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## A STUDY ON INFLUENCE OF REASONING ABILITY ON MATHEMATICAL ABILITY OF SECONDARY SCHOOL STUDENTS

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**Abstract:**-The mathematical forms today has more and more new applications for day to-day life and rapid growth of desired application helps to develop more and more new fields of mathematics. Reasoning skills are recognized as the key abilities for human being to create, learn, and exploit knowledge. The purpose of this study was to find out the influence of reasoning ability on mathematical ability of secondary school students in Shimoga District, Karnataka. The research examined the differences in mathematical ability according to sex as well as the differences in mathematical ability of students based on the level of reasoning ability. The study involved 100 form VIII standard students (50 boys and 50 girls). The Mathematical Ability Inventory constructed and standardized by the researcher and Verbal Reasoning constructed by George K. Bennett, Herold G. Seasbore and Alexander G. Women were used to measure mathematical ability and reasoning ability of students respectively. The data was analyzed using Statistical Package for the Social Sciences (SPSS) to determine the mean, standard deviation, t-test, one-way ANOVA and Pearson's coefficient of correlation. The findings of the study showed that there was a significant relationship between mathematical ability and reasoning ability. This study also shows there is a difference in mathematical ability of students based on their level of reasoning ability, while low reasoning ability students have low level of mathematical ability. Therefore, teachers should strive to understand reasoning ability and implement teaching and learning strategies so that students can improve their reasoning ability. Computer programming enhances problem-solving abilities and promotes creativity and reasoning ability of students.

**Keywords:** Mathematical Ability , Statistical Package for the Social Sciences (SPSS) , learning strategies .

### INTRODUCTION

Mathematics is a core subject in secondary schools. In the present day competitive world, success and knowledge go neck to neck. The mathematical forms today has more and more new applications for day to-day life and rapid growth of desired application helps to develop more and more new fields of mathematics. Today in the modern world there are more applications of mathematics and new field of research has been developed that a pupil can generate their knowledge. The study of mathematics was established to produce a competent person who is able to apply knowledge of mathematics in everyday life effectively and responsibly in solving problems and making decisions. Mathematical ability involves effective thinking with conceptual learning; students need to be taught to think logically along with practicing the numerical problems but on the contrary they do practice a problem, and then repeatedly do the same kind of problems until that is hardwired in their brains (Pearse & Walton, 2011).

Reasoning ability is a term that refers to non-verbal, deductive, inductive, or analytical thinking. Reasoning skills develop gradually though a person's lifetime and at different rates for different individuals. Early investigations on cognitive development and children's reasoning ability typically define the level of cognitive functioning in terms of performance on one test or the other related measures. Reasoning skills are recognized as the key abilities for human being to create, learn, and exploit knowledge. These skills are also an important factor in the process of human civilization. Therefore, the importance of reasoning skills has been of great concern in educational settings and the world of work. It becomes increasingly important to

improve reasoning ability through lifelong learning in response to such challenges and lead a meaningful life, and construct a rational better world (Shu, 2000). Therefore, current educational systems across the world have recognized the need to enhance students' reasoning ability (Wu, 2001). The purpose of the study was to find out the relationship of reasoning abilities with mathematical ability of secondary school students in Shimoga District, Karnataka State. The study believed that if students' reasoning ability, mathematical ability would definitely improve. The knowledge of student degree of study would of course help the teachers and the school counselors to select appropriate techniques of helping students during teaching and learning procedures.

### OBJECTIVES OF THE STUDY

- 1.To find significant relationship between mathematical ability and reasoning ability among secondary school students.
- 2.To find significant differences in mathematical ability among secondary school boys and girls.
- 3.To find significant differences in mathematical ability among secondary school students belonging to low, moderate and high levels of reasoning ability groups.

### Hypotheses of the study

1. There will be no significant relationship of mathematical ability with reasoning ability of secondary school students.
2. There will be no significant sex differences in mathematical ability among secondary school students.
3. There will be no significant differences in mathematical ability among secondary school students belonging to low, moderate and high reasoning ability groups.

**MATERIALS AND METHODS**

The sample of the present investigation was drawn from government and private schools of Shimoga district. The sample comprised of 100 students (50 boys and 50 girls) and was drawn by simple random sampling technique. The Mathematical Ability Inventory constructed and standardized by the researcher and Verbal Reasoning constructed by George K. Bennett, Herold G. Seabore and Alexander G. Women was used to measure mathematical ability and reasoning ability of the students respectively. Reasoning ability is highly correlated with mathematical ability. With the help of this test, we can found that whether the child is capable of solving problems. It also enables us to find the ability to see the cause-and-effect. This test can be used on students who are performing for service selection boards. High reasoning ability indicates high intelligence. There are 184 questions in the test of mathematical ability and there are 50 questions in the test of reasoning ability. One mark for each correct answer should be awarded. The coefficients of reliability of the instruments of this study are 0.80 and 0.84 respectively. To test two hypotheses, Pearson's Product Moment Correlation of coefficients was calculated for determining the relationship between variables. The data analyzed and compared with the help of statistical procedure in which arithmetic mean, standard deviation (S.D.) and t-test and F test were used to compare the data.

### ANALYSIS AND INTERPRETATION

The Pearson's Product Moment Coefficient of Correlation was calculated for determining the relationship between variables.

**Table-1. Significant relationship of Mathematical Ability with Reasoning Ability**

Variables	N	df (N-2)	'r' Value	Sig.
Mathematical Ability and Reasoning Ability	100	98	0.500	0.000

Significant level  $p < 0.01$

The obtained 'r' value is 0.500, which shows a positive significance at 0.01 level ('r' critical value 0.254) between Mathematical Ability with Reasoning Ability of secondary school students. Therefore, a null hypothesis was rejected. It concludes that higher level of reasoning ability have higher mathematical ability and vice versa

**Table 2. Differences in Mathematical Ability based on sex**

Sex	Number	Mean	Standard Deviation	t value	Sig.
Boys	50	22.220	4.131	3.26	0.002**
Girls	50	25.240	5.085		

Significant level  $p < 0.05$

A t-test was conducted to better support the finding that there was a significant difference in mathematical ability levels between boys and girls ( $t=3.26, p < 0.01$ ). Therefore, a null hypothesis was rejected. There is a significant difference in the level of mathematical ability according to sex. The girls have better mathematical ability than boys.

**Table 3. Mean of mathematical ability based on the level of reasoning ability**

Test	Reasoning Ability			Source of Variance	Sum of Squares	df	Mean Square	F Ratio	Sig.
	Low	Moderate	High						
Mean Scores	20.636	24.909	25.913	Between Groups	486.611	2	243.306	12.79*	0.000
Standard Deviation	3.525	4.152	5.664	Within Groups	1845.099	97	19.022		

Significant at 0.05 level of confidence, Table 'F Ratio' =3.09

**Table 4. Scheffe's Post Hoc Test**

Reasoning Ability	Reasoning Ability			Mean Difference and Sig. Level	Critical Difference	Sig.
	Low	Moderate	High			
20.636	24.909	×	4.272*	2.648	0.000*	
×	24.909	25.913	1.004	2.926	0.671	
20.636	×	25.913	5.276*	2.944	0.000*	

\*Significant level  $p < 0.05$

The above table shows the mean of mathematical ability based on the level of reasoning ability. To determine differences in mean mathematical ability of students by level of reasoning ability, One-way ANOVA test was adopted. Results of the ANOVA test are shown in Table-3. The above table shows that there are significant differences in mean of mathematical ability scores based on the level of reasoning ability ( $F=12.79, df = 2, 97, p < 0.01$ ). A null hypothesis was rejected. To determine significant differences, a Scheffe's Post Hoc test was applied. The results can be seen in the following Table-4. As shown in Table-4 there are significant differences in mathematical ability between low and moderate; low and high levels of reasoning ability

#### DISCUSSION OF RESULTS

The results showed that there was a significant relationship between mathematical ability and reasoning ability and the findings also showed that significant differences between mathematical ability based on their reasoning ability levels, while low reasoning ability students have low level of mathematical ability. This is because high reasoning ability students have more confidence than low ability students. The girls have better mathematical ability than boys. Based on these findings teachers and parents are called upon to see to it that they start stimulation of the children thinking as soon as they enter school through provision fascinating toys, computers and simulation games (Tella et al. 2008).

#### CONCLUSION:

It was concluded that there was a significant relationship between mathematical ability and reasoning ability. This study also shows there was a difference in mathematical ability of students based on their level of reasoning ability. Therefore, teachers should strive to understand reasoning ability and implement teaching and learning strategies so that students can improve their reasoning ability. The girls have better mathematical ability than boys. Mathematical ability is highly correlated with reasoning ability. Therefore, it is necessary that we should develop the problem solving ability through proper education and training of our young boys. Computer programming enhances problem-solving abilities and promotes creativity and

reasoning ability of students. Teachers who teach mathematics to mathematical gifted students need a strong background in mathematics content. Inquiry-oriented mathematics instruction, tasks and activities, can assist gifted students to develop his/her talents.

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