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MATHEMATICS ACHIEVEMENT OF PRIMARY SCHOOL CHILDREN IN RELATION TO THEIR MATHEMATICAL THINKING AND INTELLIGENCE

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Abstract

Our modern society requires the use of mathematical skills such as computation, measuring, organizing and interpreting data, estimating, problem solving, formulating, and establishing hypotheses as well as making inferences and predictions. It plays an indispensable role in shaping our mind and behaviour. The country needs, today effective and productive citizens who display scientific and constructive thinking and attitudes in all walks of life. In this direction, a new chapter is opined into the 21st century which is going to be an era of science and technology. The child of today has to be prepared for this era of technology for which a strong base of mathematics education is a necessity. But unfortunately, mathematics is being taught in a mechanical way by chalk and talk method. Students are cramming the formulae for passing the examination as a routine. Their thinking is being suppressed by the routine class work and home work. Thinking over the problem

Keywords:
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independently, and making their own generalizations and understanding the basic concepts would lead the child success in future mathematics classrooms. Studies by Barba and Merchant(1990); Freseman (1990), Kagan(1988), Tenenbaum (1990) showed that thinking skills instruction accelerated the learning gains of students. Thus, in the present study an attempt is made to find the relation in beteween achievement in mathematics, mathematical thinking and intelligence of students. Thereby one can find strategies to enhance the student's achievement in mathematics at the primary level and at later school years.

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1. Introduction

Learning of mathematics at the primary stage, is supposed to lay foundation for mathematical thinking about the numerical and spatial aspects of the objects and activities which the children at this stage are required to deal with. Learning by doing with concrete material is the expected main method of learning at this stage. But unfortunately, mathematics is being taught in a mechanical way by chalk and talk method. Students are cramming the formulae for passing the examination as a routine. It would be necessary that the content and language of problems and questions used in the class room mathematics are to be planned so carefully as to highlight the development of cognitive abilities of the children. Mathematics should, however not only be taught because it is useful. It should also be a source of delight and wonder to all children, whatever be their level of ability and degree of maturity. Besides providing proficiency in basic mathematical skills, it should offer children intellectual excitement such as discovery of relationships, the pursuit of rigour and achievement of elegant solutions. The mathematics teaching at the primary stage should therefore be directed to achieve the following objectives.

Ability to

- Perform computations with speed and accuracy.

- Translate verbal statements in mathematical form using appropriate symbols
- and Diagrammatically.
- Make reasonably good approximations and estimate measurements.
- Apply mathematical concepts and skills to solve simple problems of day-to-day life.
- Think logically, rationally and to reason.
- Recognize order and pattern.

Mathematics is associated with problem solving, as problem solving is closely associated with thinking. If one is able to control and regulate his own thinking processes, he or she can develop problem solving competency, which contributes to the extent for mathematics achievement.

Need for the study

Modern Science and Technology depend increasingly upon mathematics. Consequently, from social and scientific points of view there has developed a growing interest in how one learns mathematics, how one thinks through the analysis of mathematical problems. Though the importance of mathematics is realized, the method of teaching is rather crude. The student generally is not allowed to think independently and conceptualize the spirit of the subject. It is the rote method that ruled the classroom situation. Children are not encouraging to probe into questions in the classrooms. Their thinking is being suppressed by the routine class work and home work. Thinking over the problem independently, and making their own generalizations and understanding the basic concepts would lead the child success in future mathematics classrooms.

Studies by Barba and Merchant(1990); Freseman (1990), Kagan(1988), Tenenbaum (1990) showed that thinking skills instruction accelerated the learning gains of students. In India there has been a neglect of this area of research and the few studies conducted have been mostly on development of language in children. The studies conducted by Joshi(1963), Rao; S.N (1975); Reddy D.J. (1974); Vaidya, N. (1968,1977) and Chatterjee, R.G. (1973) throw some light on development of logical thought in children. Thus, in the present study an attempt is made to find the relation in beteween achievement in mathematics, mathematical thinking and intelligence of students. Thereby one can find strategies to enhance the student's achievement at the primary level and at later school years.

V class is taken as target because it is the ultimate stage of primary education and this is the period of concrete operational stage (7 or 8 to 11 or 12). According to Piaget, during this period children continue to expand logico mathematical thought. They are operational in their thinking; children are ready to think about classes, seriations and numbers.

Statement of the Study:

In view of the need of the study, the problem under study is stated as"Mathematics Achievement of Primary School Children in relation to their Mathematical Thinking and Intelligence".

Objectives of the Study:

1. To find whether urban and rural students are differing significantly in their mathematics achievement, mathematical thinking and intelligence.
2. To find whether there is any significant correlation between mathematics achievement, mathematical thinking and intelligence of students in urban area.
3. To find whether there is any significant correlation between mathematics achievement, mathematical thinking and intelligence of students in rural area.

Hypotheses of the Study:

1. There exists no significant mean difference between urban and rural students in their mathematics achievement, mathematical thinking and intelligence.
2. There is significant correlation between mathematics achievement, mathematicalthinking and intelligence of students in urban area.
3. There is significant correlation between mathematics achievement, mathematicalthinking and intelligence of students in rural area.

Variables of the Study:

The variables selected for the present study are mathematics achievement mathematical thinking and intelligence. The extraneous variable in this study is locality in terms of urban, and rural area.

Sample Selected for the Study:

The sample of the present study consists 280 V Class students selected randomly from four schools in Prakasam District.

Tools selected and used in the Study:

In the present study, the tools used by the investigator are :

1. Achievement Test in Mathematics for Standard V developed by the investigator.
2. Mathematical Thinking Test developed by the investigator. The finalized test consisted of

30 items which covers the skills of mathematical thinking. The reliability coefficient of the test was 0.706. It shows that the test is a reliable one. The intrinsic validity of mathematical thinking test was 0.840.

3. Coloured Progressive Matrices Test (CPM) developed by J.C. Raven.
4.

Analysis and interpretation of Data:

To interpret the data collected for the present study, the statistics mean, SD, and t-ratio' were applied. The mean scores in mathematical thinking, intelligence and mathematics achievement of urban and rural students were compared by test of significance of difference between means. The data and results are given in Tables.

Table 1: Statistical Constants for the Scores of Students in Mathematics Achievement.

Statistical Constants Estimated	**Urban Students (150)**	**Rural Students (130)**	**df**	**'t'-value**	**Level of Significance**
Mean	16.50	18.63	278 df	3.17	0.01
S.D	2.374	3.057			

It is interpreted from Table that mathematics achievement of rural students is better than that of urban students. There is significant mean difference between urban and rural students in their mathematics achievement scores. Since the calculated 't' value is greater than the theoritical

value at 0.01 level of significance, the 't' test is found to be significant. It is inferred that performance of rural students in mathematics is significantly better than the urban students

Figure :1 showing the comparison of Means and S.D's of Urban and Rural students for their Mathematics Achievement

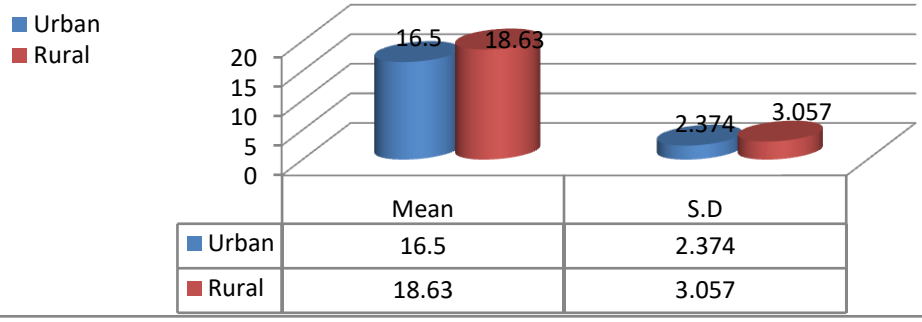


Table 2: Statistical Constants for the Scores of Students in Mathematical Thinking.

Statistical Constants Estimated	Urban Students (150)	Rural Students (130)	df	't'-value	Level of Significance
Mean	13.87	15.85	278 df	6.00	0.01
S.D	3.115	2.417			

It is evident from the Table values that the urban and rural students differ in their mean scores in mathematical thinking. The calculated 't' value (6.00) which is found to be significant at 0.01 level confirms that the mean scores of rural students in mathematical thinking is significantly greater than that of urban students. The high mean scores of the rural students may be due to the their exposure to many practical concrete experiences available in rural locality.

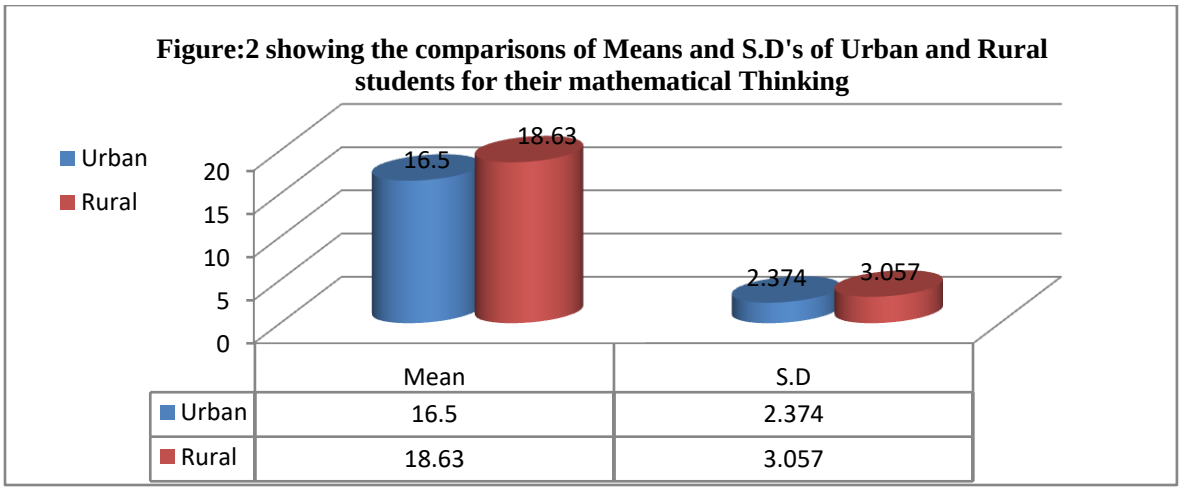
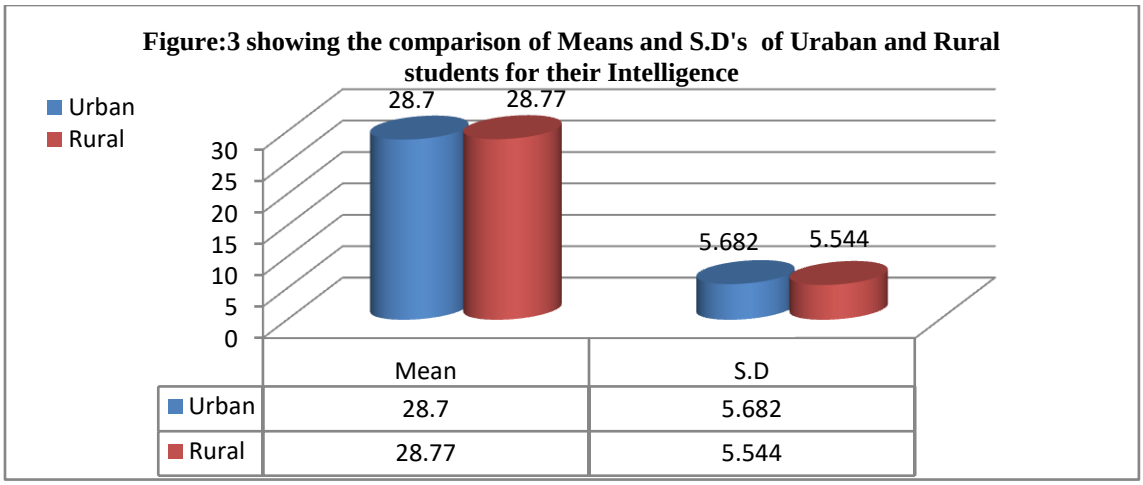


Table 3 :Statistical Constants for the Scores of Students in Intelligence.

Statistical Constants Estimated	**Urban Students (150)**	**Rural Students (130)**	**df**	**'t'-value**	**Level of Significance**
Mean	28.70	28.77	278 df	0.104	Not significant
S.D	5.682	5.544			

From the above mean values, it is seen that the urban and rural students are similar in their mean intelligence scores. The obtained 't' value (0.104) which is found to be not significant at 0.05 level confirms that both locality does influence the intelligence of students.



The table results reveal that there is significant mean difference between urban and rural students in their mathematics achievement and mathematical thinking but they are similar in their intelligence.

Table 4: Correlation Matrix showing the Coefficient of Correlation between Mathematical Thinking, Intelligence and Mathematics Achievement among V Class Students in Urban Area.

No.	Variables	Coefficient of Correlation		
		1	2	3
1.	Mathematics Achievement	---	0.404**	0.496**
2.	Mathematical Thinking	---	---	0.473**
3.	Intelligence	---	---	---

** significant at 0.01 level.

1. The coefficient of correlation obtained between mathematics achievement and mathematical thinking (0.404) shows a moderate positive correlation between them and is significant at 0.01 level. Hence it can be conclude that higher the mathematical thinking of students in urban locality, higher is their mathematics achievement.

2. The coefficient of correlation (0.496) obtained between the variables mathematics achievement and intelligence of students in urban area reveals that intelligence of students contributes to their mathematics achievement.

3. The coefficient of correlation obtained between mathematical thinking and intelligence (0.473) shows that mathematical thinking of students belonging to urban area is positively correlated to their intelligence.

Table 5: Correlation Matrix showing the Coefficient of Correlation between Mathematical Thinking, Intelligence and Mathematics Achievement among V Class students in Rural Area.

No.	Variables	Coefficient of Correlation		
		1	2	3
1.	Mathematics Achievement		0.532**	0.581**
2.	Mathematical Thinking	---	---	0.594**
3.	Intelligence	---	---	---

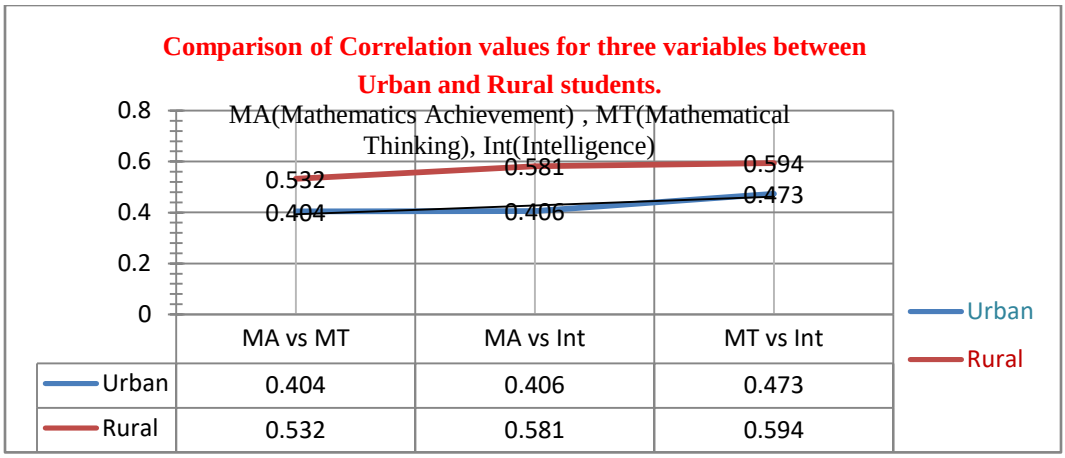
** significant at 0.01 level.

1. The coefficient of correlation between mathematical achievement and mathematical thinking is 0.532 and is significant at 0.01 level..

2. The coefficient of correlation obtained between mathematics achievement and intelligence is 0.581 and is significant at 0.01 level.

3. The coefficient of correlation obtained between mathematical thinking and intelligence is 0.594 and is significant at 0.01 level.

The results indicated that there is a significant positive relationship between mathematics achievement, mathematical thinking and intelligence of primary school students in rural locality.



Findings of the Study:

1. Urban and rural students are differing significantly in their mathematics achievement and mathematical thinking.
2. Locality do not influencing the intelligence level of the students.
3. Mathematics achievement of students is significantly correlated with mathematical thinking and intelligence.

Conclusion

John Perry said "I have taught mathematics to almost every kind of student. In my experience there is hardly any man who may not become a discoverer, an advancer of knowledge and the earlier the age at which you give him chances of exercising his individuality the better". Mathematics is a discovery of the human mind and learning mathematics is supposed to be 'rediscovery' at least to some extent. To achieve this goal, the class room could be turned into a laboratory workroom for the improvement of mathematics education. Pupils work and learn by doing and develop self learning, self study, exploratory and investigatory techniques.

The education system in India remains essentially examination oriented. Under this system, learners do not receive mathematics education. They mostly prepare themselves for preparing examinations. Such a situation not only damages the purpose of all education but also proves ruinous for mathematics education. Learners memorize important results in order to be able to reproduce them in the examinations. The result is that success in examinations has become the important objective of mathematics education. The findings of the present investigation showed that mathematical thinking and intelligence of students are contributing to their mathematics

achievement. Experimental studies conducted by Bartlett(1958); Torrance(1961); Osborn(1963); Khatena (1968,1976); Meyer(1969); and Putnam(1974) have shown that the children when taught through the use of appropriate teaching strategies do a much better job in terms of production of new ideas than those who are not initiated into this kind of training. Hence by developing teaching strategies to enhance the mathematical thinking of students, their level of achievement in mathematics can be gained.

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