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CHAPTER V: SUMMARY AND CONCLUSIONS

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CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter attempts to describe what all has been done and found in the study. As it is mentioned earlier, the thesis has been organised into different chapters the summary of which is given in the following paragraphs.

5.1. INTRODUCTION

The new revolution in science based on automation, may have an impact on man even greater than anything that has happened so far in the history of human race. This has increased considerably the importance and influence of mathematics education. In the present era of science and technology, no one can deny the importance of knowledge of mathematics. Mathematics has become a part and parcel of every new innovation. With the use of computers and other devices there is more emphasis on the subject mathematics. Hence mathematics has a prominent position in school curriculum. Mathematics is a self-contained mental discipline with its own...
language and structure. Mathematics is a mental tool for training and exercising intellectual functions.

Teaching of mathematics has been challenging to teachers. Necessity of teaching mathematics and better mathematics has emerged from the advancement of this subject itself and its application in other disciplines. The National Core-Curriculum of Mathematics (1986) has emphasised more importance on developing, thinking and reasoning skills and conceptual approach that gives more importance to discovery and understanding of concepts and ideas rather than mastery of isolated facts and techniques.

Effectiveness of any educational system is judged by the achievement of students, whether it will be cognitive, affective or psychomotor domain.

5.2. NEED AND IMPORTANCE OF THE STUDY

Keeping in view the scope of mathematics, and its unique role of solving life problems of man's day to day activities, mathematics has been considered as one of core subjects in the curriculum at the secondary school level. Though the pupil has the liberty to learn the
subject in his choice of medium of instruction, he finds this subject as more heavily loaded with abstract concepts compared to other core subjects. The parents and pupils’ at large consider mathematics as a difficult subject and these results in more number of failures in this subject. The rate of failure in mathematics is considerably higher than in other subjects.

The failure in the subject mathematics may be due to pupils' inability to read and understand the mathematical language and inability to interpret mathematical symbolism in a meaningful way. Apart from these factors, there may be other reasons like school climate, teacher-pupil’s relations, curriculum, teaching strategies adopted. There may be social and psychological factors.

Academic achievement of the learner is the primary theme of all types of educational endeavour. Particularly at secondary school stage, great emphasis is on achievement, right from the beginning to formal education. To certain extent, achievement test is a good tool for the timely appraisal of the students’ learning which will ensure improvement, also refinement, modification of teaching-learning process. The achievement tests will result in the higher academic achievement of the pupil.
Academic achievement in mathematics is affected by psychological factors like attitude, aptitude, anxiety, intelligence, creativity, motivation, achievement, adjustment, etc.

In the present study the researcher has considered some of the psychological factors like creativity, test-anxiety, attitude towards mathematics and achievement motivation that affect the academic achievement of IX standard students in mathematics.

Achievement is also affected by social factors like gender, age, type of school, location of school, school climate, medium of instruction, home climate, management, etc. In the present study the researcher has considered gender, type of management and medium of instruction as moderator variables to see their effect on achievement in mathematics.

Therefore the researcher wanted to know the percentage of contribution of each variable in predicting achievement in mathematics.
5.3. STATEMENT OF THE PROBLEM

The problem selected for the present investigation is stated below:

"FACTORS AFFECTING ACADEMIC ACHIEVEMENT OF IX STANDARD STUDENTS IN MATHEMATICS"

5.4. OBJECTIVES OF THE STUDY

The present study was taken up with the following objectives:

(i) To construct and validate a test in mathematics of IX standard students studying in Bangalore City.

(ii) To find out the relationship (if any) between achievement in mathematics and mathematical creativity of IX standard students.

(iii) To find out the relationship (if any) between achievement in mathematics and test-anxiety of IX standard students.

(iv) To find out the relationship (if any) between achievement in mathematics and attitude towards mathematics of IX standard students.
(v) To find out the relationship (if any) between achievement in mathematics and achievement motivation of IX standard students.

(vi) To study the significant difference in achievement in mathematics of IX standard students when they are classified according to their sex.

(vii) To study the significant difference in achievement in mathematics of IX standard students when they are classified according to the medium of instruction.

(viii) To study the significant difference in achievement in mathematics of IX standard students when they are classified according to type of management of the school.

(ix) To determine relative contribution of the mathematical creativity, test-anxiety, attitude towards mathematics and achievement motivation to the prediction of achievement in mathematics of IX standard students.
5.5. REVIEW OF RELATED LITERATURE

The studies reviewed have been classified broadly into 5 groups. They are:

1. Studies related to mathematical creativity and achievement in mathematics

2. Studies related to test anxiety and achievement in mathematics

3. Studies related to attitude towards mathematics and achievement in mathematics

4. Studies related to achievement motivation and achievement in mathematics

5. Studies related to type of school, gender, medium of instruction and academic achievement
5.6. HYPOTHESES:

In pursuance of objectives stated in 2-9, the following null hypotheses have been set up.

1. There is no significant relationship between the pair of variables given below with reference to IX standard students in Bangalore

   a) achievement in mathematics and
      (i) mathematical creativity
      (ii) test-anxiety
      (iii) attitude towards mathematics
      (iv) achievement motivation

2. There is no significant difference in the mean achievement scores of following sub-groups of IX standard

   a) boys and girls
   b) students studying through Kannada and English medium of instruction
   c) students in government and aided high-schools
   d) students in government and Unaided high-schools
   e) students in aided and Unaided schools.
3. There is no significant difference in the mean scores in mathematical creativity of the following sub-groups of IX standard.
   a) boys and girls
   b) students studying through Kannada and English medium of instruction
   c) students in government and aided high-schools
   d) students in government and Unaided high-schools
   e) students in aided and Unaided schools.

4. There is no significant difference in the mean scores in test anxiety of the following sub-groups of IX standard.
   a) boys and girls
   b) students studying through Kannada and English medium of instruction
   c) students in government and aided high-schools
   d) students in government and Unaided high-schools
   e) students in aided and Unaided schools.
5. There is no significant difference in mean scores in attitude towards mathematics of the following subgroups of IX standard.
   
a) boys and girls
   
b) students studying through Kannada and English medium of instruction
   
c) students in government and aided high-schools
   
d) students in government and Unaided high-schools
   
e) students in aided and Unaided schools.

6. There is no significant difference in the mean scores in achievement motivation of the following subgroups of IX standard.
   
a) boys and girls
   
b) students studying through Kannada and English medium of instruction
   
c) students in government and aided high-schools
   
d) students in government and Unaided high-schools
   
e) students in aided and Unaided schools.
5.7. VARIABLES OF THE STUDY

The following are the variables selected for the study:

1. **Dependent Variable:**
   a. Achievement in mathematics

2. **Independent Variables**
   a. Mathematical creativity
   b. Test-anxiety
   c. Attitude towards mathematics
   d. Achievement motivation

3. **Moderator Variables**
   a. Gender
   b. Medium of instruction
   c. Type of management
5.8 SAMPLING PROCEDURE

The students of IX standard studying in schools of Bangalore City constitute the population of the study. Out of the population, 800 students were drawn as sample for the study, using stratified random sampling technique.

The sample was selected from 20 secondary schools giving due representation to gender, type of management and medium of instruction.

5.9 TOOLS USED FOR THE COLLECTION OF DATA

The following tools were used in the study.

1. Achievement in Mathematics Test: constructed and validated by the researcher

2. Mathematical Creativity Test: designed and developed by Singh (1985)

3. Test Anxiety Scale: developed by Najma (1997)


5. Achievement Motivation Inventory: developed by Mehta (1989)
5.10. STATISTICAL TECHNIQUES EMPLOYED

The following statistical techniques were used to analyse the collected data:

1. Coefficient of Correlation: To find the correlation between dependent and the independent variables.

2. t-test: To know the significant difference between the means of variables.

3. Multiple Regression: To develop regression equations for dependent variable using independent variables as predictors.

5.11. MAJOR FINDINGS OF THE STUDY

1. Mathematical creativity has significant relationship with achievement in mathematics \( (r = 0.637) \).

2. Test-anxiety has negative significant relationship with achievement in motivation \( (r = -0.609) \).

3. Attitude towards mathematics has significant relationship on achievement in mathematics \( (r = 0.666) \).
4. Achievement motivation has significant relationship on achievement in mathematics \( (r = 0.526) \).

5.1. Boys and girls differ in their mean scores in

(i) Achievement in mathematics \( (t = 2.075) \)

(ii) Test Anxiety \( (t = 2.94) \) and

(iii) Achievement motivation \( (t = 2.52) \).

5.2. There is no significant difference in the mean scores in mathematics between boys and girls in

(i) Mathematical creativity \( (t = 0.992) \) and

(ii) Attitude towards mathematics \( (t = 0.071) \).

6.1. There is significant difference in the mean scores of students studying in English and Kannada medium of sections in

(i) Achievement in mathematics \( (t = 7.64) \)

(ii) Mathematical creativity \( (t = 1.976) \)

(iii) Attitude towards mathematics \( (t = 2.146) \)

(iv) Achievement motivation \( (t = 2.531) \)
6.2. There is no significant difference in the mean scores in test anxiety (t = 0.310) students studying in English and Kannada medium sections.

7.1. There is significant difference in the mean scores of students studying in Government and Aided high schools in

(i) Achievement in mathematics (t = 12.33)
(ii) Mathematical creativity (t = 3.919)
(iii) Test anxiety (t = 4.307) and
(iv) Achievement motivation (t = 3.313).

7.2. There is no significant difference in mean scores in attitude towards mathematics of students studying in government and aided high schools (t = 0.777).

8. There is significant difference in the mean scores of students studying in government and unaided high schools in

(i) Achievement in mathematics (t = 14.60)
(ii) Mathematical creativity (t = 6.453)
(iii) Test anxiety (t = 2.063)
(iv) Attitude towards mathematics (t = 3.420)
(v) Achievement motivation (t = 2.073).
9.1. There is significant difference in the mean scores of students studying in aided and unaided high schools in
(i) Mathematical creativity (t = 10.26) and
(ii) Attitude towards mathematics (t = 4.24).

9.2. There is no significant difference in the mean scores of students studying in aided and unaided high schools in
(i) Achievement in mathematics (t = 0.712)
(ii) Test anxiety (t = 1.868) and
(iii) Achievement motivation (t = 0.818).

10. Mathematics creativity, test-anxiety, attitude towards mathematics and achievement motivation as predictor variables explain the variance in mathematics of IX standard students to the extent of 19.38%, 23.34%, 21.32% and 15.42% respectively.

11. Mathematical creativity, test-anxiety, attitude towards mathematics and achievement motivation as predictor variables explain the variance in achievement in mathematics of IX standard students to the extent of 36.6%, 6.66%, 12.92%
and 12.92% respectively in case of boys and to the extent of 18.07%, -29.29%, 30.73%, 13.29% respectively in case of girls.

12. Mathematical creativity, test-anxiety, attitude towards mathematics and achievement motivation as predictor variables explain variance on achievement in mathematics of IX standard students to the extent of 18.87%, -10.71%, 7.73% and 24.98% respectively in case of students studying in English medium section and to the extent of 34.71%, 14.91%, 15.51% and 22.73% respectively in case of students studying through Kannada medium of instruction.

13. Mathematical creativity, test-anxiety, attitude towards mathematics and achievement motivation as predictor variables explain variance on achievement in mathematics of IX standard students to the extent of 2.36%, 0.37%, 4.56% and 9.29% in case of students studying in government High Schools to the extent of 52.73%, -2.68%, 14.45% and 14.45% in case of students studying in aided High Schools and to the extent of 34.19%, -5.536%, 17.91% and 28.575% in case of students studying in unaided High Schools.
14. Regression equations developed by using mathematical creativity, test-anxiety, attitude towards mathematics and achievement motivation scores on achievement in mathematics are given below:

(i) For total sample (N = 800)

\[ Y = 38.5422 + 0.1048 X_1 - 0.0971 X_2 + 0.0805 X_3 + 0.094 X_4 \]

(ii) For boys (N = 400)

\[ Y = 30.0474 + 0.0616 X_1 - 0.1170 X_2 + 0.0615 X_3 + 0.0944 X_4 \]

(iii) For girls (N = 400)

\[ Y = 26.7301 + 0.0641 X_1 - 0.0125 X_2 + 0.022 X_3 + 0.0625 X_4 \]

(iv) For students studying through English medium of instruction (N = 400)

\[ Y = 35.3289 + 0.2528 X_1 - 0.3021 X_2 + 0.6439 X_3 + 0.17163 X_4 \]

(v) For students studying through Kannada medium of instruction (N = 400)

\[ Y = 32.279 + 0.1526 X_1 - 0.1011 X_2 + 0.2731 X_3 + 0.1377 X_4 \]
(vi) For students studying in government high schools (N=200)

\[ Y = 28.2494 + 0.0837 \ X_1 - 0.00262 \ X_2 + 0.0784 \ X_3 + 0.0980 \ X_4 \]

(vii) For students studying in aided high schools (N = 320)

\[ Y = 35.3437 + 0.2724 \ X_1 - 0.0183 \ X_2 + 0.0659 \ X_3 + 0.0659 \ X_4 \]

(viii) For students studying in unaided high schools (N = 200)

\[ Y = 37.8836 + 0.1256 \ X_1 - 0.0249 \ X_2 + 0.0788 \ X_3 + 0.1170 \ X_4 \]

where,

\[ Y = \text{Achievement in mathematics} \]

\[ X_1 = \text{Mathematical Creativity} \]

\[ X_2 = \text{Test-Anxiety} \]

\[ X_3 = \text{Attitude towards Mathematics} \]

\[ X_4 = \text{Achievement Motivation} \]
5.12. CONCLUSIONS OF THE STUDY

The present study was undertaken to find out the predictive efficiency of mathematical creativity, test anxiety, attitude towards mathematics and achievement motivation for achievement in mathematics of IX standard students studying in Bangalore. The analysis of data revealed certain trends from which conclusions can be drawn.

1) Mathematical creativity contributes significantly to achievement in mathematics of IX standard students. It is found that Kannada medium students are lower in mathematical creativity than English medium students. Promotion of creative talents through educational programmes among Kannada medium students should be one of the main aims of schools. Schools should realise that classrooms are not meant only for transmission of knowledge but also for developing creative abilities and talents.
2) When compared to 'aided' and 'unaided' high school students, government school students have lower mathematical creativity. Atmosphere in government schools should be improved by providing men and material resources, so that creative abilities of the students are sharpened. The teachers should have favourable attitude towards creative students. Generally teachers expect students should be obedient, timid, fearful, and submissive. They do not appreciate courageous, curious, independent thinking and judgement, risk taking and initiative which facilitate creativity. Highly individualized and discovery teaching methods should be employed to foster creativity.

Better amenities, more enriched teachers and comprehensive curricular and co-curricular programmes should be provided. Attempt should be made to enrich educational setting of schools by providing all these facilities to promote creativity in students. Teachers in Government and Kannada medium schools should strive hard to stimulate creative abilities of the students. There shall not be more stress on achieving high marks in mathematics. Tendency prevails in our
present day society which gives more weightage to academic achievement rather than natural ability of an individual.

3) The pressure exerted by parents and teachers demand unrealistic high level of performance of their children. This situation makes the children more test-anxious. This has ill-effect on achievement in mathematics. To reduce mathematics test anxiety, the teacher should teach the subject for deep understanding. She should also make the testing situations non-burdensome to the students. For high anxious students – personal counselling can be provided in schools. Also parents should be told not to cause stress on students towards achievement. Guidance and counselling at the right time would minimize anxiety of students on their academic achievement. The teachers and parents' should not discourage students specially those who suffer from anxiety. Teachers should identify the units which give scope for creativity, by adopting most suitable methods of teaching. The class room environment should be conducive and encouraging, to develop basic skills, better work habits, divergent thinking, development of desirable attitude, adequate personal judgment, etc.
among the teaching methods the best methods suitable for developing mathematical creativity among students such as problem solving and heuristic method should be widely practised in classroom teaching.

4) In the case of attitude towards mathematics it was found that boys and girls do not differ significantly, whereas in case of medium of instruction, English medium students and Kannada medium students differ significantly. Also government and unaided high school students differ significantly. Then, it may be remembered here that favourable attitude towards mathematics has an impact on achievement in mathematics.

In schools, proper environment must be provided so that the pupils develop favourable attitude towards the subject mathematics. Mathematics teacher should take care to see that the pupils are not provided with confusing situations. Well balanced examples can be drawn from life situation by the teachers of mathematics. To develop in pupils, the most favourable attitude towards the subject, they can adopt the methods like — heuristic method, guided-discovery,
programmed instruction, inductive method. These will help them not only to develop insight over the subject, but certainly develop favourable attitude as free environment is provided in schools to the learner.

5) One of the most important attention drawing questions in education is how to enhance the academic performance of students. Many factors can contribute to students' lack of effort. The absence of academic motivation is reflected in students' negligence of their studies. In this study it was found out that there is marked relationship between academic motivation and achievement in mathematics. Boys and girls differ in mean scores in achievement motivation; students studying in English and Kannada medium also differ significantly in mean scores in achievement motivation and also students studying in government, aided and unaided high schools differ significantly in achievement motivation.

The first condition for and a very important factor of human behaviour is motivation. Teachers can make use of ways and means of motivation, keeping in view of individual
differences in intelligence, stages of development of students. Girls should also be given equal importance. They should be given equal opportunities and encouragement as boys and made highly achievement oriented. The parents also should not discriminate in the up-bringing of boys and girls. Teachers in Government High schools should also play an important role in providing conducive environment for the development of achievement motivation. Also Kannada medium students should be encouraged to participate in competition, take up challenging tasks. A good intimate emotional relationship between pupils and teachers motivates students towards success.

6) There is significant effect of gender on academic achievement in mathematics of secondary school students. It is observed that girls are better in mathematics than boys.

7) The types of schools in which the students are studying has significant effect on achievement in mathematics. It is observed that students studying in aided and unaided school perform better than students in corporation and government...
schools. This may be due to interest of teachers and also lack of required qualification and rich experience in teaching. In government high schools transfer of teachers, environment of the school and equipments have effect on achievement in mathematics.

8) Medium of instruction has significant effect on achievement in mathematics. English medium students’ mean score is higher than that of Kannada medium students. This shows the importance given to English medium.

There are many factors which influence the academic achievement in mathematics at secondary stage. In the present study, it is observed that mathematical creativity, attitude towards mathematics achievement motivation and a low level of anxiety have impact on achievement in mathematics. To enhance the performance in mathematics variety of curricular and co-curricular programmes can be instituted in schools periodically.
5.13. EDUCATIONAL IMPLICATIONS

The major findings of the study and hence the conclusions drawn helped the investigator to suggest the following for the development of mathematical creativity in mathematics, attitude towards mathematics and achievement motivation, reduce anxiety level and hence improve the achievement in mathematics.

So in the teaching of mathematics the teacher may take the following measure.

1) Teaching should emphasise more on fundamental knowledge than on subject matter. More emphasis should be given on organised and meaningful learning than mechanical learning.

2) Better student teacher understanding and relationships, better adaptation of teaching-learning, encouragement of students towards acceptance of responsibility of learning, greater satisfaction of student with his learning, etc., should be given importance.
3) Finding answers to problems through various methods, verification and testing of results, etc., may help in developing mathematical creativity and reducing their anxiety level.

4) Pupils should be provided with free and necessary environment at home and school for learning mathematics and developing their own creativity, attitude and motivation and reducing their anxiety level.

5) Teachers should encourage and help pupils to participate in quiz programmes, exhibitions and other competitive tests related to mathematics.

6) Teachers should encourage students to use their leisure time profitably by engaging in activities such as collecting puzzles, solving problems and other such activities.

7) The parents should give training to the children in doing independent work. They must appreciate the successful activities of their children. The teachers should help the students to analyse their creativity, attitude and motivation, and anxiety levels which would make them believe that they are responsible for their success.
5.14. SUGGESTIONS FOR FURTHER STUDY:

The following suggestions are offered for further study:

1) The study may be extended for students who are studying in rural areas.

2) The study may be extended to a larger sample drawn from the State of Karnataka, as a whole.

3) The study may be undertaken by incorporating variables like intelligence, aptitude, interest, adjustment, mental health, problem-solving, age, caste, family, birth order, reading ability, self-concept and socio-cultural background of the students and other psycho-social and demographic variables.

4) Similar study may be undertaken in other subjects like science and social science.

5) A study can be undertaken with in-depth analysis of variables namely creativity in terms of its dimensions, anxiety at different levels, achievement motivation at different levels and achievement in different objectives of cognitive domain.