



A Study of Academic Achievement in Mathematics in Relation to Cognitive Styles and Attitude Towards Mathematics

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ABSTRACT

The present investigation is an attempt to analyse the more discrete cognitive and affective abilities and their influence on the academic achievement of upper primary school children in a specific subject like mathematics. The researcher identified cognitive style and attitude of the learners as the important correlates of their academic achievement. The major objectives of the study are: i) To study the significance of gender differences in academic achievement in mathematics, cognitive style and attitude towards mathematics ii) to study the gender-wise differences in mean score of academic achievement in mathematics between the field independent and field dependent students and iii) to study the gender-wise difference in mean score of academic achievement in mathematics between the students with favourable attitude and unfavourable attitude towards mathematics. Findings reveal significant differences in all major areas.

KEYWORDS : Academic Achievement, Cognitive Styles, Attitude

INTRODUCTION:

Academic achievement seems to depend on the cognitive style through which information are taken in by the learners. Most cognitive styles having common property that they involve a dichotomy between, on the other hand, taking the world in large lumps and on the other hand, selectively attending only to chosen portions of the environment. The former strategy is commonly designated as field dependent and the later one is designated as field independent. The later strategy has the advantage that one can select a few highly task related and task relevant pieces of information and focus attention to them. This highly selective kind of cognitive styles leads to over come an embedding context. This ability, when developed, makes possible an analytical way of experiencing (Witkior, 1979). Research observations delineate intimate relationships between dimensions of cognitive style and variety of performance measures and problem solving (McKinney, 1975). The problem solving behaviour in mathematics requires a through grasp of deductive process, full awareness of relevant attributes of the essential concepts and needs for maximum information.

REVIEW OF THE RELATED LITERATURE

Pal, A. (1989) observed that better attitude towards mathematics ensures better achievement of the student's in mathematics at secondary level.

Jayaraman (1989) found a significant relation between attitude towards learning mathematics and achievement in mathematics.

Sorel Cahan and Yael Ganor (1995) also observed differences in favour of boys in secondary schools with respect to mathematical problem solving.

Audrey, R. Matsumoto and Xian Fan (1997) found noteworthy gender differences favouring male students when the high end of maths score distributors was examined. To understand the situation at depth the researcher analysed the data separately for each gender.

Felix Okeke Onyejiaku (1982) also found that analytic boys in the expository group scored significantly higher than non-analytic students in mathematical task.

Leddy, M.G., D.Lalonde and Runk, K. (2003) found that the traditional gender – based differences in the belief regarding the mathematics persist even in the mathematically talented students.

NEED OF THE STUDY

In the light of the above discussion, it is evident that cognitive style and attitude of the learners are the important correlates of their academic achievement. Only few numbers of researches were noticed in this area. Especially studies with upper primary school children were not carried out extensively.

The present investigation was an attempt to study academic achievement in the mathematics in relation to cognitive style and attitude

towards mathematics.

THE OBJECTIVES OF THE PRESENT STUDY ARE AS FOLLOWS :

1. To study the significance of gender differences in mean scores of academic achievement in mathematics, cognitive styles and attitude towards mathematics.
2. To study the significance of difference in mean score of academic achievement in mathematics between boys having field independent cognitive style and boys having field dependent cognitive style.
3. To study the significance of difference in mean score of academic achievement in mathematics between girls having field independent cognitive style and girls having field dependent cognitive style.
4. To study the significance of difference in mean score of academic achievement in mathematics between boys having favourable attitude towards mathematics and boys having unfavourable attitude towards mathematics.
5. To study the significance of difference in mean score of academic achievement in mathematics between girls having favourable attitude towards mathematics.

HYPOTHESES OF THE STUDY :

- There is significance of gender differences in academic achievement in mathematics cognitive style and attitude towards mathematics.
- There is significant difference between boys having field independent cognitive style and boys having field dependent cognitive styles towards their academic achievement in mathematics.
- There is significant difference between girls having field independent cognitive style and girls having field dependent cognitive style towards their academic achievement in mathematics.
- There is significant difference between boys having favourable attitude towards mathematics and boys having unfavourable attitude towards mathematics based on their academic achievement in mathematics.
- There is significant difference between girls having favourable attitude towards mathematics and girls having unfavourable attitude towards mathematics based on their academic achievement in mathematics.

SAMPLE OF THE STUDY :

A total of 200 Subjects were taken randomly from seven Zillaparished Telugu medium upper primary schools selected from the district Prakasam of Andhra Pradesh. Subjects included boys and girls reading in Class-VII.

TOOLS USED:

Three instruments were used.

- Academic achievement Test in Mathematics (AATM) was developed by Saha (1998). It measures achievement in mathematics

- of upper primary school students in the age group 10 to 12 years. It is a paper and pencil test consisting of 55 multiple choice items (with 5 alternatives). The total time allotted is 50 minutes for the whole test. The total score equals the number of items answered correctly.
- The children's Embedded Figures Test (CEFT) was developed by Karp, S.A. & Konstadt, N (1971). CEFT measures cognitive style of children in the 5 to 12 years age range. In this test, the task is to find out given forms which are embedded in each of 25 complex figures. The total score equals the number of items passed correctly. No time limit is imposed.
 - A scale for measuring attitude towards mathematics (SMAM) was developed by Saha, S. and Sen, A(2004). SMAM measures attitude towards mathematics of upper primary school students in the age group 9 to 12 years. In this scale 56 statements – items included 39 favourable items and 17 unfavourable items. The response categories are agree, undecided and disagree for each statement items. The response score weights are 3, 2, 1 respectively for the favourable statement and reverse scoring weights are 1, 2, 3 respectively for the unfavourable statements. The total time allotted is 40 minutes for the whole test. The total score of an individual is the index of attitude towards mathematics.

STATISTICAL TREATMENT:

The obtained data are quantitatively analyzed by using descriptive statistics such as Mean and S.D and inferential statistics such as t-test.

INTERPRETATION OF THE RESULTS

Table – 1: Gender Differences in Academic Achievement in Mathematics Cognitive Style and Attitude towards Mathematics.

Variables	Boys (N=100)		Girls (N=100)		σD	t-value
	Mean	S.D	Mean	S.D		
Academic Achievement	43.32	6.53	39.62	3.58	0.745	4.97*
Attitude towards Mathematics	102.25	10.38	98.72	9.48	1.406	2.51**
Cognitive Style	10.52	4.58	7.92	3.57	0.581	4.41*

* Significant at 0.01 Level & ** Significant at 0.05 level

Table 1, Clearly indicates that boys and girls differed significantly on all the three measures under consideration. Boys performed significantly better than their counterparts on all the variables. Hence the hypothesis –1 is accepted at 0.01 level. To understand the situation at depth the researcher analysed the data separately for each gender.

Table –2: Gender –wise difference in Mean Score of academic achievement in Mathematics between the field independent cognitive style group and field dependent cognitive style group.

Gender	Field independent cognitive style group			Field dependent Cognitive style group			σD	t-value	Level of significance
	Mean	S.D	N	Mean	S.D	N			
Boys	47.23	6.52	66	39.65	5.23	36	1.19	6.36	0.01
Girls	41.32	5.59	40	38.82	5.34	58	1.13	2.21	0.05

(By using formula : Mean \pm Q.D of cognitive style score)

Table-2, shows that the field independent boys excelled over the field dependent boys significantly in their achievement in mathematics. Similarly field independent girls also excelled over the field dependent girls significantly. This result suggests that analytic perceptual ability of individual helps a lot in solving mathematical problems in case of young learners in upper primary education. It is fascinating to note that training for independent thinking and perception, if given to them, may prove effective in their learning mathematics. But in gender differences boys came out towards field independence as compared to the girls. This may be due to the typical dilemma of child rearing practice of Indian Society. On one hand, boys are given freedom to operate independently and on the other hand, girls are trained for conformity. The simple implication of this observation is to remove gender bias in education, which was strongly incorporated in the national agenda education for all. Hence the hypothesis –2 is accepted at 0.01 level and the hypothesis –3 is accepted at 0.05 level.

CONCLUSION:

This study suggests that independent thinking and analytical perception if accompanied by positive attitude may produce very good mathematical skill in individual even in his early stage of education. In educating students of upperprimary schools, emphasis is to be given on developing positive attitude and analytical thinking in solving mathematical problems rather than providing ready – made mechanical cues for solving mathematical problems. Here, special care is necessary for those students who try to adopt rote memory technique instead of analytical thinking. So the task of teaching mathematics at the upper primary schools must be well planned and organised to inculcate the practice of analytical thinking and develop positive attitude in mathematics.

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