CHAPTER V

RETROSPECTS AND PROSPECTS

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CHAPTER V
RETROSPECTS AND PROSPECTS

5:1 INTRODUCTION

Among the subjects that are being offered at the secondary and higher secondary levels, Mathematics is considered to be the most important for inculcating the skill of abstract thinking and improving the mental capabilities of the individuals. Further, as it forms the basic tool of analysis of investigations in most of the modern sciences including medicine, engineering and technology, it is called the "Queen of Sciences". Therefore, both the teachers as well as parents give much importance to the study of Mathematics from the primary to the Higher Secondary Level.

5:2 EMERGENCE OF THE PROBLEM

Though Mathematics is considered to be the most important school subject, majority of the students find it rather difficult to score high in Mathematics. On the part of the teachers, the problem of helping the students to understand the concepts as well as the intricacies of Mathematics is often expressed openly in the class room as well as on the forums meant for teaching Mathematics. Therefore, several studies have attempted to unravel the problems pertaining to the factors that may have significant impact over the learning of Mathematics. Often it has been reported that factors such as motivation, self-concept, attitude and so on so forth are influential enough to
alter the learning outcome of the students in Mathematics. A quick review of literature related to the teaching and learning of Mathematics will show that the home background, teacher - student relationship, study habits and certain other allied sociological variables are also influential enough in deciding one's achievement in Mathematics. Many of the studies that have made use of the variables such as gender, locality, types of schools etc., have brought out only inconclusive findings.

After thorough perusal of the available literature, the investigator felt that variables such as learning environment and learning style have not received much attention of researchers as they should have and that too, in relation to achievement in Mathematics. More over the investigator felt that though intelligence is a definite factor influencing the achievement in Mathematics, there may be certain other factors such as learning environment and learning style which could minimise the influence of intelligence over achievement in Mathematics. That is, with proper learning style coupled with congenial learning environment, even a student of average intelligence could attain higher level of achievement in Mathematics. In order to verify this conceptualisation, the investigator would like to state his research problem as given below:

5.3 STATEMENT OF THE PROBLEM

Learning styles, Intelligence and Learning Environment in Mathematics as determinants of Achievement in Mathematics.
The present study sets out to investigate the following:

i. To identity the nature of learning styles, the level of intelligence, the nature of learning environment in Mathematics and the level of achievement in Mathematics of students of standard IX, particularly those hailing from low socio-economic stratum of society.

ii. To find the relative influence of learning styles, intelligence and learning environment in Mathematics on pupils’ achievement in Mathematics.

iii. To find also the inter relationship between the three independent variables learning styles, intelligence and learning environment in Mathematics among themselves as well as among the four styles of learning.

iv. To find out the predictive nature of the independent variables, [Intelligence and Learning environment in Mathematics (both school and home)] over the dependent variable (Achievement in Mathematics).

v. To find the influence of gender difference, types of schools attended, types of management of schools and the medium of instruction on pupils’ achievement in Mathematics.
5:4:02 Hypotheses

In the light of the insight gained by going through the related research literature concerning the variables taken for the present study, the following hypotheses have been framed.

1. The three achievement groups in Mathematics viz. high, moderate and low, exhibit differential learning styles.

2. Level of intelligence significantly influences pupils’ achievement in Mathematics.

3. Learning environment in Mathematics significantly influences students' level of achievement in Mathematics.

4. Level of intelligence influences the learning styles of students.

5. There may not be significant relationship between learning environment (both school and home) in Mathematics and intelligence.

6. Students with different learning styles have differential learning environment in Mathematics.
7. There will be no significant relationships among learning styles based on thinking process, perceptual modes of learning, social settings in learning and hemispheric dominant learning styles.

8. The variables 'intelligence' and 'learning environment in Mathematics' have significant but of different amount of bearing on students' achievement in Mathematics.

9. a. Sex has no significant bearing on pupils' achievement in Mathematics, intelligence and their learning environment in Mathematics.

   b. Types of schools has no significant bearing on pupils' achievement in Mathematics, intelligence and their learning environment in Mathematics.

   c. Types of management of schools has no significant bearing on pupils' achievement in Mathematics, intelligence and their learning environment in Mathematics.

   d. Medium of instruction has no significant bearing on pupils' achievement in Mathematics, intelligence and their learning environment in Mathematics.

10. The effect of experimental variables on the achievement in Mathematics of boys and girls will display differential patterns.
To verify the hypotheses, the following tools have been selected/developed for the present study.

a. Kolb’s learning style inventory (1976), categorizing students as accommodator, assimilator, converger or diverger based on their preferred thinking processes, has been employed.

b. J.M. Reid’s perceptual learning style questionnaire (1987), categorizing students based upon their preferred perceptual modes of learning viz. visual, auditory and kinesthetic/tactile as well as the two social interaction styles viz. individual and group learning, has been used in this study.

c. A. Hilliard’s hemispheric dominance learning style inventory (1989), categorizing the learners based upon their hemispheric dominance viz. analytic and global learning, has been put to use in the present investigation.

d. Raven’s standard Progressive Matrices Test has been used to identify the intellectual capacity of the pupils in the sample studied.

e. Mathematics Learning Environment Scale (1997) prepared by K.J. Srinivasan and suitably modified by the investigator, by including necessary changes, has been used to assess learning environment in Mathematics (both school and home).
f. The socio-economic status scale constructed and validated by Prof. B. Kuppuswamy and subsequently modified by Dr. K. Nagarajan has been made use of in the present study to identify the socio-economic status of the pupils.

g. An Achievement Test in Mathematics consisting of only objective type test items has been constructed and validated by the investigator to measure pupils' achievement in Mathematics.

5:4:04 Sample

The sample for the present study selected through stratified random sampling consists of 662 students of standard IX studying in 10 schools at Chennai, during the academic year 2001-2002. When students with low socio-economic status alone were taken for the final study, the sample for the main study shrunk from 662 to 585.

5:4:05 Data Collection

A pilot study was conducted to establish the reliability and validity of the different tools/tests used, to streamline the instructions to be given to students and to find the optimum time duration for each tool.

The main study was conducted during the month of March 2002. All the tests were scored and each student was assigned scores for the different variables dealt in the study.
5:4:06 Analysis of the Data

Suitable statistical techniques like analysis of variance, multiple correlation, chi-square analysis and multiple regression analysis were employed to test the hypotheses formulated in this study.

5:5 MAJOR FINDINGS AND CONCLUSIONS

Analyses of the data reveal the following findings.

5:5:01 Learning styles and level of achievement in Mathematics

i. Assimilation and convergence facilitate high achievement in Mathematics and accommodation and divergence are less contributive for achievement in Mathematics.

ii. Abstract conceptualization mode of thinking facilitates high achievement in Mathematics.

iii. Among the high achievers, visual learners are predominant as compared to learners using auditory or kinesthetic/tactile mode. Among the low achievers, learners using kinesthetic/tactile sensory mode are predominant as compared to auditory or visual learners.
iv. High achievers tend to prefer individual learning, whereas low achievers seek group learning.

v. High achievers exhibit analytical thinking influenced by left hemisphere of the brain, whereas low achievers in Mathematics predominantly exhibit global thinking due to right hemispheric dominance.

5:5:02 Influence of intelligence on learning styles and level of achievement in Mathematics

i. Intelligence seems to be a major factor in determining pupils' achievement in Mathematics.

ii. Pupils with superior level of intelligence seem to have abstract mode of thinking whereas students with below average intelligence seem to exhibit concrete mode of thinking. Intelligence seem to mediate between the variables 'learning styles' and 'achievement in Mathematics'.

iii. Visual learning is predominant among pupils with superior level of intelligence, whereas kinesthetic/tactile learning is the significant preferred mode among pupils with below average intelligence as compared to other two perceptual modes of learning.
iv. Learning style due to hemispheric dominance seems to have little or no influence on pupils with superior level of intelligence, whereas it has significant effect among pupils with below average intelligence in whom the global thinking is significantly predominant.

v. There is no relationship between individual/group learning and intelligence.

5:5:03 Mathematics learning environment and level of achievement in Mathematics

i. High achievers in Mathematics have significantly high facilitating learning environment in Mathematics as compared to the other two achieving groups viz. Moderate and low, who between themselves do not differ much.

ii. It is the home learning component of the total learning environment that matters much in determining the levels of pupils’ achievement in Mathematics.

5:5:04 Intelligence of pupils and their learning environment in Mathematics

i. Pupils’ intelligence has no significant bearing on their learning environment in Mathematics either at school or home or the total environment.
Learning environment of pupils and their learning styles

i. Learning styles based on preferred thinking process, preferred perceptual modes of learning and hemispheric dominance do not indicate any significant association with pupils' learning environment in Mathematics (both school and home).

ii. Learning style due to social settings seems to exhibit significant association with pupils' learning environment in Mathematics (both school and home).

Relationship among the three major variables of the study

i. The four classification of learning styles considered in the present study do not reveal any significant relationship among themselves implying that each classification is unique and distinct and based on different frames of reference.

ii. Major chunk of variations in achievement in Mathematics is accounted by intelligence and to a small extent by pupils' learning environment in Mathematics and the remaining, attributable to other variables belonging to educational, social as well as psychological settings.
Influence of pupils' preage variables on the three experimental variables of the study

i. Girls have significantly higher scores as compared to boys with respect to their mean scores in achievement in Mathematics, intelligence and learning environment in Mathematics (both school and home).

ii. Achievement in Mathematics, intelligence and learning environment in Mathematics of pupils studying in Girls' schools are significantly higher than those studying in Boys' schools as well as Co-education schools.

iii. Pupils studying in Government aided schools as compared to those in Government schools exhibit significantly higher mean scores in Mathematics achievement and intelligence.

iv. Pupils learning through English medium exhibit significantly higher mean scores in achievement in Mathematics as well as intelligence as compared to those learning through Tamil medium. The school environment is highly conducive for Tamil medium students whereas home learning environment is most facilitating for students of English medium.
v. The contribution of mathematical learning environment for achievement in Mathematics is significantly higher for boys as compared to girls. However, the contribution of intelligence to achievement in Mathematics is more for girls than for boys. The joint influence of intelligence and learning environment on achievement in Mathematics is almost identical for both boys and girls.

5.6 EDUCATIONAL IMPLICATIONS

The findings of the study point out that achievement in Mathematics is affected by both personality and environmental factors. Among the personality factors, learning styles and intelligence have significant contribution to achievement in Mathematics. Among the learning styles, abstract conceptualization as expressed through assimilation and convergence thinking processes facilitate high performance in Mathematics. Similarly, visual learning as well as individual learning facilitate high performance in Mathematics. Analytical learning resulting from left hemisphere dominance seems to promote higher efficiency in learning Mathematics. Thus class room interaction should aim to develop abstract thinking among students in Mathematics and also provide for lot of visual experiences. Students should be encouraged to learn individually. Low achieving students hailing from low socio-economic stratum seem to prefer group learning; however, individual learning points to the way for getting higher grades in Mathematics.
So Mathematics teachers in schools which mainly cater the needs of people of low socio-economic status should encourage the pupils to adopt to individual learning.

Further, the present study highlights that it is the home rather than the school environment that differentiates pupils' achievement in Mathematics and this suggests that school environment is to be tuned up so as to supplement the home environment of pupils particularly for those hailing from low socio-economic stratum to enhance their achievement in Mathematics and compete with pupils coming from other strata of socio-economic status.

5:7 RECOMMENDATIONS

In order to improve the overall performance of the students in Mathematics, it is suggested to match pupil's learning style preferences with complementary instructional strategies and environments. By incorporating a variety of modality based teaching models, instructors of Mathematics can provide a learning environment in which students can construct their own learning of Mathematics.

Another significant findings of the study lays emphasis on improving learning environmental facilities (both school and home) essential for higher performance in Mathematics. Many alternative approaches have to be employed in designing learning environment (both school and home) that respond more effectively to the needs of the students.
Teachers are responsible for developing a climate conducive to learning, responding to the needs of individual learners and encouraging students to achieve to their fullest potential. Education is the interplay between the self esteem of students and the perceptions of teachers and parents within the classroom learning environment and that prevails in the home.

Awareness and utilization of behaviours and values learned in the home might inform the design of learning environments to produce higher achievement. This study points to the need to explore, the importance of creating parent teacher dialogue and partnerships in educating each student.

Educators can come one step closer to prepare all students for their roles in the everchanging society by selecting suitable techniques to promote curriculum development and instructional strategies for a class to respond to the learners' needs, according to their different learning styles.

5:8 SUGGESTIONS FOR FURTHER STUDY

The following suggestions are given for further research investigations in the area of this study.

1. A detailed analysis can be undertaken to study the effect of learning styles coupled with suitable teaching styles on achievement in Mathematics.
2. Case studies of under achievers with low socio-economic status in Mathematics can be undertaken.

3. This study may be extended to cover the students of higher secondary and under graduate courses.

4. Diagnostic studies and remedial measures can be suggested for specific content areas in Mathematics.

5. The impact of parental involvement on achievement in Mathematics can also be studied.

6. Longitudinal studies may be undertaken to find out whether learning style of students change over time, so as to improve their performance in Mathematics.