Gender	Boys	50	69.1	15.26	3.06	1.04	Not Significant p < .0
	Girls	50	65.9	15.62			
Locale	Urban	75	71.17	14.27	3.22	2.95	Significant P < .01
	Rural	25	55.5	13.85			

The values of 't' for df=98 at 0.05 level and 0.01 level of significances are 1.98 and 2.36 respectively obtained from the table of critical values of 't'. On perusal of this table, it is revealed that 't' ratio is significant on locale variation and not significant on gender variation of Mathematics Achievement Scores. The Achievement in Mathematics is more in case of urban students than rural students.

**Differences between High and Low Scientific Aptitudes in Achievement in Mathematics.**

On the basis of Q3 (53), the students secured above 53 marks in SAT were categorized as High Scientific Aptitude Achievers and on the basis of Q1 (44.4) value, the students secured below 44 marks in SAT were categorized as Low Scientific Aptitude Achievers.

**Table 4: Test of significance between the mean scores on High Scientific Aptitude scorers with their corresponding Mathematics Achievement Scores (HSAM) and Low Scientific Aptitude Scorers with their corresponding Mathematics Achievement Scores (LSAM)**

Variation	N	Mean	S.D.	SE <sub>m</sub>	t'	Remarks
HSAM	31	76.1	13.935	2.865	4.25	Significant P < .01
LSAM	23	59.7	14.72			

The values of 't' for df=54 at 0.05 level and 0.01 level of significances are 2.05 and 2.67 respectively obtained from the table of critical values of 't'. On pursuance of the above table, it is revealed that the 't' ratio is significant. So the null hypothesis that, "There does not exist significant difference between high and low Scientific Aptitude in Mathematics" is rejected. Therefore students possessing High Scientific Aptitude achieved more in Mathematics Achievement compared to Low Scientific Aptitude Students.



**Analysis of Interaction effect of gender and locale variations on Scientific Aptitude**

From the Scientific Aptitude Scores, Students were categorized on gender and locale variations and one way ANOVA analysis was performed and summary of ANOVA table was prepared. F-ratios were calculated. Scheffe's test was followed.

**Table 5: Test of significant interaction effect of Gender and Locale on Scientific Aptitude through the one way ANOVA Summary Table.**

Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean Square (MS) Variance	F-ratio
Between Groups	SS <sub>B</sub> = 2005.55	05	MS <sub>B</sub> = 668.65	27.39
Within groups	SS <sub>W</sub> = 2243.81	96	MS <sub>W</sub> = 24.41	
Total	SS <sub>T</sub> = 4249.76	99		

From the F-ratio table, the value of F-ratio (df for 3 and 97) at 0.05 level and 0.01 level of significances are 2.76 and 3.99 respectively. By referring summary table of one way ANOVA, F-ratio is 27.39. But calculated value is more than that of tabular values of F-ratio is 27.39, But calculated value is more than that of tabular values of F-ratio. So F-ratio is significant. But it needs further testing of Scheffe's test.

**Table 6: Scheffe's Test of Significance.**

Variations	N	Mean	F-ratio	Remarks
Urban Boys	32	56.03	20.03	Significant p < .01
Urban Girls	43	47.09		

Urban Girls	43	47.09	02.1	Not Significant
Rural Boys	18	43.6		
Urban Boys	32	56.03	24.3	Significant p < .01
Rural Boys	18	43.6		
Urban Girls	43	47.09	3.4	Significant p < .05
Rural Girls	07	40.7		

On pursuance of these tables, it is revealed that Urban Boys posses more Scientific Aptitude than Urban Girls as well as Rural Boys.

**Prediction of Scores of Achievement in Mathematics from the Scientific Aptitude Scores**

In order to predict the Achievement in mathematics Scores from the Scientific Aptitude Test scores, simple regression analysis is followed. The co-efficient of correlation (r<sub>12</sub>) between Scientific Aptitude and Achievement in Mathematics was already estimated as 0.41.

**Table 7: Prediction of Mathematics Achievement Scores when Scientific Aptitude Scores are known through the Regression equation**

SAT Vs Mathematics Achievement Scores				
Variation	N	Mean	S. D.	r <sub>12</sub>
SAT Score (X)	100	47.36	6.69	0.41
Mathematics Achievement Scores (Y)	100	67.5	15.52	

By using simple regression analysis from the above data, it is revealed that, the regression equation is Y=0.95X+ 22.45. When the SAT Score (X) is known, we can predict the

Mathematics Achievement Score of the students. Ex. When SAT Score =  $X = 50$  (known),  $Y = 0.95(50) + 22.45 = 70$ . Prediction of Mathematics Achievement Score = 70.

SE (esty) = Standard Error (SE) of estimate (when Y scores are predicted from X scores).  $SE(esty) = 14.2$  (Our estimate will not miss the actual Mathematics Achievement Scores by more than 14 marks). At 0.01 level of significance  $Y$  (predicted Score) =  $\pm 2.58 SEy = \pm 36.4$ . So Actual score in Mathematics Achievement will be the range of  $Y \pm 36$ .

### MAJOR FINDINGS OF THE STUDY

The result of the study revealed that:

1. Boys possess more Scientific Aptitude than Girls.
2. Scientific Aptitudes of Urban students are more than that of rural students.
3. Gender variation does not play its importance in the Achievement of Mathematics.
4. Positive Substantial of Marked Correlation exists between Scientific Aptitude and Achievement in Mathematics.
5. Students possessing High Scientific Aptitude Achieved more in Mathematics Achievements compared to Low Scientific Aptitude students.
6. Urban Boys Possess more Scientific Aptitude than Urban Girls and Rural Boys.
7. Scientific Aptitude can be used to predict the Achievement in Mathematics.

### RECOMMENDATIONS

Aptitude test can provide information that is useful in determining learning readiness, individualizing instruction, organizing classroom groups, identifying underachievers and high achievers, diagnosing learning problems and helping students with their educational and vocational plans. Although the results of Achievement tests are useful for these purposes, aptitude tests make a special contribution.

Standardized Aptitude Tests (like SAT) are designed to predict future performance in some activity, such as school learning. Like Achievement Tests, Aptitude Tests measure learned abilities. They differ from achievement

tests, however, in that the test content is broader in scope, and test performance is less dependent on any specific set of learning experiences. This makes it possible to use the tests with students of varying educational backgrounds and to predict future performance over a wide range of learning activities. Therefore, the investigator has felt to recommend Scientific Aptitude Tests can be used to measure the potentialities of the students in school level.

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## A STUDY ON JOB SATISFACTION AMONG TEACHERS AT VARIOUS LEVEL

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### ABSTRACT

*In this paper, the researcher investigated the present level of job satisfaction among the private and govt. school teachers. In this research, 50 Govt. and 50 Private teachers, 100 in total, working in different govt. & private schools were examined. The obtained data were analyzed through Mean, S.D. and C.R.test. The study revealed that there is no significant difference in the level of satisfaction of male and female teachers. Furthermore, it was again revealed that there is no significant difference in the level of satisfaction of Govt. and Private school teachers.*

### INTRODUCTION

Job satisfaction portrays the perception of the person towards his/her job, job related activities and environment. It is a combination of psychological and emotional experiences at work. In fact, Job satisfaction is a pleasurable or emotional state resulting from the appraisal of one's job experience. It is often a result of the perception of the employee as to whether his job provides him with the outcomes he views as important. Job satisfaction is determined by how well the result of the job meets the expectations of the employee. Some important factors influencing job satisfaction may be classified in two categories.

- (i) Environmental factors:-Job content, Occupational level, Pay and Promotion, Work group and Supervision.
- (ii) Personal factors: - Age, Sex, Educational level, Marital status and Experience.

### REVIEW OF LITERATURE

The present study examines the job satisfaction, i.e. the degree to which job features that are highly valued by individuals are present in their work environment. Though a number of studies have been conducted in this field, but a few have been undertaken to compare the job satisfaction of male and female teachers in government & private schools. Bandhana (2011) mentioned that the level of job satisfaction and attitude of the teachers towards teaching is least affected by the gender, the marital status, minimum qualification and income group of physical Education

teachers to compare the job satisfaction among Physical Education teachers and their attitude towards teaching. Mehta (2012) investigated on job satisfaction among teachers to know whether the perception of job satisfaction among teachers was affected by the type of organization (private vs. Govt.) and the gender (male vs. female). Descriptive analysis was made to study the perception of job satisfaction of male/female and t-test was used. Result showed that there would be significant difference in the level of job satisfaction of Govt. and private school teachers. Nagar (2012) undertook a study on "Organizational commitment and job satisfaction among teachers during times of Burnout for developing and tests a model for Burnout and its effect on job satisfaction on organizational commitment" Research showed that in term of job satisfaction & organizational commitment the mean score for female teachers was higher than male teachers.

### OBJECTIVES OF THE STUDY

- The followings were the objectives of the study:
- (i) To measure the level of job satisfaction of the teachers.
  - (ii) To compare the job satisfaction between male and female teachers.
  - (iii) To compare the job satisfaction between govt. and private school teachers.

### HYPOTHESIS

The following hypotheses were formulated for the present study:

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