The survey of related literature is an essential aspect of a research report. It involves a synthetic and synoptic understanding of the researches that have already been completed in the field over a period of time. It is through the related studies that the researcher understands the general trends and the areas unexplored. It also helps the investigator to have a clear idea of the scope of the subject of study in all aspects and implications.

The study of related literature can never be ignored in any type of research. To quote C.V. Good, "Without a critical study of the related literature the investigator will be groping in the dark and perhaps uselessly repeat work already done." Therefore, to conserve time, energy and resources, it is necessary to undertake a detailed and penetrating study of all available literature.

Review of related literature serves as a guide post not only with regard to the quantum of work done in the field; but also enables one to perceive the gaps and lacuna in the concerned field of research. The analysis and review of such studies act as an impetus which inspires and guides the investigator into greater detail and wider applicability of the problem at hand to provide new ideas, theories, explanations and hypotheses.
John W. Best opines that,

"A summary of the writings of recognized authorities and of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this step helps to eliminate duplication of what has been done and provides useful hypotheses and helpful suggestions for significant investigation citing studies that show substantial agreement and those that seem to present conflicting conclusions helps to sharpen and define understanding of existing knowledge in the problem area, provides a background for the research project, and makes the reader aware of the status of the issue. Parading a long list of annotated studies relating to the problem is ineffective and inappropriate. Only the studies that are plainly relevant, competently executed, and clearly reported should be included."²

The review of related literature promotes a greater understanding of the problem and its critical aspects and ensures the avoidance of unnecessary duplication. For conducting research in any field, the researcher requires full acquaintance with the library and its many sources to take advantage of the previous studies that may help him proceed along his own lines of investigation.

Every research project should be based on relevant thinking and proper plan and procedure. When a new research is not based on a thorough review of the literature, it becomes
an isolated entity, bearing at best accidental relevance to what has been done before. The findings of earlier experiments encourage the new worker to give importance to useful projects in education, and he is able to avoid the past mistakes or defects in the procedure. For any worthwhile study, in any field of knowledge, the research worker needs to acquire up-to-date information about what has been thought and done in the particular area from which he takes up a problem for research.

From the above view it can be stated that the survey of related literature plays a very crucial role especially in locating the research problem. In the present study, though it was not possible on the part of the investigator to get access to the entire published or unpublished researches in the field, yet an attempt had been made to gather pertinent information relating to the studies undertaken in this field in India. Studies undertaken in this field in the developed countries are difficult to obtain; and do not have high relevance as the entire socio-cultural milieu of those countries totally differ from that of the under-developed and developing countries.

STUDIES IN INDIA

A brief outline of the research studies that had been undertaken in the different Universities in India on "Curriculum, Methods and Text Books of Mathematics" have been provided.

The objective of the study was to have a critical examination of the various practices of teaching mathematics in secondary schools with a view to locating the limitations and drawbacks and making certain observations to improve the same. The data were collected from the matriculation examination results from years 1931 to 1943. Marks of about 18,000 candidates who took examination in 1938, marks of 9129 candidates from 22 good schools for the years 1936 to 1943 and marks of 11,827 pupils in secondary schools in the annual examinations, the results of 2,000 candidates who appeared at the mathematics examinations for the second time: the case study of 294 students out of 2,000 whose progress could be traced continuously from Class-I to Class-VII in the same school.

The study revealed that:

i. the analysis of the matriculation results showed that the percentage of failures in mathematics was very high;

ii. nearly 85 percent at matriculation level and 90 to 95 percent at the annual examination level in schools invariably failed in more than one subject;
iii. the percentage of cases who failed in mathematics alone and mathematics plus other subjects in various classes did not help improving them in mathematics;

iv. Liberal promotions helped to get better results in mathematics;

v. Students' dislike for mathematics was found to be one of the main causes for their failure in the subject;

vi. the dislike for the subject was more noticed in higher classes than in the lower classes;

vii. the subject matter was presented, weakness in English (the medium of instruction, at that time) and poor teaching were found to be main causes for disliking the subject;

viii. the home work in mathematics was poorly planned;

ix. private tuitions did more harm than good;

x. Confusions in method and application of the formulae, teachers' speed, the way of each step and lengthy calculations were some of the causes of poor performance in mathematics;

xi. nearly 46 percent of the teachers were found to be unqualified to teach mathematics; and

xii. the analysis of the instructional material revealed that there was a need for rearranging the topics with definite aims.

It was a pioneering study in the field of mathematics curriculum of the pre-independence period; and though old seems not to be out of date or irrelevant.
Dave R. H. and Saxena R.C.


The objectives of the study were to study the existing curricula, textbooks and teaching methods in mathematics in the light of the experimental curriculum by adopting suitable techniques of teaching and learning.

The analysis of syllabi and text books was extended to all States; but the study of teaching-learning situations was confined to only four States viz., Bihar, Gujrat, Mysore and the Punjab and the Union Territory of Delhi. The study was confined to general mathematics course. For survey and analysis of the present syllabi in mathematics, Information Bank was prepared. For analysis of textbook, a questionnaire for teachers was prepared and mailed to 200 teachers but only 60 were received duly completed. For study of teaching learning procedure, a questionnaire was given to students and classroom observations were made. Teachers were interviewed. Students in groups were also interviewed and general information bank was developed.

The major findings of the study have been listed below.

i. Most syllabi did not specifically mention any objective of teaching mathematics.

ii. Even where these were recorded, considerations were given to:

a) computational skills and abilities including knowledge of mathematical concepts, facts and principles,
b) utility of mathematics, application of mathematical knowledge to solve everyday problems, select the relevant facts, reject the irrelevant ones etc.

iii. In listing the content, all syllabi had followed the logical sequence of different mathematical processes.

iv. The content was arranged under topics further divided into different sub topics.

v. Basic concepts underlying the topics or subtopics had nowhere been indicated.

vi. Most syllabi did not define clearly the scope of a topic.

vii. Eleven percent of the authors had a doctoral degree in the subject.

viii. Majority of the books were written in regional languages.

ix. In about twenty-five percent of books solved examples did not clarify the concepts.

x. In all books problems were provided but no book encouraged problem solving as a method of learning mathematics.

xi. Of the forty teachers observed during classroom teaching only 14 usually linked a lesson with premises.

xii. Introducing a new topic, about ninety percent of teachers talked about the subject and did not encourage pupils' participation.

xiii. Not even fifty percent of teachers ensured that the new concept had been learnt properly.

xiv. To a great extent the teachers depended on the textbook for selection of problems.
xv. About forty percent of teachers did analyse the problems on the day of observation.

xvi. Only about 26% of the teachers corrected the home assignments with or without suggestions for improvement and majority of the teachers just signed the note books.

Dave and Saxena's study indicates the evident change in the scenario of mathematics teaching and is quite interesting to compare with the findings of Samanta (1944).

Pillai K. K.


This study sought to survey the various aspects of mathematics instruction in Secondary Schools of Kerala with the following objectives:

i. to study the aims of teaching mathematics in the context of socio-economic conditions;

ii. to study how far the syllabus in mathematics reflected the objectives sought;

iii. analysis of the content in mathematics textbooks;

iv. to study the methods and techniques followed in teaching mathematics; and

v. to study the professional preparation of the mathematics teachers.
Data were collected through the study of literature in mathematics, mathematics textbooks, syllabus published by the Government of Kerala from time to time and discussions carried out with various people connected with the teaching of mathematics. Questionnaires were administered to the heads of the institutions and the teachers of mathematics to collect information.

The findings of the study revealed that: No syllabus published since 1932 indicated any objective of teaching mathematics; but syllabi published in 1962 and 1964 provided the objective of teaching mathematics in secondary schools.

i. The syllabus-frame reflected the objectives of teaching mathematics to a large extent though improvements were needed in certain areas.

ii. The mathematics syllabus followed in the secondary schools of Kerala was superior in certain respects when compared with the syllabus followed in Tamil Nadu and Andhra Pradesh, but it was far below the level of the syllabus suggested by the NCERT.

iii. It was impossible to compare with the syllabus followed in U.S.A. and U.K., as the standard of the content was far superior in those countries.

iv. The content of the mathematics textbooks revealed that algebra taught did not imply functional value of the subject; and both analytic and synthetic methods of teaching mathematics were poorly expounded.
v. Many schools did not have facilities to teach graphs, lacked in instrument boxes and other mathematical models.

vi. Reference books in mathematics were rarely found in libraries of the schools.

vii. About 97 percent of teachers handling classes were trained in the methods of teaching mathematics.

viii. Many teachers lacked knowledge of modern trends in teaching mathematics and were not familiar with modern mathematics books and literature.

ix. Home assignments were given in mathematics; but only thirty-seven percent of teachers corrected them.

x. Teachers complained that they did not have adequate time for handling all aspects of teaching.

xi. 74 percent of the teachers reported that the curriculum was heavy in mathematics while 58 percent felt that methods followed did not incudate the necessary enthusiasm and interest amongst the pupils.

Karandikar, S.P.,


The study was conducted with the following Objectives:

i. to examine whether the mathematical concepts mentioned in the syllabus for Standards II to VII were in consonance with the intellectual maturity of the students; and
ii. to analyse the corresponding textbooks to ascertain whether the presentation of various concepts was appropriate to the students' intellectual maturity.

The study essentially involved a detailed analysis of the prescribed syllabi and textbooks. The investigator's findings were supplemented by teachers' opinions obtained through a questionnaire. For analysing the prescribed syllabus, the investigator evolved a set of criteria based on the Piagetian stages of cognitive development. The textbooks were analysed with respect to fifteen criteria representing three important characteristics of mathematical concepts. These data were then supplemented by the data obtained through the teachers' questionnaire which was administered to thirty mathematics teachers teaching at the primary and the secondary level.

The major findings and conclusions of the study were:

i. All mathematical concepts in the syllabi for Standard II to VII, except those of time and space, were in consonance with the intellectual maturity of the pupils.

ii. According to teachers, out of forty concepts in the mathematics syllabus for Standard II to VII, twenty were easy and twenty were difficult to teach.

iii. Teachers hardly read the syllabus; they just followed the textbooks.

iv. The presentation of concepts in the textbooks was logical rather than psychological.
v. The presentation gave little scope for concrete experiences and self-effort by pupils.

vi. Teachers felt that textbooks gave them very little help in introducing new concepts by providing suitable learning experiences followed by adequate drill.

vii. According to teachers, textbooks were deficient in pictures, figures and examples conducive to the development of mathematical concepts.

viii. In the syllabus, it was necessary to indicate the relationship between specific concepts and the objectives of teaching mathematics.

Wanchoo V.N. and Sharma H.L.


Wanchoo and Sharma conducted a study on survey and research in Science and Mathematics Education in 1974. The objectives of the study were:

1. to survey the research conducted in Science and Mathematics education in the country;

2. to locate gaps and to evolve programme for development of research in these two subjects;

3. to co-ordinate the researches done in the N.C.E.R.T., Universities and other agencies;

4. to disseminate the informations so as to reach the consumer and curricular development agencies.
Data were collected from training colleges, universities, State Institute of Education and State Institute of Science to know the position of science teaching and researches done at M.Ed. level. The information available was classified into different areas as:

a) syllabus  
b) teaching materials  
c) audio-visual aids  
d) laboratories and equipment  
e) teaching methods  
f) evaluation  
g) inspection and supervision  
h) pre-service science teaching training &  
i) in-service science teaching training.

The important findings were -

i. The quantum of research done at the primary level was meagre.

ii. The research work done in the area of evaluation was mostly confined to test construction.

iii. The work done in the area of the concept development was practically negligible.

Sinha D.K.


The main purpose of the study was to establish some broad outlines of criteria for evaluation of curricular materials in new mathematics. Therefore, an attempt was made in this investigation to set forth in quantitative terms some yardstick of evaluation.
In keeping with the central objective a procedure was adopted which had essentially three phases: namely the review of literature, field studies, collection of data, analysis and interpretation of the sample. In the second phase, tryout in schools was undertaken so as to elicit responses from students in actual class room situations. A broad-based questionnaire was prepared and sent to schools using materials in new mathematics, particularly those under the Central Board of Secondary Education and the Council for Indian School Certificate Examinations. A sample of answers to the questionnaire from 125 schools was scanned and analysed statistically. Notions of acceptability or otherwise of topics were introduced. Statistical analyses brought out one aspect of criteria of evaluating such materials.

A quantitative analysis from statistical considerations on the basis of the questionnaire and tryouts showed that materials in new mathematics rather on topics with a different slant, were by and large acceptable. Material did not reflect necessarily the spirit of the so-called new mathematics, it had often been mixed up with a ritual, in the shape of rote learning of techniques.
The main objectives of the study were:

1. to collect the mathematics syllabi used in the primary schools of Maharashtra since 1901;
2. to analyse the syllabi and determine their objectives;
3. to determine how the objectives changed from time to time; and
4. to find out the deficiencies, if any, in the changes brought about in the syllabus.

The method used in the study was that of historical survey. Thus, it was essentially a library study. First, all the syllabi in mathematics used in Maharashtra from 1901 onwards were procured. With the help of the documents available, it was found that the mathematics syllabus had been revised several times during that period namely, in 1901, 1913, 1928, 1940, 1947-49, 1955 and 1966. The next step was to list the objectives of teaching mathematics according to each of the seven syllabi. It was found that there was no statement of objectives in several of the past syllabi. The investigator, therefore, made a detailed content analysis of the syllabi along with the corresponding textbooks and question papers.
Based on this analysis the implied objectives for each syllabus were stated in explicit terms. These seven sets of objectives were then analysed in a comparative frame to discern the changes that had been made over the period under study.

The major findings of the investigation were:

i. There were deficiencies in knowledge of reading and writing numbers, skill in the four fundamental processes, ability to handle personal money transactions, efficiency in understanding the environment and skill in drawing geometrical figures.

ii. The two objectives which were introduced for the first time in 1966 were to develop the concept of fractional notation and to lay a firm foundation for higher mathematical education.

iii. The disciplinary and vocational aims emphasized in some of the previous syllabi were developed in the 1966 syllabus.

iv. Two objectives which were greatly emphasized in the 1966 syllabus and which continued to be included were development of complete mastery over the four fundamental operations of arithmetic.

Gopalkrishnan, K.R.

The main objectives of the investigation were:

1. to find out how far the syllabus prescribed in mathematics was adequate in the light of the main qualities expected of textbooks;

2. to find out the constraints that affect the implementation of the current syllabus;

3. to attempt a comparative study of the current syllabus (1970-73) with that of the immediately preceding years;

4. to locate areas or topics to be deleted from and/or added to the syllabus under study; and

5. to find out how the syllabus in mathematics prescribed for the Kerala schools was compatible with that of advanced countries.

The main tools used in the study were questionnaire and interviews. A sample of 1500 teachers from 250 schools was selected for the study. Interviews were carried out with a selected number of parents, students, educational experts and teachers.

The major findings of the investigation were:

1. Pre-determined percentage of promotion, over-crowding in class-rooms, low socio-economic status of the parents, frequent strikes and agitations, poor academic background of students,
lack of adequate foundation in mathematics, lack of parental interest, lack of interest on the part of the students and lack of textbooks dominated among the causes that adversely affected the introduction of new mathematics.

ii. The structure and rigour of the mathematics textbooks were appropriate. The rate of introduction of new terms was uneven. Typographical errors, errors due to carelessness and real errors were found, here and there, in the textbooks. Almost all topics needed gradation. The revision exercises, diagnostic tests and general exercises were, in general, appropriate. The inclusion of enrichment programmes was a good feature of the textbooks but the diagrams were not satisfactory. There was some disagreement between the syllabus and the textbooks due to omission of certain topics and sub-units.

iii. The syllabus of 1970-73 was better than that of the immediately preceding years.

iv. The coverage of content of textbooks of Kerala was not at par with that of the SMSG and the SMP series; the Kerala syllabus differed from even the NCERT syllabus.

v. The additions to the syllabus suggested by the respondents were more exercises suitable for homework, problem related to life. English equivalents of new terms and life history and important events of mathematicians. The deletions suggested included discovering patterns, enrichment programmes, difficult problems and fundamental laws.
Dev, S.K.,


The major objectives of the investigation were:

1. to study methods of teaching school mathematics in Nagaland, and
2. to evolve an effective instructional programme in mathematics especially for the schools in Nagaland.

An attempt was made to evaluate classroom teaching in mathematics. Keeping in view the principles of teaching mathematics, twenty-one classroom teaching activities were conceptualized. After analysing the opinions of ten experts regarding the efficiency of these activities, they were employed in measuring classroom teaching effectiveness. Data were collected through structured interview, questionnaire, observation, inventory, and tests. The Pupil Attitude Inventory, Mathematics Teaching Competence Scale, Headmaster's Rating Scale for teacher behaviour, and Minnesota Teacher Attitude Inventory were employed to collect data. For measuring effectiveness of existing mathematics syllabi and for investigating learning facilities and departmental supervision, Pupil's Maturity Test and Arithmetic and Teaching Learning Facility schedule were used. The study was based on the
Observation of a stratified random sample of twenty schools (eight urban and twelve rural) selected from three districts of Nagaland, viz., Kohima, Mokokchung and Tuensang. In all, forty-nine teachers and 1877 pupils from classes III to VI were included in the final sample.

The study revealed:

i. The teachers were more interested in lecture method. They had a negative attitude towards reflective type questioning.

ii. A large number of teachers could not maintain logical succession of steps and 40 percent of the teachers could neither do sums correctly nor explain through correct and economic procedures.

iii. Teachers were poor in questioning skill mainly because they were weak in subject matters.

iv. The percentage of teachers having positive attitude towards making the lesson objective was the highest and it was the lowest towards ensuring assimilation.

v. About 82 percent teachers did not ensure whether the concept was understood by the students or not.

vi. In all, 65 percent teachers did not strive to evoke non-coercive participation from students.

vii. About 61 percent teachers could not effectively guide pupils' idea towards objectives of the lesson.
viii. About 61 percent teachers followed what had been said in textbooks.

ix. The majority of teachers did not have creative ability.

x. The inter-correlations of teaching behaviours were quite substantial.

xi. The factorial study of teaching behaviour revealed that the teaching behaviour for pre-learning activities had a high impact on in-learning process. In all, three learning modules, viz. pre, in and post, were identified.

xii. The teaching behaviour appeared to have a functional relationship with teaching experience.

xiii. Teachers who took college course in mathematics (pre-degree or degree) seemed to be more efficient in teaching mathematics than matriculate and undergraduate teachers.

xiv. Teaching success depended partly on the teachers personal feelings towards the profession.

xv. The existing mathematics syllabi were unscientific.

xvi. The mathematics books were defective.

xvii. The teaching learning facilities were inadequate in a majority of the schools.

xviii. The teacher behaviour and the achievement of the pupils were interrelated.
Gupta, B.S.,


The main objectives of the investigation were:

1. to study the overall relative effectiveness of analytic-synthetic (A-S) method and traditional (narration-explanation N-E) method of teaching geometry to students of Classes VIII and IX.

2. to evaluate their effectiveness with respect to knowledge, understanding, application and skill objectives.

3. to compare their overall effectiveness in the case of high and low groups of mathematical and mental abilities, and

4. to evaluate their effectiveness in terms of the four objectives in the case of high and low intelligence groups.

The experiment based on bio-group rational design was conducted in actual classroom situations in a boys' high school of Aligarh. The investigator himself taught two periods daily to one of the two equated sections of each of the two classes for about eight months covering the entire course. There were twenty-three students in each section of class IX and thirty-two in each section of class VIII. Six geometry achievement tests were standardized for the purpose: their validity and reliability were established. The group
test of Intelligence of U.P. Bureau of Psychology, Allahabad, was used. The technique of chi-square, t-test, correlation and analysis of covariance were employed.

The major findings of the investigation were:

i. The A-S. method was significantly more effective in terms of overall geometry achievement than the N-E method in Class IX but both the methods were equally effective in Class VIII.

ii. Both the methods were equally effective in terms of the four objectives in Class VIII and application objective in Class IX but the A-S method was definitely more effective than the N-E method.

iii. The A-S method was significantly superior in terms of overall geometry achievement in the case of high and low intelligence groups of Class IX and low intelligence group of Class VIII but both the methods were equally effective in the case of high intelligence group of Class VIII.

iv. The A-S method proved superior as measured in terms of overall achievement in geometry in the case of mathematically low achievers of Class IX but in the case of high achievers of Classes VIII and IX and low achievers of Class VIII both the methods were equally effective.

v. Both the methods were equally effective in terms of the four objectives in the case of high and low intelligence groups of Class VIII
but the A-3 method was significantly more effective in achieving understanding and skill objectives in the case of high intelligence students of class IX and for achieving objectives pertaining to knowledge and understanding of low intelligence students of class IX; however, they did not differ significantly in the case of high intelligence students for knowledge and application objectives and for application and skill objectives of class IX of low intelligence students.

Lalithamma K. N.


The study was intended to evaluate the textbooks in Modern Mathematics introduced in secondary school classes in Kerala consequent on the curriculum revision effected in 1973. The main objectives were:

1. to develop criteria for the preparation of a good textbook in mathematics;

2. to prepare an analysis sheet based on the criteria developed; and

3. to evaluate the six textbooks prescribe for standards VIII, IX and X for the year 1980-81 for both English and Malayalam media classes, by the application of the analysis sheets.
A questionnaire prepared to collect the criteria for evaluating the textbooks based on the objectives of teaching mathematics and the characteristics which determine the goodness of mathematics textbooks, was administered to a representative sample of 240 experienced secondary school teachers of mathematics. The criteria identified through the analysis of the responses and classified into two categories, viz., academic aspects and physical aspects, were used to prepare the analysis sheet, the second tool used in the study. A sample of 240 experienced secondary school teachers of mathematics was then requested to evaluate the six textbooks by applying the analysis sheet.

The main findings of the study were:

i. More emphasis was given to process operations than to the product to be obtained.

ii. Minor omissions in particular areas were present in all the textbooks.

iii. The instances in the textbook of presentation of ideas through life situations were not adequate.

iv. The enrichment materials provided for all standards needed to be increased.

v. Historical notes provided for Sets and Geometry in the standard VIII textbook were not sufficient.

vi. Reference material were not provided in any of the textbooks.
vii. Specific errors could be identified in all the textbooks.

viii. The different topics included were properly correlated using the concept of Set and Real Numbers.

ix. The grading and sequencing of topics and problems were properly done.

x. The fundamental principles which give structure to the subjects were emphasised.

xi. Sufficient exercises were provided and a variety of problems were included.

xii. Answers were not given for any of the problems to be worked out.

xiii. The physical aspects of the book were adequate; however, it was seen that the table of content could have been more detailed. The test of formulae should have been given in the textbook for standard X also.

Mohammad M.

A study to Examine the Effectiveness of Methods of Teaching Mathematics in Developing Mathematical Creativity, Ph.D.

The objectives of the study were:

1. to find out the comparative effectiveness of three methods of teaching and learning for developing mathematical creativity of students;

2. to examine whether the methods of teaching had any effect on the development of convergent and
divergent thinking components of mathematical creativity; and

3. to assess the effect of methods of teaching on low, medium and high creative students in mathematics.

Students of three sections of class IX of a Kendriya Vidyalaya, New Delhi, comprised the sample. These three sections were administered the Test of Mathematical Creativity (developed by the investigator) in order to know the level of creativity of the subjects before being exposed to different methods of teaching. These three sections of class IX were taught simultaneous linear equations and inequations, logarithms and logarithmic tables, and percentage, profit and loss and discount by the tell and do guided discovery and pure discovery methods. The Test of Mathematical Creativity was again administered at the end of the treatment which lasted about six weeks.

The analysis of data revealed:

i. None of the three methods was significantly different in developing mathematical creativity.

ii. None of the methods of teaching was markedly better than the other in developing fluency and flexibility.

iii. The guided discovery method was the most effective in enhancing originality as compared with the tell and do and the pure discovery methods.
iv. None of the methods was significantly different in developing divergent thinking and convergent thinking abilities.

v. There was no differential effect of the three methods of teaching on any one of the three levels (low, medium and high) of creative performers in mathematics.

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