

Mathematics Education

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Akpan, Asuquo Asuquo. 1991. **A path-analysis model of mathematics problem-solving for secondary school students.** *Indian Educational Review*, Vol 26(2): 30-45.

Problem: The central purpose of the study is to develop a valid path-analysis model of problem-solving in mathematics and to determine the hierarchy of the total effects of the factors on mathematics problem-solving.

Objective: To investigate interrelationships among a set of variables using path-analysis.

Methodology: The subjects of the study were 820 junior secondary school students (made up of 512 males and 308 females) randomly selected from 20 schools in Cross River State of Nigeria in the 1985-86 academic year. The age range was from 12 to 20 years. The tools used were, Home Background Questionnaire (HBQ), Test of Comprehension and Application in Mathematics (TCAM), a parallel test used by Meyer, Test of Computation in Mathematics (TCM), Test of Reasoning Ability in Mathematics (TRAM), Attitude Measurement Scale (AMS), Motivational Intensity Measurement Scale (MIMS), The Creativity Assessment Scale (CAS), Test of Mathematical Terminology and Symbolism (TMTS), Test of Mathematical Reading Ability (TMRA), Test of Mathematical Problem-Solving Ability (TMPSA), and two separate Mathematical Achievement Tests, namely, Test of Understanding Mathematical Problem Structure (TUMPS)

and Test of Understanding Mathematical Problem Content (TUMPC). The path-analysis, a series of multiple regression analyses, was computed to throw some light on the tenability of the conceptual path model for students' problem-solving ability. An intercorrelation matrix of six variables was obtained and a series of regression analyses were carried out.

Major Findings: (1) Five paths, namely P_{32} (affective factors and cognitive abilities), P_{52} (affective factors and problem characteristics), P_{54} (mathematical language factors and problem characteristics), and P_{62} (affective factors and problem-solving ability) were not found to be significant. (2) Students' attributional factors (motivation, creativity and attitude towards mathematics) had no direct effect on their ability to solve problems in mathematics, while other variables had a direct effect on the criterion variable. (3) The discrepancies between the original and reproduced correlations were very negligible. Patterns of correlations in the data were consistent with the trimmed path model. The new path-analysis model was tenable in explaining causal relations among the variables in the model. (4) Cognitive abilities exerted the strongest and the most significant total effect on students' problem-solving ability. (5) Mathematical language, home background and problem characteristics variables, in descending order of magnitude, exerted significant total effect on the criterion variable. (6) Cognitive

abilities were most effective in enhancing students' understanding of the language of mathematics. (7) Home background factors exerted positive and significant direct effects on students' mental abilities and affective behaviours, which in turn had a direct effect on their ability to understand mathematical language. (8) Students' affective behaviours had no direct causal impact on their ability to solve problems in mathematics.[Spr 1498]

Bhagwat, Sunita A. 1992. **To prepare a package of divergent production type problems in mathematics and to study the effectiveness of the package against levels of intelligence and sex differences for Standard VIII students in Pune city.** Ph.D., Edu. *Shreemati Nathibai Damodar Thackersey Women's Univ.*

Problem: This study addresses the preparation of a package of a divergent production type problems in mathematics and its effect with respect to students of different levels of intelligence. The researcher developed test items based on the syllabus of Standard VIII from the State of Maharashtra.

Objectives: (i) To prepare divergent production type problems on the Standard VIII mathematics syllabus in Maharashtra State, (ii) to test the effectiveness of the package against the levels of intelligence for Standard VIII students, and (iii) to test the effectiveness of the package against the sex differences of Standard VIII students.

Methodology: An incidental sample of 50 students (25 boys and 25 girls) was chosen for the pilot study. A similar procedure was followed for the main study by selecting 100 boys and 100 girls. This sample was divided into groups of 50 each on the basis of level of intelligence. The tools used to collect data included, a standardized test measuring creativity in mathematics, Raven's Progressive Matrices, a package of Divergent Production Type Problems prepared by the researcher. The experiment was conducted using the pre-test, post-test group design. The data

were analysed by using correlated 't' test and analysis of co-variance.

Major Findings: (1) There was a significant increase in the post-test scores in the case of both girls and boys. (2) Taking into consideration the three levels of intelligence, it was found that there was a significant increase in the post-test scores in the case of both boys and girls.[AGB 1281]

Bhatia, Kusum. 1992. **Identification and remedy of difficulties in learning fractions with programmed instructional material.** *Indian Educational Review*, Vol. 27(3): 102-06.

Problem: The present study tests the effectiveness of programmed instructional material as a remedial teaching tool.

Objectives: (i) To develop programmed instructional material on fractions for students of Class V, (ii) to use programmed instructional material as a remedial tool, (iii) to test the effectiveness of programmed instructional material in classroom teaching for students of Class V, and (iv) to test the significance of difference between the traditional method of teaching and teaching through programmed instructional material.

Methodology: A sample of 50 students was selected from two M.C.D. primary schools of Karol Bagh, New Delhi (twenty-five students from each school). Four criterion tests were administered as tools to collect data. The collected data were treated by using mean, SD, and 't' test.

Major Findings: (1) Teaching and learning through programmed instruction could definitely help both students and teachers. (2) Students receiving the programmed instructional material did better in post-test as compared to the other group. (3) The programmed instructional material worked effectively as a remedial tool. (4) Programmed instructional material not only helped the students to learn better but also helped the teacher to know how the students learn better. [SPR 1541]

Biswal, J. 1988. **Creativity in mathematics as a function of study habits and pupils' perception of teachers' impression about their performance in mathematics.** Ph.D., Edu. Utkal Univ.

Problem: The study centres upon the problem of creativity in mathematics as a function of study habits and pupils' perception of teachers' impressions about their performance in mathematics.

Objectives: (i) To estimate the functional relationship between Mathematical Creativity and Study Habits in Mathematics (SHM) and Mathematical Creativity and Pupils' Perception of Teachers' Impressions about their Performance in Mathematics (PPTIPM), (ii) to determine the efficiency of pupils' study habits in mathematics and their perception of teachers' impression about their performance in mathematics, (iii) to determine intercorrelations among pupils' fluency, flexibility and originality measures derived from a Mathematical Creativity Search (MCS) Battery, (iv) to estimate the combined efficiency of pupils' study habits in mathematics and pupils' perception of teachers' impressions about their performance in mathematics and their mathematics achievement scores in predicting their mathematical creativity, and (v) to assess the effects of sex, caste, rural-urban locale, birth-order, home study time for mathematics, rank in class mathematics tests and self-assessment of achievement in mathematics on pupils' creativity in mathematics.

Methodology: The study involved a sample of 585 students (323 boys and 262 girls) of Class X drawn from 40 high schools (6 boys' 13 girls' and 21 co-educational schools) located in two districts of Orissa State. The tools used to collect the data included a Mathematical Creativity Search Battery, a Study Habits in Mathematics Scale and a Pupils' Perception of Teachers' Impressions about their Performance in Mathematics Scale, developed by the investigator.

The collected data were treated by using correlation, linear and multiple regression and analysis of variance.

Major Findings: (1) Pupils' creativity in mathematics was found to be a linear function of each of the variables, study habits in mathematics and pupils' perception of teachers' impressions about their performance in mathematics. The product-moment correlations in both the cases were positive, low but statistically significant. Nine point eight per cent and 8.7% of the total variation of pupils' mathematical creativity could be predicted from the variation in SHM and PPTIPM measures, respectively. (2) Pupils' Creativity in Mathematics was also found to be a function of those two variables, SHM and PPTIPM, taken together. The multiple-correlation involving the Criterion (Mathematical Creativity Scores) and the Predictors (SHM and PPTIPM Scores) was positive and statistically significant; the variation of scores on the predictors could predict 11% of the total variation of the criterion measures. (3) A functional relationship was also found to exist between Pupils' Creativity in Mathematics and the combination of SHM, PPTIPM and Achievement in Mathematics. The multiple correlation was positive and statistically significant. Thirty-two per cent of the total variation in mathematical creativity measures was attributable to the joint variation of the measures of the predictors; achievement in mathematics accounted for about 28% of the variation in criterion measures. (4) Both SHM and PPTIPM had significant main effects on creativity in mathematics. (5) Urban students were found more creative in mathematics than their rural counterparts. (6) Creativity in mathematics varied directly with the increase in the time devoted to studying mathematics at home — from one or less than one hour to two hours. (7) Pupils who got the first four ranks in mathematics tests were found more creative in mathematics than their remaining classmates. [KCP 0416]

Chel, Madan Mohan. 1990. **Diagnosis and remediation of underachievement in compulsory mathematics of madhyamik examination in West Bengal.** Ph.D., Sc. Univ. of Calcutta.

Problem: The study attempts to diagnose and suggest remediation of underachievement in the compulsory mathematics of the *madhyamik* examination in West Bengal.

Objectives: (i) To identify different kinds of difficulties related to underachievement of students in mathematics from classroom observations of mathematics lessons, (ii) to seek out the types of errors which are identified from the performances of the students in their answer scripts, (iii) to find out the factors, according to the opinion of students, teachers and guardians, that are responsible for underachievement in mathematics at the secondary level, (iv) to know the extent to which the procedure of evaluation is responsible for the underachievement, (v) to know the reinforcers and noises in communicating mathematical principles to learning, (vi) to find out the remediation programme that should be suggested for students, teachers and others for obtaining better achievement in mathematics at the secondary level, and (vii) to find out what should be the role of the authority or the management in implementing the remedial programme.

Methodology: The sample comprised urban, semi-urban and rural students of Classes VI to X of West Bengal. The case study method was used in collecting the data. The statistics used to treat the collected data were mean and rank differences correlation.

Major Findings: (1) The main difficulties faced by students included, concept gaps, confusion in understanding mathematical language, stereotype way of presenting contents and lack of openness in teaching. (2) The major mistakes found in the performances of students and teacher trainees in the areas include mathematization of verbal problems, interpretations of

mathematical results and learning new topics in mathematics. (3) Underachievement was caused due to lack of understanding of the mathematical concepts of the earlier stage, and the abstract nature of mathematics. (4) Errors were caused due to the versatility and variability of contents, lack of time, etc. (5) Noises in the channel of message were fear, anxiety, psychological imbalance, the faculty's arrangement of contents. (6) Reinforcers in the channel of learning were readiness, interest, active involvement, use of effective materials of instruction and learning efficiency. [SPB 0194]

Dandapani, C. 1992. **Dimensions of effective teaching of mathematics.** Ph.D., Edu. Annamalai Univ.

Problem: The study identifies the process variables and the characteristics of mathematics teachers which contribute to the effective teaching of mathematics. Further, it builds up a model to identify effective and ineffective teachers.

Objectives: (i) To observe the differences, if any, in the perception of effective teaching of mathematics of teachers with respect to sex, qualification, place of work, type of management of schools, experience, hours of teaching per week, and the type of the school, (ii) to study the factorial structure of the perception of teachers on effective teaching of mathematics, (iii) to identify the dimensions of effective teaching of mathematics based on their perception, (iv) to investigate the relationship between the perception of teachers and the evaluation of headmasters, (v) to evolve a method to identify effective and ineffective teachers based on the headmasters' evaluation, (vi) to compare the perception of effective and informative teachers on the eleven aspects of effective teaching, and (vii) to construct a mathematical model to classify teachers into effective and ineffective teachers.

Methodology: The researcher used the normative survey method. An attempt was made to cover all mathematics teachers working in

Tanjore District in Tamil Nadu. There are 374 high and higher secondary schools and 689 mathematics teachers working in these schools. In the pilot study, 31 mathematics teachers and 25 headmasters of 25 schools participated. In the final study, 375 mathematics teachers from 162 schools participated, and 162 headmasters evaluated their mathematics teachers. The tools used to collect data developed by the investigator included a Teachers' Perception Scale of Effective Teaching of Mathematics and Characteristics of Effective Mathematics Teachers Description form. The collected data were treated with mean, SD, 't' test, 'F' test and chi-square.

Major Findings: (1) Female teachers had a significantly higher perception than the male teachers. (2) Teachers' perception had been found to vary with their years of experience. This variation was found to exist on all the eleven aspects of effective teaching. (3) The perception of teachers did not differ because of their qualifications (both academic and professional), place of work, viz. rural and urban, type of management, type of school and number of periods/week of teaching mathematics. (4) Factorial analysis had revealed the existence of two factors accounting for 50% of the variance. Factor I consisted of the five aspects of effective teaching of mathematics. There were six aspects in Factor II of the effective teaching of mathematics. (5) Teachers' perception had been significantly related to their headmasters' evaluation, and, consequently, to their characteristics (chi-square). (6) There had been 57 effective and 52 ineffective teachers. (7) The effective teachers differed significantly from the ineffective teachers on all the eleven aspects of teaching. [MDa 1376]

Deshmukh, Veena. 1988. **Some temperamental correlates of mathematics learning.** Ph.D., Edu. Nagpur Univ.

Problem: This study tries to explore the relationship of mathematics learning with different temperamental variables. It attempts to

justify the identification of a certain closely knit group of personality variables (ten only) which may be related with mathematics in the cognitive domain.

Objectives: (i) To study the relationship of mathematics learning and temperamental traits, (ii) to study the influence of sex differences and socio-economic status on the variables, temperamental traits, mathematics learning, and the cognitive variables considered conducive to mathematical learning, and (iii) to study the temperamental factor structure of high, average and low achievers as well as of over, normal and underachievers in mathematics.

Methodology: The sample of the study comprised 1,008 subjects selected by using the stratified random sampling procedure. 491 boys and 517 girls studying in Standard IX were selected from 22 English-medium schools selected randomly from the secondary schools in Nagpur. Using the regression technique, the sample was classified into high achievers, average achievers and low achievers as also over-normal and underachievers. The tools used to collect data included the Thorndike Dimensions of Temperament Inventory, the SRA Tests of Educational Ability, an Achievement Test in Mathematics, and a Socio-economic Status Scale. Intercorrelations, mean, standard deviation, critical ratio, correlation and factor analysis were used to treat the collected data.

Major Findings: (1) A low but positive and highly significant correlation was found between mathematics learning and responsible and ascendant temperaments. (2) A low but negative and highly significant correlation was found between mathematics learning and temperamental dimensions, viz. sociable, accepting and impulsive, which means the negative ends of these traits. (3) IQ and reasoning were found significantly related to the dimensions ascendant, responsible, critical and plentiful, and language ability, to the dimensions: responsible, critical, solitary, tender-minded and lethargic. (4) Girls

were found more gloomy, more tender-minded and more irritable than boys who were found more active than girls. (5) As far as cognitive abilities, basal to mathematics learning are concerned, boys were found superior to girls on quantitative and total educational ability and mathematics learning. (6) The temperamental profiles of high, average and low achievers were found to differ considerably from one another. (7) The high achievers/were found to be more critical, more responsible, more solitary and more ascendant than the average achievers, who were tender-minded. (8) Middle-class students were found more active than the students from upper strata. (9) The three groups, i.e. the high, average and low socio-economic status groups were found to be in the descending order on all the cognitive abilities considered as basal to mathematics learning.[GPK 1614]

Doshi, P.C. 1989. **A study of achievement and cognitive preference styles in mathematics of Class X students.** Ph.D., Edu. Univ. of Rajasthan.

Problem: A study of the achievement and cognitive preference styles in mathematics of Class X students.

Objectives: (i) To find out the cognitive preference in mathematics among Class X (arts, science and commerce) students, (ii) to find out the cognitive preference styles of high and low achievers in mathematics, (iii) to study the effects of sex, type of school and the stream of the student on the cognitive preference styles of students, (iv) to compare the teachers' cognitive preference styles in mathematics with those of students, and (v) to study the relationship between students' mathematics achievement and their cognitive preference styles.

Methodology: The sample comprised 1,200 students made up of an equal number of rural and urban students. The design used was a factorial design. The researcher developed and used an Elementary Mathematics Achievement Test as well as a Mathematics Cognitive

Preference Test. The collected data were treated using analysis of variance.

Major Findings: (1) The majority of arts and commerce students manifested the R-P-A-Q order of cognitive preference styles. (2) Science students and teachers manifested the P-R-A-Q order of cognitive preference styles. (3) The questioning style among different groups of students and teachers was found to be the last. (4) Rural female students were more inclined to check the Recall (R) style as compared to rural/urban male students. (5) There was an insignificant relationship between cognitive preference styles and achievement in mathematics. (6) Knowledge scores were positively correlated with questioning at the low level.[JKS 0703]

Dutta, Anima. 1990. **Learning disabilities in the reasoning power of the students in geometry — diagnosis and prevention.** Ph.D., Edu. Univ. of Kalyani.

Problem: The study attempts to diagnose the problems in reasoning faced by the students in learning geometry, and their prevention.

Objectives: (i) To diagnose the major patterns of disabilities in a specific area of geometry with the help of tools specially developed for the purpose, and (ii) to try out experimentally teaching methods which would prevent development of learning disabilities in the area under study.

Methodology: The sample comprised 148 students covering both the genders and belonging to both rural and urban areas. Using an experimental design, the study was conducted using a diagnostic test, an attainment test and a teaching strategy. The collected data were treated with ANOVA.

Major Findings: (1) The experimental group, taught by audio-visual materials and techniques achieved significantly more than the control group taught by the conventional method. (2) Learning through audio-visual materials

caused more prolonged retention than through the conventional method. (3) The experimental group showed more interest in the lesson than the control group. [PDR 0639]

Gupta, J.K. 1991. Srivastava, A.B.L. and Sharma, K.K. **Estimation of true change under the Matrix Sampling Model.** *Indian Educational Review*, Vol. 26(3): 1-19.

Problem: The study addresses itself to use of the Matrix Sampling Model for estimating an individual's true change and the reliability of change scores.

Objectives: (i) To study whether the regression coefficient is interpretable as the reliability of change scores, and (ii) to study whether the stratified sampling model provides the highest reliability for the true change score followed by the simple random sampling and two stage sampling models.

Methodology: A hypothetical data was used for illustration purpose. The collected data were treated with ANOVA and regression analysis.

Major Findings: (1) It was found that the value of B_2 , an estimate of the reliability of true change in the case of the stratified random sampling model is 0.7714, which was greater than both B_3 ($= 0.7030$) and B_1 ($= 0.5519$), the estimates of reliability coefficients when test items were selected at random and by using the two-stage sampling procedure, respectively. These results were consistent with the sampling-theory results. (2) In the two-stage sampling model, the variance for the estimated mean or total was greater than that obtained for the stratified sampling model due to further addition or between strata variance, and this increase in the variance tended to reduce the reliability of true change. (3) Although stratified random sampling does not necessarily provide a smaller variance than a simple random sample, the proper use of stratification nearly always results in a smaller variance for the estimated mean or total than is given by a simple random sample. This tended

to increase the reliability of the true change scores obtained by using stratified random sampling in comparison to that obtained under a simple random sampling model. [CGVM 1504]

Gurusamy, S. 1990. **A diagnostic study of the errors committed by students of Standard IX in solving problems in geometry.** M.Phil., Edu. Alagappa Univ.

Problem: This study attempts to find out the errors committed by students of Standard IX in solving problems in geometry, and tries out the remedial packages.

Objectives: (i) To identify and categorise the errors committed by the students of Standard IX in solving problems in geometry, (ii) to design some suitable remedial teaching programmes for the students of Standard IX in solving problems in geometry, and (iii) to implement the remedial teaching programmes with the students of Standard IX in order to minimise these errors in solving problems in geometry.

Methodology: The case study method was used by the investigator to observe the causes of committing errors by students of Standard IX in solving geometry problems. To collect data, a questionnaire developed by the investigator was sent to 20 expert geometry teachers of Standard IX. Percentages were computed for comparison and interpretation of errors. The collected data were treated with mean, standard deviation and 't' test.

Major Findings: (1) It was found that the students' mean achievement scores were increased and the errors were considerably reduced in the post-test. (2) The level of performance of the students in the post-test was found to be high after the implementation of the remedial programme. [SM 1740]

Hariharan, D. 1992. **Attitudes of high school students towards homework and their achievement in mathematics.** M.Phil., Edu. Madurai Kamaraj Univ.

Problem: The study attempts to find out the attitudes of high school students towards homework and their achievement in mathematics.

Objectives: (i) To measure the attitudes of high school students towards homework in mathematics, (ii) to measure their academic achievement in mathematics, and (iii) to find out the relationship between the attitudes of high school students towards homework and their achievement in mathematics.

Methodology: The sample of the study comprised 250 students of Class IX selected from the various high schools of Madurai City. A Homework Attitude Scale (HAS) was constructed and used for measuring the attitude of the sample. An achievement test was also constructed to measure the academic achievement of the high school students in mathematics. The mean, SD, t-test and Pearson's product-moment correlation were used for statistical analysis.

Major Findings: (1) Girls were higher than boys in their attitude towards homework. (2) Urban students were higher than rural students in their attitude towards homework. (3) Private school students were higher than the government school students in their attitude towards homework. (4) The attitudes of high school students towards homework were related to their achievement level in mathematics. [MKU 1087]

Jain, S.L. and Burad, G.L. 1988. **Low results in mathematics at secondary examinations in Rajasthan.** Independent study. Udaipur: State Institute of Educational Research and Training.

Problem: The study centres upon the problem of low results in compulsory mathematics at the secondary level examination in the state of Rajasthan.

Objective: To find out the causes related to low results and give suggestions to remove them.

Methodology: The sample of the study comprised rural and urban boys and girls of 100 government and private schools with lower results than those of the private students of Rajasthan. The heads of the institutions, the subject teachers and the students of those schools were also involved. The tools used to collect data included questionnaires for subject experts, for heads of the institutions, for subject teachers and for students.

Major Findings: (1) Non-availability of mathematics teachers due to late appointment and frequent transfers, lack of appropriate classroom blackboards and other physical facilities, irregular attendance of students, teachers' habit of leaving the headquarters daily, and lack of residential facilities in some difficult areas were the administrative causes. (2) A low standard in the lower classes, non-availability of textbooks, lack of timely correction of homework, an overburdened and uninteresting curriculum, lack of child-centred teaching, overcrowded classrooms, lack of sufficient periods for the subject, use of 'pass books' and guidebooks by most of the students, scarcity of teaching material for mathematics, and lack of proper supervision were the academic causes. [JCV 1558]

Kasat, B.S. 1991. **In-depth study of the causes of the large failures in mathematics at S.S.C. examination of Marathi medium high school students in Palghar Tahsil.** M.Phil., Edu. Pune: Indian Institute of Education.

Problem: The study attempts to identify the causes of the large failures in mathematics at S.S.C. examination of Marathi medium high school students in Palghar Tahsil.

Objectives: (i) To find out whether low intelligence and poor numerical ability are the reasons for failures in mathematics, and (ii) to find out the student-related, teacher-related, subject-related, parents-related and school-related reasons for the failures in mathematics.

Methodology: The sample of the study comprised 200 students (100 boys and 100 girls) of 25 Marathi medium high schools of Palghar Tehsil, between October 1988 and October 1989, who had failed in mathematics. Standardised tests of numerical ability and a self-made questionnaire for teachers were used to collect data. The collected data were treated with percentages, 't' ratio, frequency distribution, frequency polygon, mean, median, mode, standard deviation, quartile deviation, kurtosis and skewness.

Major Findings: (1) Low intelligence, poor numerical ability, poor comprehension and recall ability, no interest in mathematics and poor study habits were the causes of the large failures of boys and girls. (2) It was found that techniques like the Dalton Plan and group work were not followed by the teachers while teaching. (3) The teachers found that the mathematical curriculum was not child-centred. Topics such as percentage and shares were difficult in arithmetic; the circle, circle-arc and area, similarly, were difficult to teach in geometry. (4) Percentage, rational algebraic expression, variations, probability and statistics were difficult topics in mathematics. (5) The parents being illiterate could not help the children at home. There were no finances for audio-visual aids in the schools. [ASB 0034]

Kaul, Phool. 1992. **An investigation into the relationship of maturation of space concept and mental imagery with achievement of concepts of polygon among the middle and secondary grade pupils of English medium schools in Delhi.** Ph.D., Edu. Jamia Millia Islamia.

Problem: The present study attempts to investigate the relationship of maturation of the space concept and mental imagery with achievement of concepts of polygon among the middle and secondary stage pupils of English medium schools in Delhi.

Objectives: (i) To identify the relationship

between space concept maturation and mental imagery among middle (Class VIII) and secondary (Class X) Grade pupils of English medium schools in Delhi, (ii) to identify the relationship between space-concept maturation and achievement of polygon-concepts among the middle (Class VIII) stage pupils of English medium schools in Delhi, (iii) to identify the relationship between maturation of mental imagery and achievement of polygon concepts among the middle and secondary stage pupils of English medium schools in Delhi, and (iv) to find out the extent to which the maturation of space-concept and mental imagery contribute to the achievement of polygon concepts among middle (Class VIII) and secondary (Class X) pupils of English medium schools in Delhi.

Methodology: In the study 243 pupils of Class VIII and 250 pupils of Class X of Delhi Public Schools were selected as sample. Out of these, the answer-sheets of only those pupils who were of the age 13+ in Class VIII and of 15+ in Class X were picked up for scoring. The tools used to collect data, developed by the investigator, included Topological Space (TS), Projective Space (PS), Euclidian Space (ES), Anticipatory Transformation of Products (ATP), Anticipatory Transformation of Modifications (ATM), Kinetic Anticipation of Products (KAP), Kinetic Anticipation of Modifications (AKM), Elements of a Polygon, Properties of a Polygon, Relations Pertaining to a Polygon (RPP), and Measurement and Construction of a Polygon (MCP). The data were treated with coefficient of correlations.

Major Findings: (1) All the significant coefficients of correlation between tests measuring maturation of space concept, maturation of mental imagery and achievement of concepts of polygon were fair-sized and positive. There existed a positive and significant relationship between maturation of mental imagery and maturation of space-concept in the case of both Class VIII and Class X subjects. (2) Mental imagery appeared to get differentiated into two independent factors, AT and AK, in the case of Class VIII and Class X

subjects. But further differentiation of AT into ATP and ATM and that of AK into AKP and AKM was not noticed either in the case of Class VIII or Class X subjects. Space-concept emerged as a unitary mixed factor in the case of Class VIII, wherein no differentiation of space concept into Topological, Projective and Euclidian components was noticed. (3) The composites of maturation of mental imagery as well as maturation of space concept emerged as viable determiners of the achievement of concepts of polygon as they contributed significantly to both the Classes VIII and X. Out of AT and AK, only AT emerged as a viable major determiner of achievement of concepts of polygon at both Classes VIII and X levels. [SPR 0614]

Khatoon, Fareeda. 1988. A study of mathematical aptitude among boys and girls and its relationship with interests and vocational preferences at the secondary school level. Ph.D., Edu. Osmania Univ.

Problem: The study attempts to identify mathematical aptitude among boys and girls and its relationship with interests and vocational preferences at the secondary school level.

Objectives: (i) To find out whether the students' educational and vocational preferences were related to their environmental factors, (ii) to find out whether the students' educational and vocational preferences were related to the father's occupation and course of studies, (iii) to find out whether there is a significant difference between the measured interest and the expressed interest of the students, (iv) to find out the differences in the educational and vocational interests of students due to their sex, (v) to find out the extent to which of the courses preferred by the students agree with their interest, (vi) to find out whether the attainment of the students in the school subject of mathematics had a bearing on their interest and aptitude for mathematics, (vii) to find out the school subjects liked most and liked least by boys and girls and (viii) to study the aptitude for mathematics in students belonging to different religions.

Methodology: A stratified random sample of 600 boys and 600 girls of Class X of 15 English-medium recognised high schools in the twin cities of Hyderabad and Secunderabad was taken. The tools used to collect data included an Interest Inventory and an Aptitude Test in mathematics. The collected data were treated with mean, SD, 't' test and 'F'-test.

Major Findings: (1) The achievement of boys in mathematics was found to be somewhat superior than that of the girls (based on the marks obtained in mathematics at the Class X annual examination). (2) There was no significant difference in the aptitude for mathematics between boys and girls. (3) Interests and job preferences tended to be influenced by environmental factors like the occupation of the father. (4) Boys showed more interest in mathematics and subjects related to mathematics as compared to girls. (5) There was no significant difference between the aptitude for mathematics and age-levels at Class X stage. (6) The boys and girls of educationally well-placed parents had a different educational set of interests. (7) There was no significant difference between the income per month of the families, from all sources, and aptitude for mathematics. (8) There was no significant difference in the aptitude for mathematics between students belonging to different religions. [SSS 0842]

Krishnan, Navaneetha J. 1990. Identification of problem-solving strategies in mathematics among high school students in Devakottai Educational District. M.Phil., Edu. Alagappa Univ.

Problem: The study attempts to identify the problem-solving strategies in mathematics among high school students in the Devakottai Educational District.

Objectives: (i) To identify and categorise problem-solving strategies, (ii) to identify how far these problem-solving strategies are applied by the students, (iii) to identify their achievement of

problem-solving in mathematics, and (iv) to find out the relationship between identification of problem-solving strategies (IPSS) and application of problem-solving strategies (APSS) and achievement of problem-solving in mathematics (APSM).

Methodology: A sample of 370 students (225 boys and 145 girls) from 12 schools was randomly selected by using the cluster sampling technique. The tools used to collect data included, Identification of Problem-Solving Strategies (IPSS) to identify the steps in problem-solving strategies by students, Achievement of problem-solving in Mathematics (APSM) to identify pupils' achievement of problem-solving in mathematics, Application of Problem-Solving Strategies (APSS) to identify pupils' application of problem solving strategies in an actual problem-solving situation. The collected data were treated with multiple correlation.

Major Findings: (1) There was no significant relationship between the IPSS and the APSS of students. (2) There was no significant relationship between the IPSS and the APSM of students. (3) The correlation between APSS and achievement of problem-solving in mathematics was significant. (4) The test of relationship between the scores of the algebraical sum and APSS provided a significant 'r' value. (5) The correlation between the scores of the sum in application and APSS was significant. (6) There was a significant relationship between the scores of the sum in mensuration and the APSS of the remaining students. (7) While computing 'r' value between the scores in Achievement of Problem-Solving in mathematics and the half-yearly marks in mathematics, it was found to be significant. (8) There was no significant relationship between the scores of IPSS and the half-yearly marks in mathematics. (9) There was no significant relationship between the IPSS and the APSM of the students, partialling out the effect of APSS. (10) There was a significant relationship between the APSS and the APSM of the students, partialling out the effect of IPSS. (11) IPSS and APSS had an indirect effect on APSM. So it was

found that 31% of students' achievement in mathematics was contributed by IPSS and APSS. [SM 1764]

Lalitha Bai, T.K. 1992. **A comparative study of the cognitive factor structures of the high, average and low-achievers in secondary school mathematics.** Ph.D., Edu. Univ. of Kerala.

Problem: The study compares the cognitive factor structures of high, average and low achievers in mathematics at the secondary level.

Objectives: (i) To identify the pattern of clustering of the 31 cognitive variables for the total sample in terms of the resulting cognitive factor structure for the total sample, (ii) to identify the cognitive factor structures (obtained in terms of the 31 cognitive variables) for the three achievement levels in mathematics (HA, AA, LA), and (iii) to compare the differential pattern of clustering of the 31 cognitive variables for the four groups (total sample, HA, AA and LA) by comparing the cognitive factor structures of the total sample with the factor structures of the three achievement levels.

Methodology: The study was conducted on a representative sample of 531 students of Standard X selected on the basis of the proportionate stratified sampling technique. The tools used were an Achievement Test in Mathematics for Standard X (based on Bloom's Taxonomy, Cognitive Domain), a paper Form Board Test, a test for Spatial Ability, a test for Perceptual Speed, a Numerical Ability Test, and Verbal and non-Verbal Group Tests of Intelligence. The statistical techniques used were test of significance for difference between means of large, independent samples, factor analysis using the 'Principal Axes' method, and factor rotation following the criteria of simple structure and positive manifold.

Major Findings: (1) The 31 cognitive variables for the total sample were reduced to a single factor, 'Numerical Ability', when analysed. (2) For the high mathematics achievers, the 31 cognitive

variables were reduced to three cognitive factors, 'Abstract Reasoning', 'Numerical-Spatial Facility', and 'Non-language Reasoning'. (3) For the average mathematics achievers, the factor identified was 'General Mental Ability'. For the low mathematics achievers two factors were identified. They include 'Numerical-Perceptual Ability' and 'Numerical Facility'. [VR 1640]

Mishra, R. 1991. **Development of teaching steps for handling arithmetic-disabled children.** M.Phil., Psy. *Utkal Univ.*

Problem: The study centres upon the problem of development of teaching steps for handling arithmetic disabled children.

Objective: To develop an approach and specific steps in teaching subtraction and addition to the arithmetic-disabled children.

Methodology: The sample consisted of four learning-disabled children, among them were two boys and two girls. The sample was taken from a special institution meant for learning-disabled children, open-learning system, Sahid Nagar, Bhubaneswar. The age-factor of these children was not taken into consideration because of arithmetic-disability and they remained between the range 10-16 years. The tools used to collect data included a children's computer programme of single digit.

Major Findings: (1) With training and following the teaching steps, the disabled subjects, could perform in a better way. (2) With repetition, the subjects' performance improved. Thus, the defect did not lie with the teaching procedures as the subjects' performance was increased, though the improved performance remained for a shorter period. (3) With repetitive training and more assessment, the subjects could improve and retain in the memory for a longer period. [KCP 0510]

Mohapatra, B.C. 1990. **A critical appraisal of the secondary school mathematics curriculum of Orissa.** Ph.D., Edu. *Utkal Univ.*

Problem: The study centres around the problem of a critical appraisal of the secondary school mathematics curriculum of Orissa.

Objectives: (i) To analyse the objectives of teaching mathematics at the secondary school level and to compare the curriculum with the curriculum of the CBSE, the NCERT and the ICSE, (ii) to analyse the syllabus from the point of view of students and teachers, (iii) to compare the syllabus in mathematics with the syllabuses of the NCERT, the CBSE and the ICSE, (iv) to analyse the present mathematics curriculum of Orissa to find out the relative importance of the various topics, and (v) to assess (a) the present operational situation relating to the mathematics curriculum and the textbooks that are prescribed and their adequacy, (b) the methodological approaches adopted for teaching the subject, (c) the procedure of evaluation, (d) the facilities available for teaching and (e) the attitude of the students in learning mathematics.

Methodology: In the study, 22 secondary schools were taken from six districts of Orissa. 220 teachers and 556 students constituted the sample. The tools used to collect data included Questionnaires for the students studying mathematics and for the teachers teaching mathematics. The collected data were treated with calculation of percentage of teachers' and students' opinions on different aspects of the mathematics curriculum.

Major Findings: (1) The mathematics teachers of Orissa were conservative in their outlook so far as the objectives of teaching mathematics were concerned. They emphasised the fundamental mathematical operations, familiarity with mathematical concepts and terms, development of mathematical skills; objectives like development of discipline, determination and a sense of proportion were given the least importance. (2) The students, by and large, were pragmatic in their approach and considered mathematics to be a utilitarian subject. (3) The mathematics syllabus of Orissa contained a more detailed description of the

objectives of teaching mathematics than the other syllabuses. Some teachers opined that the objectives had been well reflected in the topics, but an almost equal number of teachers refuted this. (4) The provision of optional mathematics was a good feature of the Orissa syllabus. (5) The syllabus committee, constituted of ten members, had four mathematics secondary school teachers, three university teachers, two headmasters and one primary school teacher. (6) The teachers provided higher ranking to the traditional topics and resisted the intrusion of new topics. (7) Geometry and its application were more highly satisfying than algebra and its application. (8) The textbooks did not contain the objectives in clear terms. (9) Most of the teachers as well as students did not appreciate the physical aspects of the mathematics textbooks. (10) The teachers adopted the discussion method. The analysis-cum-discussion method was largely neglected. (11) The pictures, diagrams and solved examples were inadequate. (12) Wrong answers to the problems provided in the textbooks confused both teachers and students. (13) The teachers did not get any opportunity for in-service training. (14) About 13% students disliked the subject due to the cruelty of the teachers. (15) Pedagogical methods could not be strictly followed due to lack of time, lack of students' participation, lack of ancillary facilities, unsuitable time-table, constraints of the examination, lack of motivation, and the shortened period. (16) To 60% of students textbooks were the only source of learning mathematics. (17) 31% of the teachers did not bother to correct the homework assigned to students. (18) Only 6.3% schools had reference books and mathematical journals in the library. (19) Classroom tests and weekly tests were rarely conducted, and that too only in a few schools. (20) All the teachers disapproved of the system of central evaluation. (21) The majority of the teachers preferred the procedure of awarding marks step-wise. Negative marking was disapproved. [KCP 0415]

Nagar, Nirmal. 1988. **Effectiveness of computers in teaching mathematics in schools.** M. Phil., Edu. Univ. of Delhi.

Problem: The study attempts to ascertain how best a teacher can use the computer to improve learning in the classroom.

Objectives: (i) To examine the usefulness of the computer in teaching mathematics, (ii) to examine areas/aspects of mathematics which can be more effectively taught with the help of computers, and (iii) to examine the trends regarding the use of computer-aided teaching of mathematics.

Methodology: This study is based on a survey of studies, which include, mainly, three projects and ten research studies conducted independently.

Major Findings (1) Computer Assisted Teaching (CAT) of mathematics benefited both the teacher and the learner. (2) CAT encouraged individualisation and practice without burdening the teacher with repetitive and monotonous activity. (3) CAT helped the learners to use their creativity by exploring new areas not covered by the syllabus. (4) Computer awareness was not sufficient in schools for CAT. (5) In India, we have gone in for the theoretical rather than the practical aspects of computer-based education. Project CLASS was not able to reach the child especially. (6) There were not enough computers in schools, and not enough awareness regarding the computer. The computers that were available were not being put to the best possible use. Teachers had a great mistrust of the computers and perceived it as an inconvenience rather than as an aid. Their negative attitude was a great hindrance in popularising the use of computer literacy in the educational system, especially at the secondary level of education. [RDM 0355]

Nalayini, S. 1991. **Effectiveness of using number games to teach arithmetic at primary level.** M.Phil., Edu. Coimbatore: Avinashilingam Institute for Home Science and Higher Education for Women.

Problem: The study centres around using games in teaching arithmetic in primary classes.

Objectives: (i) To find the impact of the number games on primary school children in doing mathematical operations, and (ii) to study the relationship between their academic performance and their family background including the economic and educational level of the parents.

Methodology: The sample comprised students of Classes I to IV of Kendriya Vidyalaya, Coimbatore. In each class, the experimental group consisted of 50 students and the control group of 25 students. Two similar tests for each standard were developed by the researcher. One was used as the pre-test and the other as the post-test. The mean, SD and 't' test were computed while treating the data.

Major Findings: (1) Among eight comparisons, five comparisons showed significant improvement due to the supplementation of ordinary teaching by number games. In the other three comparisons, though the difference was not significant, the means of the experimental groups were higher than the control-group mean. (2) It was also found that neither the educational level nor the economic status of parents influenced the arithmetic growth score of the pupils. (3) Thus it was concluded that number games motivated children to develop the computational skills.[MC 1685]

Obad, Mahyoob Mohamammad Ali. 1989. **An investigation into the relationship of maturation of space and of mental imagery with achievement of concept of polygon (triangle and quadrilateral) among pupils studying in Grade VI (age 12+) to Grade VIII (age 15+) of government schools in Aden Governorate in the P.D.R. of Yemen.** Ph.D., Edu. *Jamia Millia Islamia.*

Problem: The study centres around the investigation into the relationship of maturation of space and of mental imagery with achievement of concept of polygon among pupils studying in

Grades VI to VII of government schools in Aden Governorate in the P.D.R. of Yemen.

Objectives: (i) To identify the relationship between concept maturation and concept achievement of polygon of Grades VI, VII and VIII levels among the Aden Government's Unity Schools' pupils in the P.D.R. of Yemen, and (ii) to find out the extent to which the maturation of the basic concepts of space and mental imagery determine the achievement of the concept of polygons (triangles and quadrilaterals).

Methodology: The sample of the study comprised students of age-groups 12+, 13+ and 14+ of Standards VI, VII and VIII, respectively, in Aden Governorate in the P.D.R. of Yemen. The tools used to collect data included a test of Maturation of General Space Concepts, a Test of Maturation of Mental Imagery Concept and Tests of Concept Achievement of Polygon. Correlation and multiple regression analysis were used to treat the collected data.

Major Findings: The ATM and ATP components of mental imagery were significant determiners of achievement of the concept of the polygon composite at all the three grade levels and also of the four constituents of the polygon concept at the three grade levels, except in the case of contributions of ATP to the variance of relations between polygons at Grade VI level and to the variance of properties — quadrilateral and triangle at Grade VIII level, and also in cases of contributions of ATM to the variance of relations between polygons at Grade VII level, and to the variance of properties — triangles at Grade VIII level, i.e. in case where the contributions were not significant.[SPR 0597]

Pal, Asutosh. 1989. **A critical study of some affective outcomes of the students as predictors of their mathematical ability.** Ph.D., Edu. *Univ. of Kalyani.*

Problem: In this study four variables of the affective dimensions, viz. self-concept, anxiety, attitude and academic motivation, related to

mathematics have been taken and their relation to achievement in mathematics has been studied.

Objectives: (i) To construct and standardise four tests on self-concept, anxiety, attitude to mathematics and a questionnaire on academic motivation, (ii) to find out their relation to students' achievement in mathematics, sex-wise, stratum-wise, and (iii) to fit a regression equation so that prediction of achievement in mathematics can be made.

Methodology: In all 16 schools (6 urban, 5 semi-urban and 5 rural) were selected and 600 students took the various tests. The tools used were a test on Self-Concept in Mathematics, a Test of Anxiety towards Mathematics, a test of Attitude towards Mathematics and a questionnaire on Academic Motivation. The statistical techniques used were analysis of variance, correlation and regression analysis.

Major Findings: (1) Boys showed higher self-concept than girls. (2) There existed significant correlation between mathematics and self-concept, between mathematics and anxiety, between mathematics and attitude, between mathematics and academic motivation. [PDR 0636]

Pandhari, A.S. 1988. **A study of language, memory and process as factors affecting students' learning of mathematics in Standard XII.** Ph.D., Edu. Pune: Indian Institute of Education.

Problem: This is a study of three factors, viz. language, memory and process, which may affect students' learning of mathematics in Standard XII.

Objectives: (i) To study the effect of language, memory and process as factors affecting students' performance in mathematics in Standard XII, (ii) to study the effect of these factors in the following situations: (a) urban, semi-urban, rural institutions, (b) 'school attached' and 'college attached' junior colleges, (c) junior colleges having

technical courses, and in the ones not having such courses, (iii) to study the effect of these factors namely, language, memory and process, singly as also in combination, and (iv) to construct an achievement test in mathematics for Standard XII.

Methodology: The sample of the study comprised 27 junior colleges selected at random from Pune District, and 676 students appeared for the test. The tools used included an Achievement Test administered exactly on the H.S.C. Board's pattern. The statistical techniques used were frequencies, percentages and analysis of variance.

Major Findings: (1) The three factors under consideration, viz. lack of language, memory and process affected students' learning in mathematics either separately or in combination. (2) All the three factors under study affected students' learning in mathematics adversely. (3) The learning outcome of children belonging to urban, non-technical institution attached to colleges was superior to urban technical institution attached to high schools. (4) The 'F' value for interaction was not significant. Thus there was no significant interaction between the factors and the type of the institutions. [ASB 0047]

Prabha, Rashmi. 1992. **An investigation into the effectiveness of programmed mathematics in relation to some socio-academic variables.** Ph.D., Edu. Patna Univ.

Problem: The study seeks to study the relationship between achievement in mathematics through programmed text and through the traditional method of teaching mathematics.

Objectives: (i) To compare learning through programmed text in mathematics and through traditional teaching, (ii) to see whether the mother's education affects achievement through programmed text, (iii) to see whether the father's education affects learning through programmed

text, (iv) to see whether parental profession affects achievement through programmed text, (v) to see whether parental income affects achievement through programmed text, (vi) to see whether caste affects achievement through programmed text, and (vii) to compare previous achievement and achievement through programmed text.

Methodology: The sample consisted of 217 secondary final year students studying in two randomly selected schools of Patna. The control group consisted of 113 students and the experimental group consisted of 104 students. A critical test was used for collection of data. The statistical technique applied were mean, SD, analysis of variance and 't' test.

Major Findings: (1) The programmed text group performed significantly better than the traditional-method group. (2) The programmed text group were found to be significantly better than the traditional-method group. (3) The mother's education significantly affected achievement in mathematics through programmed text. (4) The father's education significantly affected achievement in mathematics through programmed text. (5) The mother's profession significantly affected achievement in mathematics through programmed text. (6) The father's profession did not affect achievement in mathematics through programmed text. (7) Parental income significantly affected achievement in mathematics through programmed text. (8) Caste significantly affected achievement in mathematics through programmed text. (9) The previous achievement level had no role to play in learning through programmed text. [RPSi 0660]

Raman, J. 1989. **Impact of remedial teaching programmes for the common errors committed by students of Standard XI in calculus.** M.Phil., Edu. Alagappa Univ.

Problem: An attempt is made to identify the impact of remedial teaching programmes on the common errors, committed by students of Standard XI in calculus.

Objectives: (i) To identify the errors committed by the students under four categories, entry behaviour, perceptual, conceptual and computational, in the different divisions of calculus at Standard XI level, (ii) to identify the percentage of error under each category of errors, (iii) to design some suitable remedial teaching programmes for the students of Standard XI to minimise these errors in calculus, (iv) to implement the remedial teaching programmes for the students of Standard XI in order to minimise these errors in learning calculus, and (v) to find out the impact of the remedial teaching programmes implemented for the students of Standard XI in minimising these errors in learning calculus.

Methodology: The sample comprised students of Standard XI, vocational group as the experimental group, and the computer science group students as the control group. The tools used in the study were two entry-behaviour tests, one in trigonometry and the other in analytical geometry, and a diagnostic test. Statistical techniques used to analyse the data included mean, SD and 't' test.

Major Findings: (1) Students committed more conceptual errors, followed by computational errors, entry behaviour errors and perceptual errors. (2) The control group students' achievement in the post-test did not differ significantly with the pre-test. (3) The experimental-group students' achievement in the post-test was significant, and they were able to score more marks in the post-test. (4) Students of both the control group and the experimental group did not differ significantly in the pre-test scores. (5) Students of both the experimental group and the control group differed significantly in the scores in the post-test. (6) The experimental-group students differed significantly among themselves with respect to their mean errors in all the eight concepts in the pre-test. (7) The experimental-group students did not differ among themselves significantly with respect to mean errors in all the eight concepts in the post-test after the remedial teaching. [SM 1750]

Rawool, Satyawati. 1988. **A study of the conceptual maturity of students belonging to the age-group 11 to 14 in non-metric geometry.** Ph.D., Edu. *Shreemati Nathibai Damodar Thackersey Women's Univ.*

Problem: The study is conducted to ascertain the level of conceptual maturity attained by students of the age-group 11 to 14 with respect to the non-metric geometrical concepts.

Objectives: (i) To study the level of conceptual maturity attained by students with respect to the non-metric geometrical concepts, (ii) to study the students' ability to give a logical explanation for a particular statement on the basis of the relevant sets of assumptions, (iii) to study the effects of geometrical terminology and the figural or concrete representation of the performance of the students, (iv) to study the mental processes adopted by students while performing the tasks, (v) to study the possibility of identifying the ideal competencies which underlie the mathematical behaviours, specifically with reference to the non-metric geometrical concepts, (vi) to study the reasons for the failure of students to attain the expected level of conceptual maturity, and (vii) to study the effectiveness of the spiral approach of the mathematics curriculum in terms of students' conceptual behaviour.

Methodology: The sample of the study consisted of 50 students. The data were collected using three tests. The first consisted of the task of classification of sixty statements based on non-metric geometrical concepts, the second test consisted of the task of drawing geometrical figures as per a given verbal description; and the third involved the task of describing a verbally given geometrical figure. The data from all the three tests were analysed qualitatively.

Major Findings: (1) The evidence showed that students were familiar with the terminology, assumptions and figural and concrete representation related to the non-metric geometrical concepts, but they failed to use these concepts at the 'understanding' and 'application' levels.

(2) The students failed to use geometrical terms, assumptions and figural representations rigorously and failed to deduce relationships in the geometrical context. With the different concepts they added their own ideas and formulated their own assumptions, which were not accepted by the geometrical structure. (3) When presented with the problem situation which required verbal explanation, the students avoided giving the explanation, or they pointed to the figure. The students did make an effort to give an explanation but did not give any importance to the geometrical assumptions. They were students who used relationships and properties which were geometrically irrelevant. (4) In dealing with different verbal, figural or concrete stimuli, it was found that the students did not attend to all aspects of the stimulus. (5) The students did not use precise language to express their thinking related to the non-metric geometrical concepts. [AGB 0028]

Rosaly, A. 1992. **The relationship between attitude of students towards mathematics and achievement.** M.Phil., Edu. *Madurai Kamaraj Univ.*

Problem: The study attempts to find out whether high school students have a favourable attitude towards learning mathematics, and whether the favourable and unfavourable attitudes of the students affect their achievement in mathematics.

Objectives: (i) To construct an attitude scale to measure the attitude of high school students towards learning of mathematics, (ii) to construct an achievement test in mathematics, and (iii) to find out the relationship between attitude and achievement in mathematics.

Methodology: The sample comprised 200 students of Class X in eight high schools in Dindigul Town. A Mathematics Attitude Scale (MAS) and an Achievement Test in Mathematics were constructed and used in the study. The statistical techniques used were the mean, SD,

chi-square, Pearson's product-moment correlation and 't' test.

Major Findings: (1) The attitude of high school students towards learning mathematics and their achievement in mathematics were related. (2) Urban girls had a more positive attitude towards mathematics than rural girls. (3) Similarly, urban boys had a more positive attitude towards mathematics than rural boys. (4) Girls were higher than boys in their achievement in mathematics. (5) Urban girls were higher than rural girls in mathematics. [MKU 1085]

Samuel, Francis. 1989. **Conceptual powers of children: An approach through mathematics.** Ph.D., Edu. Pune: Indian Institute of Education.

Problem: This study has been undertaken to investigate the thinking and reaction of seven to ten-year old children when they face practical problems concerning the fundamental concepts of weight, area and volume as explained by Jean Piaget.

Objectives: (i) To find out whether the children's conceptual ability is according to their age, (ii) to examine the children's responses to similar tests in all three concepts, to find out whether there is any difficulty of understanding between the three topics, and (iii) to find out whether there is any relation between intelligence and their ability to conceptualise as well as their ability to use concreto-logical forms of reasoning.

Methodology: One thousand and forty-seven children of the age-group 7 years 5 months to 9 years 11 months and 40 children from Classes II and III from 9 schools in Bangalore City were included in the sample. The tools used were Raven's Coloured Progressive Matrices sets, and test material designed by Joseph Rogers. The statistical techniques used were percentages and chi-square.

Major Findings: (1) Children at a younger age (7 years 5 months) did not display the ability to

use the concreto-logical forms of reasoning, but on the other hand, more children at the age of ten did display this ability. (2) There was little difference in the degree of difficulty of understanding between the three topics—area, weight and volume. (3) The majority of the children were in a transitional stage. A high proportion of the children of average ability used alternative forms of thinking, depending on how they perceived the problem. (4) Piaget's main thesis that the conceptual process follow stages of development is confirmed. (5) The Piagetian stages of development from perceptual reasoning to concreto-logical reasoning are confirmed. [ASB 0059]

Sarala, S. 1990. **Conceptual errors of secondary school pupils in learning select areas in modern mathematics.** Ph.D., Edu. Univ. of Kerala.

Problem: The study surveys the conceptual errors of secondary school pupils in learning select areas in modern mathematics.

Objectives: (i) To study the general nature of the error scores of secondary school pupils in modern mathematics, (ii) to compare the error scores of pupils in the sub-samples classified on the basis of sex, location, school management, school standards, intelligence, interests, study habits, socio-economic status and community, (iii) to find out whether there is any sex difference in committing errors in each concept in sets, trigonometry and statistics, (iv) to identify the different types of errors and the common errors, if any, in each concept in sets, trigonometry and statistics, and (v) to study the relationship between (a) error scores and intelligence, (b) error scores and interest in mathematics, and (c) error scores and the study habits in mathematics of secondary school pupils.

Methodology: The sample consisted of 800 pupils selected by the stratified sampling procedure from the secondary schools in the Trivandrum revenue district. The tools used

included diagnostic tests in sets, trigonometry and in statistics; the Non-Verbal Test of Intelligence by Nafde; an Interest Inventory in Mathematics; a Study Habits Inventory in Mathematics; and personal data sheet. The statistical techniques used included, percentages, means, SD, critical ratios and Pearson's product-moment coefficients of correlation.

Major Findings: (1) The number of conceptual errors committed by secondary school pupils in the areas selected for study was very high. (2) Conceptual errors in mathematics were seen to be influenced by sex, locality of school, management of school, intelligence, study habits, socio-economic status and caste. (3) The relationship between errors in mathematics and intelligence, and study habits, was seen to be negative and significant. (4) Interest in mathematics was seen to have no influence on errors. [VR 1661]

Sarangapani, Padma. M. 1990. **A critique of the primary school mathematics curriculum from a Piagetian perspective.** Ph.D., Edu. Univ. of Delhi.

Problem: This study uses the Piagetian view for analysing curriculum design and materials. It is then used for a critical evaluation of the NCERT primary mathematics series.

Objectives: (i) To investigate the psychological soundness of mathematics curricula from a Piagetian perspective, (ii) to study the phobia for mathematics in the early primary school years, and (iii) to evaluate critically the National Curriculum Framework of 1988 and mathematics textbooks.

Methodology: Document analysis was used in the study.

Major Findings: (1) The concepts of specific learning objectives and minimum levels of learning put forward by the National Curriculum Framework were found to militate against child-centredness. (2) There was an overall mismatch between the various tasks and objectives

prescribed, and the operational level of the age-group for which they were meant, e.g. in Class I, where children were mostly in the pre- or transition to the concrete operational stage, almost 80% of the tasks were concrete operational, mainly involving large numbers and place value. In Class III, where children were still in the early concrete operational stage, over 40% tasks required formal operations and abstract thinking. (3) The strategies for communication were primarily visual, or written, with an emphasis on mathematical terminology. Problems were either numerical computation, or involve situations removed from the child's reality and did not encourage operativity. (4) The course was ambitious, so that on an average, a teacher would have just one or two periods of 40 minutes each to spend on each new concept. Exercises while in plenty, were mostly a drill in computation. Thus there was little scope for horizontal elaboration or play. (5) There was virtually no recognition of alternative strategies for assimilation or constructing of concepts. (6) Practically all the concepts had been built on epistemologies shown by Piaget to be invalid. They were sequenced logically rather than psychologically. (7) There was also a high level of algorithmisation which may help children in coping with what has to be learnt, but which will also impede conceptualisation, as it rules out the scope of children inventing conceptual links. [RDM 1325]

Sen Gupta, Debjani. 1989. **A child's conception of the fundamentals of Euclidean geometry.** Ph.D., Edu. Univ. of Kalyani.

Problem: The study is an attempt to study the child's conception of the fundamentals of Euclidean geometry.

Objective: To develop the efficacy of Piaget's method of investigating epistemological problems (like objects, space, time, etc.) in learning problems of any branch of knowledge (specially mathematics) of the curriculum of formal education, which is usually based on some self-evident truths.

Methodology: The study is both longitudinal and cross-sectional because consecutive age-groups—(5-6), (6-7), (7-8) years—have been taken and in each age-group thirty children have been included in a randomised way. It is quasi-experimental because children have been asked to perform some tasks, and then a clinical type of question-answer has been resorted to. The tools consisted of two types of tests—auxiliary (prerequisites for understanding the axioms) and main (the axioms)—framed in both verbal and non-verbal types. There are 20 items in the main test. There are three items on plane, straight line and point in the auxiliary test. The responses were given numerical value and then ANOVA were applied. Qualitative analyses of the response-protocols were also done.

Major Findings: (1) The 'F' ratio of children's acquisition of five groups of axioms (axiom factor) was significant. (2) The 'F' ratio of the three age-groups of children (age factor) was significant. (3) Understanding of axioms as self-evident truths occurs in the course of growth between ages 5 and 7. (4) There were age variations among the children for the conceptual development of different axioms present in the same group. (5) There was an order in the understanding of axioms which did not follow the general principle of development of Euclidean axioms. [PDR 0633]

Sensarma, Alope. 1989. **The evaluation method: A new teaching strategy for secondary school mathematics.** *Indian Educational Review*, Vol. 24(1): 170-76.

Problem: In this study the effectiveness of the evaluation method and the traditional method was explored through experimentation on the achievement of students of Class VIII in mathematics.

Objective: To compare the relative effectiveness of the evaluation method and the traditional method, in respect of students achievement in the traditional achievement test and a High

Mental Ability Test (HMAT) of mathematics.

Methodology: The sample of the study comprised 60 students of Class VIII. The group was classified into three sections, one section as the experimental group and the remaining two sections as control groups. Each group comprised 20 students. The tools used were eleven tests, including three Content Competency Tests, one General Achievement Test (GAT) and a Higher Mental Ability Test (HMAT) of mathematics. The statistical techniques used include analysis of co-variance, mean, SD, and 't' test.

Major Findings: (1) The adjusted GAT mean of Group A was significantly greater than that of Group B and Group C. (2) The mean score on HMAT of experimental Group A was significantly greater than the mean scores of the Control Groups B and C on HMAT. (3) The evaluation method of instruction in mathematics was significantly better than the traditional method. [TNSB 1524]

Setia, Seema. 1992. **Socio-psychological and educational factors of differential learning rate in modern mathematics at the senior secondary stage.** Ph.D., Edu. *Panjab Univ.*

Problem: The study addresses itself to the theoretical understanding of the achievement of learners at the senior secondary stage in modern mathematics in relation to socio-psychological and educational factors.

Objectives: (i) To develop and standardise a modern mathematical concepts test for senior secondary students of the +1 stage, (ii) to identify intelligence, personality, adjustment, SES, sex differences, classroom behaviour and emotional characteristics as correlates of mathematical achievement among rapid, average and slow learners, separately, (iii) to study the intellectual level, personality traits, adjustment level, socio-economic status, sex-differences, classroom behaviour and emotional characteristics of the rapid, average and slow learners in mathematics,

(iv) to compare the intellectual level, personality traits, adjustment level, socio-economic status, sex-differences, classroom behaviour and emotional characteristics of the rapid, average and slow learners in mathematics, and (v) to study the trend of the variables, i.e. intelligence, personality, adjustment, SES and sex differences in predicting the mathematical achievement of rapid, average and slow learners.

Methodology: A sample of 510 senior secondary students and 42 teachers from 19 government, private and urban, rural recognised institutions were selected randomly, following the stratified random sampling technique. The tools used included: the Group Test of General Mental Ability of Tandon, Cattell's 16 PF questionnaire, the Adjustment Inventory of Mittal, the Socio-economic Status Scale of Trivedi and Udai Pareek, the Modern Mathematical Concept Test, a Mastery Criterion Test developed by the investigator, Classroom Behaviour Questionnaire and an Emotional Characteristics Questionnaire. The statistical techniques used to analyse the data were mean, median, SD, skewness, kurtosis, correlation analysis, factor analysis, regression analysis, 't' test and Pearson's product-moment correlation.

Major Findings: (1) The intellectual level of rapid and average learners, SES of slow learners, personality traits of rapid, average and slow learners and adjustment of rapid learners correlated significantly with their achievement in modern mathematics. (2) The intellectual level, SES, personality traits, and adjustment of rapid, average and slow learners cluster together in group factor(s) with achievement in modern mathematics, and the factors underlying their measures also differed from each other. (3) The intelligence, SES, personality and adjustment of rapid, average and slow learner cluster together in group factor(s) with achievement in modern mathematics, and the factors underlying their measures also differed from each other. (4) The intelligence, SES, adjustment and personality traits of rapid, average and slow learners were

differential predictors of achievement in modern mathematics and their conjoint effect was higher as compared to their separate predictors. (5) Rapid, average and slow learners differed significantly in their intellectual and SES levels. (6) Male, female, rapid, average and slow learners differed slightly in their achievement on a modern mathematical concept test. (7) There was a significant difference in the achievement of rapid learners on different levels of intelligence; slow learners on different levels of SES; and rapid, average and slow learners on different levels of personality. (8) Rapid, average and slow learners differed from each other in their emotional characteristics, classroom behaviour and the time taken to learn. [JNJ 0258]

Shah, P.A. 1992. **A critical evaluation of the mathematics syllabi introduced in the schools of Gujarat state for Grades I to IV.** Ph.D., Edu. Gujarat Univ.

Problem: The study attempts a critical evaluation of the syllabi of mathematics for Grades I to IV.

Objectives: (i) To check whether the objectives of teaching mathematics, Essential Learning Outcomes (ELO) mentioned in the syllabi for the units/sub-units, are fulfilled, (ii) to check whether the syllabus could sustain interest, develop rational thinking and mathematical aptitude in pupils, and (iii) to check whether the teachers could execute these syllabi by using appropriate educational methods, educational instruments, activities, etc.

Methodology: Seven hundred and sixty-two primary teachers from 186 talukas of all the 19 districts of Gujarat State from different schools run by the gram panchayats, taluka panchayats, district panchayats in rural as well as urban areas also schools run by municipalities and corporations were included in the sample. In addition to this 100 educational supervisors and 21 principals, who evaluated teaching and ELO,

were included in the study. The schools were selected by the incidental sampling method and the sample was selected by the stratified-purposive-cluster sampling method. Tools and techniques used to collect the data were questionnaires, opinionnaires, academic tests and interview schedule. The collected data were treated with percentages, weighted mean scores and Spearman's rank difference method.

Major Findings: (1) The grade-wise correlations were found between the opinion of the teachers for essential learning outcomes and the results of assessment of the pupils by testing ELOs were found significant. (2) About 45 per cent of teachers of Grades I and II agreed that the contents of the syllabi could sustain the interest of the pupils, while teachers of Grades II and IV agreed very little with the same. (3) Forty-five per cent of the teachers of Grades I and II agreed that rational thinking in the pupils could be developed by the existing content, while teachers of Grades III and IV had different views. (4) About the development of mathematical aptitude, 40 per cent of the teachers of Grades I, II and III had a positive opinion while the teachers of Grade IV had their doubts. (5) Fifty per cent of teachers agreed on the completion of the syllabi in time. However, there were the least possibilities for personal guidance for weak pupils. (6) Fifty per cent of the supervisors confirmed the use of audio-visual materials used by teachers in the classroom teaching. [JHS 1049]

Shankara Narayanan, B.L. 1990. **Achievement in mathematics under guided discovery learning and reception learning conditions.** Ph.D., Edu. Univ. of Mysore.

Problem: This study addresses the problem of achievement in mathematics under guided-discovery learning and reception learning conditions in relation to intelligence and anxiety.

Objectives: (i) To test the main effects of two modes of instructional presentation, two levels of intelligence (high and average) and two levels

of the trait anxiety, (high and low) on students' immediate and delayed achievement; immediate and delayed retention, immediate and delayed transfer, as measured by tests of probability, (ii) to test interactions (a) between method of instruction and level of intelligence, (b) between intelligence level and the trait anxiety level, (c) between the trait anxiety level and method of instruction, and (d) among methods of instruction, intelligence level and the trait anxiety level in their effects of student's retention, (iii) to develop and try out programmed learning material in 'egrul' and 'ruleg' forms as a unit of introduction to probability in mathematics on the basis of the Hermann Model.

Methodology: A sample of 128 girls students of Standard IX were selected from seven randomly selected girls' high schools located in the city of Mangalore, adapting the stratified random sampling technique. The subjects were assigned to the two instructional treatments. The tools used in the study were Nafde's Non-Verbal Test of Intelligence, a State-Trait Anxiety Inventory, an Achievement Test and an Entering Behaviour Test. The statistical techniques used were a three-way analysis of variance.

Major Findings: (1) The girl students taught by the guided-discovery learning method performed significantly better than the girl students taught by the reception-learning method on the six criterion measures — dependent variables. (2) The students of high intelligence performed better than the average-intelligence students, irrespective of the method of instruction employed on the criterion measures. (3) The performance of the low-trait variety students was significantly better on measures of delayed achievement and delayed retention, and was significantly better on measures of immediate achievement, retention and delayed transfer, irrespective of methods of instruction employed. (4) There was significant first-order interaction between instructional method and level of intelligence in their effect on the criterion measures, while with the trait,

anxiety, it was not significant. (5) There was significant first-order interaction due to intelligence and trait anxiety on all the criterion measures. (6) There was significant second order interaction involving intelligence, trait anxiety and instructional treatment on all the criterion measures. (7) The girl students of high level of intelligence and low level of the trait anxiety, under the guided- discovery learning condition were found to perform significantly better. (8) The girl students of high level of intelligence coupled with high level of trait anxiety exposed to the guided-discovery learning treatment were found to perform significantly better. [BNS 0969]

Singh, R.D. 1992. **Effectiveness of teaching mathematics through computer-assisted instruction and conventional method of instruction on cognitive and non-cognitive variables.** Ph.D., Edu. *Guru Ghasidas Univ.*

Problem: The present study aims to compare the results of computer assisted instruction(CAI) with the results of the conventional method of instruction in teaching mathematics in certain selected units of the mathematics curriculum.

Objectives: (i) To compare the results of the two groups in mathematical achievement, (ii) to compare the results of the two groups in mathematical achievement sex-wise, and (iii) to compare the attitudes towards mathematics of the two groups as whole, and also sex-wise.

Methodology: The study was conducted in four higher secondary schools having facilities of three to five BBC micro computers. The students belonged to different socio-economic groups. Three units of the mathematics syllabus for Class IX, namely, simultaneous equations in algebra, statistical data and their graphical representation in statistics, and triangles and their congruences in geometry were chosen for the study. The tools used in the study included Rating Scale by the researcher, General Intelligence Test of Mohsin, the Attitude Scale towards Mathematics

of Suydam, and the Educational Software prepared by the practising teachers. The statistical techniques used included, mean, SD, and 't' test.

Major Findings: (1) The groups taught through CAI in all the schools showed a substantial progress. (2) The gains in achievement of the pupils of good schools are higher than those of pupils of average and poor schools. (3) The CAI method of teaching mathematics had proved to be more effective. (4) Both boys and girls gained more from the computer treatment. (5) A significant favourable change in the attitude of the pupils of the experimental groups over the control groups was observed. (6) The change in attitude towards mathematics was independent of gender. [RSD 0210]

Singh, R.D. and Verma, S.C. 1992. **Mathematics as a function of intelligence, sex and age: A study of attitudes of high school students.** *Indian Educational Review*, Vol. 27(1): 47-55.

Problem: This is a study of the attitude towards mathematics as a function of some individual characteristics like sex, age and intelligence.

Objectives: (i) To study the attitude towards mathematics as a function of intelligence, (ii) to study the attitude towards mathematics as a function of sex, and age, and (iii) to study the attitude towards mathematics as a function of age.

Methodology: A sample of 220 students (140 male and 80 female) studying mathematics in Class IX of different higher secondary schools of the Education Department of Bhilai Steel Plant, Bhilai (M.P.), was taken. The schools were categorised into three groups—good schools, average schools and poor schools. The tools used were Rating Scale, the General Intelligence Test of S.M. Mohsin and the Attitude Scale towards Mathematics by Suydam. The statistical techniques used were mean, SD and 't' test.

Major Findings: (1) The students of high intelligence and average intelligence had a more favourable attitude towards mathematics than the students of low intelligence. (2) Attitude towards mathematics was independent of sex. (3) Students of the age 13+ showed a more favourable attitude towards mathematics in comparison to students of the ages 14+ and 15+, but the students of 14+ did not have a more favourable attitude towards mathematics than students of 15+.[SPr 1891]

Srivastava, J.P. 1992. **A study of learning outcomes in terms of objectives in mathematics.** Independent study. Meerut Univ. [ERIC Funded]

Problem: There is a lot of bad teaching in mathematics. Teachers teach mathematics without any emphasis on the taxonomy of the objectives of mathematics. Teachers of mathematics may be made aware of learning outcomes in mathematics.

Objectives: (i) To find out the relationship of learning outcomes in mathematics (Class X) with intelligence, and socio-economic status, (ii) to find out the relationship between intelligence and learning outcomes after controlling the effect of socio-economic status, (iii) to find out the relationship between socio-economic status and learning outcomes after partialling out the effect of intelligence, and (iv) to compare the learning outcomes in mathematics (objective-wise): (a) of male and female students, (b) of rural and urban students, (c) of science and non-science students, (d) among male students of high, average and low socio-economic status and of high, average and low intelligence, (e) among female students of high, average and low socio-economic status and of high, average and low intelligence.

Methodology: The multi-stage random sampling technique was adopted to select the data, making the school as the unit of sampling. Thirty-two schools and 1,030 students were selected at random. The tools used in the study were: an Achievement Test in Mathematics, the

Socio-economic Status Scale by S.P. Kulshrestha, and the Culture Fair Test of Intelligence (Form A) by R.B. Cattell. The Pearson's co-efficient of correlation, and 't' test were used to analyse the data.

Major Findings: (1) Intelligence and SES both were such factors which contributed significantly and positively to the development of learning outcomes in mathematics in terms of knowledge, understanding, application and skill. (2) Female students were better in mathematical knowledge than male students. So far as understanding, application, skill and total learning outcomes in mathematics were concerned, male and female students did not differ. (3) Students who were studying in good schools were better in knowledge, understanding, application, skill and total learning outcomes in mathematics than those studying in bad schools. (4) Students of urban schools showed better gains in all types of learning outcomes in mathematics than students of rural areas. (5) The students of the science group achieved better learning outcomes in mathematics than non-science students. (6) Male students belonging to high SES were better in all the four types of learning outcomes in comparison to low-SES students. (7) Female students who belonged to the high SES group showed higher gain in knowledge, understanding, skill and total achievement in mathematics than low SES female students. [SKB 1215]

Thind, S.K. 1990. **Effect of parental education and occupation on the mathematical problem-solving ability of students of Grades VII and IX.** Independent study. Punjab Agricultural Univ.

Problem: This research attempted to study the impact of the socio-economic status of parents on the mathematical problem-solving ability of school students.

Objective: To determine the relationship between parental education and occupation on the mathematical problem-solving ability of Grade VII and Grade IX rural and urban students.

Methodology: The respondents were selected proportionately from the rural area of Ludhiana Tehsil, Punjab. The total sample consisted of 204 respondents. Relevant data were collected using a schedule consisting of items related to social and economic factors, a test comprising 22 items to assess the problem-solving ability of the students. The statistical technique used was the chi-square test.

Major Findings: (1) The education of the father had no effect on the problem-solving ability of rural as well as urban children. (2) The mother's education had no impact on rural children's problem-solving ability whereas the problem-solving ability of urban children was affected by the mother's education. (3) The father's occupation indicated no effect on both rural and urban children's problem-solving ability. (4) The occupation of the mother also showed no effect on rural and urban children's mathematical problem-solving ability. [SPK 0247]

Tuli, Mulk Raja. 1988. **Mathematical creativity and personality**. *Indian Educational Review*, Vol. 23(4): 144-49.

Problem: The study is designed to understand mathematical creativity and personality. In this context, the nature of creative activity of the mathematicians and other requirements for creative work in mathematics and their relationship with intelligence, verbal aptitude and personality structure were also highlighted.

Objective: To study the personality profiles of high- and low-creative persons in mathematics.

Methodology: The survey method was considered useful as it enabled the gathering of data from a relatively large number of cases at a time and the collecting of detailed description of the existing phenomena. The school population of the intermediate science classes of Almora City constituted the sample. Only 45 girls and 45 boys took part in the investigation effectively. The research tools administered for the collection of data were the Creative Ability in Mathematics

Test (CAMT) in Hindi and the 16 PF Test of Cattell (Form A) (translated by Kapoor). Mean, SD and 't' test were used in the treatment of the data.

Major Findings: (1) It was found that the high-creative persons in mathematics were happy-go-lucky, impulsive, lively, enthusiastic, tender-minded, dependent, over-protected, sensitive, self-sufficient preferring their own decisions, resourceful, controlled, socially precise, following self-image, tense, frustrated driven, overwrought, expedient, evading rules, feeling few obligations, venturesome, socially bold, uninhibited, spontaneous, suspicious, self-opinionated, and hard to fool. (2) Significant differences existed in the personality profiles of high and low-creative persons in mathematics. (3) The creative person in mathematics had a unique strand of mental abilities, interests, attitudes, temperament, and other variables characterising thoughts, feelings and behaviour. [SP 1426]

Vasanthi, R. 1991. **Mathematical learning disabilities in relation to certain psychological, social and educational factors**. Ph.D., Edu. Univ. of Madras.

Problem: The study explores the incidence and content of certain mathematical learning disabilities as well as the influence of select psychological, social and educational factors on these. The learning disabilities chosen for investigation are: acalculia, agnosia, asymbolia, perceptual problems, forward-backward confusion, mixed laterality, reversal of numbers, strephosymbolia, time and distance confusion, and up-and-down confusion.

Objectives: (i) To identify the various types of mathematical learning disabilities among the Standard VII pupils, and (ii) to ascertain the relationship, if any, between mathematical learning disabilities, and (a) psychological factors like intelligence, neuroticism and behaviour problems, (b) socio-economic status and gender, and (c) educational factors.

Methodology: The sample consisted of 1,172

pupils of Standard VII in the age-group 11-13 years drawn from government and Central Board affiliated high schools. The tools used were a Mathematical Learning Disability Test constructed by the investigator, Chatterji's Non-Language Test of Verbal Intelligence, the Junior Eysenck Personality Inventory for assessing extraversion-introversion and neuroticism; Vasumathu's Behavioural Problem Ability Scale, and Kuppaswamy's Socio-Economic Status Scale adapted to the contemporary context. The statistical techniques used were multivariate analysis, multiple regression and analysis of variance.

Major Findings: (1) Mathematical learning disabilities had a significant negative relation to intelligence and socio-economic status, and a positive relationship to behaviour problems. (2) The degree of prevalence of mathematical learning disabilities was the greatest among monolingual pupils and less among bilingual pupils. The differences among all the three groups were statistically significant. (3) The incidence of mathematical disabilities was the greatest among pupils in government schools affiliated to the State Board, less among pupils in matriculation schools, and the least among pupils in schools affiliated to the Central Board of Secondary Education. These differences among the three types of schools were statistically significant. (4) There were differences in the incidence of mathematical learning disabilities across the three socio-economic strata, and the differences among the strata were statistically significant. [DRG 0093]

Wagh, S.K. 1991. **Development of a multi-media instructional system for remedial measures in fractional numbers.** Ph.D., Edu. Shivaji Univ.

Problem: The study relates to the development of a multi-media instructional system for remedial measures for Class VIII students, in fractional numbers.

Objectives: (i) To develop a multi-media instructional system for remedial measures in fractional numbers, according to the multi-media instructional system for developing computation skills, and (ii) to compare the results of this approach to those of the traditional approach of remedial teaching and thus to find the difficulty levels of skills experienced by the students in fractional numbers.

Methodology: One hundred and twenty students of Standard VIII (60 girls and 60 boys) were selected randomly from the secondary schools of Sangli District in Maharashtra. The tools used in collecting data included a Survey Test, a Battery of Eight Diagnostic tests, structured interviews, questionnaire, lesson-observation rating scale, and multi-instructional system (containing charts, flash cards, film-strips, audio-cassettes, assignments, and a self-learning programme). The data were analysed using the mean, SD, analysis of variance and 't' test.

Major Findings: (1) In fractional numbers and their operations, students were found to commit common errors in the basic process, cross-multiplication, the terms used, and in mixed operations in addition, subtraction, multiplication and division. (2) The facilities, resources and raw material, for the instructional material were available but were not used in schools. (3) A Multi-Media Instructional System (MIS) was designed and constructed. (4) The Traditional Instructional System (TIS) and the MIS remedial approaches both helped students in improving their performance on all the six computational skills in fractional numbers. (5) The skill-wise and overall differences between the means of gains of boys and girls from the control-group and the experimental group were found to be non-significant. (6) The six skills were found to differ from each other in their difficulty level. The ascending order of skills from easy to difficult was experienced by both the groups. (7) The effect of the systems on the performance of the students

in fractional numbers was not dependent on (a) the sexes, (b) levels of skills when sex-levels were averaged, (c) levels of skill when system-levels were averaged. (8) Systems and sexes jointly did not affect the performance of the students in fractional numbers at different levels of skills, when systems and sex averaged over the level of skills.[CMY 0894]

Yadav, Chhangur Prasad. 1988. **A study of the attitude of teachers towards the new mathematics in secondary schools of Uttar Pradesh.** Ph.D., Edu. Patna Univ.

Problem: The study examines the attitude of various categories of secondary school teachers towards teaching of the new mathematics.

Objectives: (i) To ascertain the status of the new mathematics in secondary school curriculum, (ii) to identify the problems of teaching the new mathematics, and (iii) to assess teachers' attitude towards the new mathematics.

Methodology: The study is based on the responses of 400 school teachers selected from four districts, two from Varanasi Division and two from Gorakhpur Division, following the two-stage random sampling technique. The tool used to collect the data was Likert type self-developed scale. The statistical techniques used were mean, SD, 't' test and analysis of variance.

Major Finding: Male teachers and female teachers, more experienced teachers and less experienced teachers, and post-graduate teachers and undergraduate teachers did not differ significantly in respect of their attitude towards the new mathematics.[RPSi 0661]

Yadav, R.S. 1990. **A study of the relationship of school environment and socio-economic status in the formation of geometrical concepts among school children.** Ph.D., Edu. Guru Ghasidas Univ.

Problem: The study aims to explore whether the home culture of the children in the form of

their socio-economic status has a significant impact not only in their schooling but also in their learning process in the classroom.

Objectives: (i) To replicate Piaget's work on 'distance', 'length', 'conservation of length' and 'units of length' as geometrical concepts among primary school children, and on 'area', and 'volume' among middle school children, (ii) to study the effects of schooling on the development of geometrical concepts among school-going children, (iii) to study the effects of socio-economic status on the development of geometrical concepts among school-going children, (iv) to study the relative interactional effects of father's income, occupation and education on development of geometrical concepts, (v) to study the sex difference in various geometrical concepts among school-going children, and (vi) to study the relative interactional effects of age and school, environment and SES, upon the development of geometrical concepts.

Methodology: Six hundred and three pupils were selected, adopting a systematic random sampling technique. The tools used in the study were Socio-Economic Status Scale by B. Kuppaswami, and Piaget-type Tasks with some modifications, adopted in Hindi, to study the geometrical-concepts formation. A $5 \times 3 \times 2$ factorial design for elementary school level and a $3 \times 3 \times 2$ factorial design for the middle school level were used for analysing the data.

Major Findings: (1) All the three factors, namely, age, SES and school environment, had a significant effect upon concept formation in geometry, whereas age had the greatest effect and the school environment had the lowest effect. The SES occupied the second position. The position was reversed in the case of middle schools. (2) Interaction effects (age x schools and age x SES) significantly affected the concept formation in geometry at both the levels, i.e. both primary and middle school pupils. However, the interaction (school x SES) had no significant effect over concept formation in geometry at primary

level, but had a significant effect at the middle-school level. (3) The combined interactions of all the three sources of variations had significant effect at both the levels. (4) The children of NGUSS school were significantly better than the children of UGS school and RGS school on the development of geometrical concepts from Classes I to VIII. (5) Pupils of the high-SES group were found better in the concept formation ability in geometry than the low-SES groups. (6) There

existed no significant difference between the pupils (low socio-economic status) of the three categories of schools on concept formation in geometry. (7) A positive significant correlation was found between the scores on the tests of geometry and father's education in UGS at middle school level only. (8) No significant correlation has been found between the geometry scores and father's occupation; geometry scores and father's income. [RSD 0209]

Also See

- Baskaran, K. 1991. **Achievement motivation, attitude towards problem-solving and achievement in mathematics of Standard X students in Devakottai educational district.** Ph.D., Edu. *Alagappa Univ.* [SM 1768] (See in Chapter 38.)
- Desai, A.A. 1992. **A critical study of the spiral arrangement of sub-units in the mathematics textbooks of Standards I to III.** Ph.D., Edu. *Pune: Maharashtra State Bureau of Textbooks.* [Author 1831] (See in Chapter 13.)
- Deshpande, A.R. 1992. **An enquiry into the development of curriculum in mathematics at the secondary stage of education in Maharashtra State.** Ph.D., Edu. *Nagpur Univ.* [GPK 1693] (See in Chapter 13.)
- Flory, Christal J.W. 1988. **A study of underachievement in mathematics of university entrants with a view to developing a guidance profile.** Ph.D., Edu. *Univ. of Kerala.* [VR 1755] (See in Chapter 38.)
- Jayaraman, V. 1989. **Some correlates of students' achievement in mathematics at Standard X level in Devakottai educational district.** M.Phil., Edu. *Alagappa Univ.* [SM 1738] (See in Chapter 38.)
- Kaul, V. et al. 1992. **Starting children too early on number work.** Independent study. *National Council of Educational Research and Training.* [GCU 1937] (See in Chapter 14.)
- Ngailiankim, Caroline. 1988. **An investigation into the attitude and study habits related to achievement in mathematics of Class IX students in Shillong.** M.Phil., Edu. *North-Eastern Hill Univ.* [PPG 0171] (See in Chapter 38.)
- Ngailiankim, Caroline. 1991. **A study of selected variables associated with achievement in mathematics.** Ph.D., Edu. *North-Eastern Hill Univ.* [PPG 0185] (See in Chapter 38.)
- Rajyaguru, Mahesh S. 1991. **A comparative study of over and underachievers in mathematics.** Ph.D., Edu. *Bhavnagar Univ.* [DJM 0335] (See in Chapter 38.)
- Ramaa, S. 1990. **Study of neuro-psychological processes and logico-mathe-**

- mathematical structure among Dyscalculics.** Independent study. *Mysore: Regional College of Education.* (ERIC Funded). [BNS 0985] (See in Chapter 27.)
- Ramasamy, V. 1992. **Problems of adolescents and their achievement in mathematics.** M.Phil., Edu. *Madurai Kamaraj Univ.* [MKU 1089] (See in Chapter 38.)
- Rangappa, K.T. 1992. **A study of self-concept, reading ability in relation to achievement in mathematics of students of Standard VII.** Ph.D., Edu. *Bangalore Univ.* [MKh 1828] (See in Chapter 38.)
- Sarojamma, Y.H. 1990. **A comparative study of reading ability and social maturity of over, normal and under-achievers of Standard VII.** Ph.D., Edu. *Bangalore Univ.* [MKh 0325] (See in Chapter 38.)
- Singh, Bhoodev. 1988b. **Relationship between mathematical creativity and some biographical factors.** *Indian Educational Review*, Vol. 23(2): 157-161. [JPM 1402] (See in Chapter 11.)
- Singh, Bhoodev. 1988c. **Mathematical creativity and some socio-psychological factors of Hindus and Muslims.** *Indian Educational Review*, Vol. 23(4): 121-128. [JPM 1423] (See in Chapter 11.)
- Singh, R.D.; Ahluwalia, S.P. and Verma, S.K. 1991. **Teaching of mathematics: Effectiveness of computer-assisted Instruction (CAI) and conventional method of instruction.** *Indian Educational Review*, Vol. 26(4): 15-34. [JPM 1914] (See in Chapter 23.)
- Sinha, Durganand and Jha, Tantreshwar. 1990. **Invariance of mass and number among tribal and non-tribal children: Influence of age, sex, culture and habitation.** *Indian Educational Review*, Vol. 25(1): 56-70. [SPR 1489] (See in Chapter 30.)
- Tawde, Snehal. 1991. **An intra-cultural study comparing the relative effectiveness of three instructional programmes based on three different modes of representation, as proposed by Bruner on the acquisition of mathematical concepts by children of age 11+ belonging to different socio-cultural groups in Maharashtra.** Ph.D., Edu. *Shreemati Nathibai Damodar Thackersey Women's Univ.* [AGB 0029] (See in Chapter 25.)
- Viney. 1992. **Effectiveness of different models of teaching on achievement in mathematical concept and attitude in relation to intelligence and cognitive style.** Ph.D., Edu. *Punjab Univ.* [JNJ 1252] (See in Chapter 24.)