CHAPTER III

REVIEW OF RELATED LITERATURE
Every individual, however, intelligent and cunning he may be, requires assistance while entering into a new field. Experience is the great master of man. Man has to bow down before this great-master in order to conquer the problems, hurdles and mysteries of life. A researcher at the beginning is like a helpless child in a crowded cross-road. Someone has to lead him on in crossing the road safely. Related literature serves as the experienced guide to a researcher. It enriches and enhances researcher's learning and knowledge with the work done in the concerned field of research. It facilitates in choosing the topic, designing the problem and adopting the right method of study. It saves the researcher from unnecessarily replicating the studies already completed. It assists the researcher in what to do and how to do. Study of related literature is a must for every researcher.

In this connection, C.V.Good says:

"Without a critical study of the related literature the investigator will be groping in the dark and perhaps uselessly repeat work already done!"

By studying the related literature the researcher can know what his predecessors had already done in the chosen field of investigation. Unnecessary repetition of work already done can be avoided. A researcher should not waste his time and concentrate completely on the objectives of research. Study of related literature only can help the researcher in this regard. It also help the researcher to find out the gaps and lucuna in the field of research.
John W Best had aptly remarked:

"A summary of the writing of recognised 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."

Best's guidelines relating to the importance and rate of related studies in providing the right direction to research is apposite and facilitates the researcher to achieve success without wasting time, energy and labour.

In the present study, the researcher has gone through the relevant research papers pertaining to the concerned problem in India and abroad and collected necessary information.

**STUDIES IN INDIA AND ABROAD**

A brief outline of the research studies that had been undertaken in the different universities in India and other countries on Teacher Effectiveness, Methods of Teaching Mathematics have been presented.

*SINGH S: Relationship between Teacher’s Personality Teaching Success and Behavioural change in students, Ph.D. Edu, Udaipur Univ. 1978*

The major objective of the investigation was to find out the
relationship of teachers personality, success in teaching and impact on students' behaviour.

The basic sample comprised 135 permanent male teachers with a minimum of three years' experience in teaching and 2839 boys of class IX of the secondary and higher secondary schools of Udaipur. For the final study, ninety teachers, equally divided into high, average and low groups, were selected on the basis of students rating, headmasters rating and performance of students in public examinations. Factors such as geographical location, sex, age, educational qualifications, experience, subjects taught and income, were controlled. The case study method along with the causal comparative method and the correlational technique were used. The tools used were teaching success rating scale, information schedule, interview schedule, critical incidents blank, behaviour change questionnaire, all of which were constructed by the investigator. Allport Vernon-Lindzey study values, 16 PF, Incomplete sentence blank and research inkblot test were also used. Data were analysed with the help of mean standard deviation, t-test, median test, chi-square test and other necessary techniques.

The major findings of the investigation were:

(i) the theoretical and social values were positively related to searching success but the economic and aesthetic values were negatively related,

(ii) the highly successful teachers were assertive, venturesome controlled, emotionally stable and trusting.
(iii) the highly successful teachers were better adjusted than the average and low successful teachers while the average successful teachers were better adjusted than the low successful teachers.

(iv) positive attitude towards family, a sense of identification with the people, place and profession and growing concern for the school, students and studies were helpful in making a teacher successful.

(v) the highly successful teachers possessed better intellectual capacity and efficiency, had higher creative potential and level of aspiration, showed more introversion and better adjustment than the average and low successful teachers.

(vi) the highly successful teachers were able to induce learning, develop interests and foster desirable attitudes in their students.

(vii) the unsuccessful (low successful) teachers contributed significantly to develop aversion to the subject, creating misunderstandings and fostering undesirable attitudes and producing little subject learning.

KAUL L: Factorial Study of Certain Personality Variables of Popular Teachers in Secondary Schools

The objectives of the study were:
(i) to sort out the differentiating personality traits of 'popular' and 'not popular' teachers;

(ii) to extract and interpret the common factors of the differentiating personality traits of popular teachers;

(iii) to sort out the differentiating Sprangerian values of popular and not popular teacher;

(iv) to extract and interpret the common factors of the differentiating sprangerian values; and

(v) to study the effectiveness of popular teachers with respect to attitude towards teaching, public examination, student results and appraisal of teacher's work.

Twenty high and higher secondary schools for boys of the State of Haryana were randomly selected for the study. All the students of Classes VIII, IX and X were taken up for study. 'Popular' and 'Not Popular' teachers were selected from each school on the basis of student judgement. The sample of 'popular' teachers numbered 124 and that of 'not popular' teachers 100. The differentiating personality traits of popular teachers were assessed by using the 'Sixteen Personality Factors' (Cattel and Eber). The sprangerian values of popular teachers were assessed by using the Allport-Vernon Lindzey study of values (modified by Chowdhury for adoption to Indian situations). An attitude scale for measuring attitudes of school teachers teaching in schools was constructed and used. The public examination results
of Classes VIII, IX and X of the 1968-69 session were used to assess the academic attainment of students in subjects taught by the popular teachers. The significance of the differences in means of the personality inventory and the study of values was found out. Correlation between the differentiating personality variables were computed. The factorial study of differentiating Cattell's personality traits of popular teachers was carried out.

Results of the study were:

(i) Popular teachers distinguished themselves as more outgoing, intelligent, emotionally more stable, sober conscientious, venturesome, toughminded, shrewd, placid, controlled and relaxed.

(ii) Popular teachers were significantly high on theoretical, social, political and religious values and significantly low on economic and aesthetic values;

(iii) Popular teachers had a favourable attitude towards teaching in schools; and

(iv) Popular teachers were found to be interested in their work as teachers.

BALACHANDRAN E.S: Teaching Effectiveness and Student Evaluation of Teaching, Ph.D. Education, Madras University, 1981

The main objectives of the study were:
(i) to construct a rating scale to evaluating teaching effectiveness of college teachers by their students, and

(ii) to find out the feedback effect of the student evaluation on teachers in terms of their teaching effectiveness.

The sample consisted of the teachers who taught at the undergraduate level in the colleges of Madras University area offering general academic courses and the students who took these courses. A tool to evaluate college teachers was constructed in the first phase of the study. The teachers characteristics which contributed to effective teaching were pooled from a sample of college students and of college teachers and from related literature. The pooled items were screened and simple and discrete characteristics which were manipulated by teachers and which are relevant to all subject teachers were listed. These characteristics were judged by a sample of students under five important categories. Out of the ninety one characteristics, thirty five were selected as the important ones. These characteristics were phased as items of 5-Point numerical type of rating scale. The second phase of the study was an experimental one in which sixty one teachers, both men and women, teaching English and Economics, were selected from eleven colleges in Madras. The teachers were randomly assigned to the experimental or the control group. Each of the teachers was rated by anyone class of their students whom they had also taught in the previous semester. The teachers in the experimental group alone were given the evaluative feedback based on the students rating within two or three days. The teachers from both the groups were rated a second time after an interval of five to six weeks. The gain scores for the two groups were compared to determine the feedback effect of students evaluation. The study also included a survey of teaching
effectiveness of college teachers teaching different subjects using the constructed rating scale. A sample of teachers made self-ratings using the same rating scale. The general survey of ratings was factor analysed using principal axis solution to identify the dimensions of effective teaching and to establish reliability and validity of the items.

The findings of the study were:

(i) The evaluative feedback based on students rating helped teachers significantly improve their teaching effectiveness irrespective of sex or subject of teachers,

(ii) Students rating and self-rating of teaching effectiveness were positively and significantly related but the self-rating was significantly higher than the students rating,

(iii) The factors of teaching effectiveness identified were: subject mastery and intellectual kindling, responsiveness, integrity and communicating ability, commitment to teaching impartiality, motivating concern for the student's progress and informal academic help,

(iv) The lowest performance of teachers, on an average, was with respect to encouraging discussion in the class and the best was with respect to punctuality,

(v) The teachers in the Madras University area, in general, had
a favourable attitude towards students evaluation of teaching.


The study attempted to identify the factors attitudinal, motivational and personality - which differentiated effective teachers from ineffective ones.

The sample comprised 300 secondary school teachers - 180 male and 120 female - randomly drawn from the secondary schools of Jodhpur. Teacher effectiveness scale was developed and standardized to form criterion groups. The criterion groups consisted of seventy five effective teachers and seventy five ineffective teachers. Job Satisfaction Questionnaire for secondary level teachers was also developed and standardized to study the attitude of teachers towards job and job-related conditions. Besides this, personal factors like sex, age, professional training, income level, nature of residence, marital status, size of family and nature of schooling, were studied. Personality variables like intelligence, anxiety, teaching aptitude, marital adjustment extroversion, neuroticism, job satisfaction, values, ascendence submission and self-concept, were also studied. The tools employed were Raven's Progressive Matrics, Sinha's self analysis form, Eysenck-Mandsley Personality Inventory, Srivastava's Teaching Aptitude Text, Bhatnagar's value scale, Singh's marital adjustment inventory, Sharma's self-concept inventory and Allport's Ascendence submission scale, percentage chi-square, t-test, factor analysis and multiple correlation were employed to analyse the data.

The major findings of the study were:

1. A favourable attitude towards students evaluation of teaching.
2. The study attempted to identify the factors attitudinal, motivational and personality - which differentiated effective teachers from ineffective ones.
3. The sample comprised 300 secondary school teachers - 180 male and 120 female - randomly drawn from the secondary schools of Jodhpur. Teacher effectiveness scale was developed and standardized to form criterion groups. The criterion groups consisted of seventy five effective teachers and seventy five ineffective teachers.
4. Job Satisfaction Questionnaire for secondary level teachers was also developed and standardized to study the attitude of teachers towards job and job-related conditions.
5. Besides these, personal factors like sex, age, professional training, income level, nature of residence, marital status, size of family and nature of schooling, were studied. Personality variables like intelligence, anxiety, teaching aptitude, marital adjustment extroversion, neuroticism, job satisfaction, values, ascendence submission and self-concept, were also studied.
6. The tools employed were Raven's Progressive Matrics, Sinha's self analysis form, Eysenck-Mandsley Personality Inventory, Srivastava's Teaching Aptitude Text, Bhatnagar's value scale, Singh's marital adjustment inventory, Sharma's self-concept inventory and Allport's Ascendence submission scale, percentage chi-square, t-test, factor analysis and multiple correlation were employed to analyse the data.
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The major findings of the study were:

   - A favourable attitude towards students evaluation of teaching.
(i) Sex, professional training, nature of schooling and income level were significantly associated with the teacher's effectiveness.

(ii) The effective teachers had significantly higher scores on intelligence than the ineffective.

(iii) The effective teachers had higher scores on anxiety than the ineffective.

(iv) The effective teachers had significantly higher scores on teaching aptitude than the ineffective.

(v) The effective teachers had significantly higher scores on neuroticism than the ineffective.

(vi) The effective teachers had significantly higher scores on theoretical value than the ineffective.

(vii) The ineffective teachers had significantly higher score on political value than the effective.

(viii) The effective teachers had significantly higher score on job-satisfaction than the ineffective.

(ix) The set of personality variables ascendency-submission, anxiety, marital adjustment extroversion, neuroticism, job-satisfaction, teaching aptitude, real self-ideal, self-discrepancy, religious
value, social value, theoretical value, aesthetic value, economic value, political value and intelligence-significantly predicted the teacher's effectiveness.

The objectives of the investigation were:

(i) to find out at which lesson or lessons in the teaching practice period, the teacher's effectiveness in general reached the maximum,

(ii) to ascertain if this point of maximum development was the same or different for experienced trainees and freshers and whether this point differed with different school subjects,

(iii) to determine the extent of agreement of assessment of the teacher's effectiveness in general with that when behaviour components were taken together,

(iv) to find out if this agreement differed with different subjects and with experienced and fresh trainees,

(v) to ascertain if all the behaviour components were equally effective in lessons in different subjects, and
(vi) to examine if trainees showed a tendency towards systematic improvement in all behaviour components.

The sample comprised all the 99 trainees who had offered subjects other than home science and Gujarati during 1973-74 in the SNDT College of Education for Women, Pune. One thousand four hundred and fifty six lessons of the trainees were assessed for data collection. The tool used was a pro-forma giving twenty one behaviour components of the teacher's effectiveness to be assessed on a nine-point scale. The lessons were assessed component-wise and also as a whole.

The major findings of the investigation were:

(i) The coefficients of correlation obtained between the overall grade and the grade computed on the basis of assessment of components were quite significant in respect of both the experienced teachers. The relationship was higher in the case of subjects in which subject experts observed higher percentages of lessons;

(ii) In the case of experienced teachers, teacher's effectiveness in general reached a limit on sixth, seventh or eighth lesson in all subjects except science;

(iii) In the case of inexperienced group, the limit was reached in the seventh or eighth lesson, in the case of English, Hindi, Marathi and History;
(iv) Teacher's effectiveness reached a limiting value in respect of English, Marathi, Hindi and History in respect of both the experienced and inexperienced groups in the Seventh or Eighth lesson. In the case of Science for both the groups, teacher's effectiveness reached a limit earlier;

(v) In terms of appreciable improvement, which meant teaching grade-A and above, in the case of experienced group, Science showed the highest percentage frequency. Next in order were geography and mathematics. In the case of inexperienced group, the order was science followed by mathematics;

(vi) The commonly observed significant elements of the teacher's effectiveness were: his ability to motivate the class, ability to speak effectively, ability to use black board aptly and certain personality maturity;

(vii) Certain behaviours such as exposition of the subject matter in an appealing manner, sensitivity to individual differences among pupils and making provision for their differences, relating the topic to other topics and to practical life situations, setting problem-solving and emotional assignments, were not attended to by both the groups to the desired extent.

ARORA K : Differences between Effective and Ineffective Teachers, Ph.D.Edu, JMI, 1976

The main objective of the study was to find out the characteristic
differentiating effective and ineffective teachers. Other objectives were to study:

(i) their educational background

(ii) their occupational background

(iii) their job motivation

(iv) their present work, workload and professional growth

(v) their job satisfaction

(vi) their socio-economic and family background

(vii) their attitudes, and

(viii) their opinion about certain current issues related to school education.

The study was conducted in thirty higher secondary schools of Delhi, including equal number of boys and girls schools. Among the 160 teachers selected for the study, there were equal number of effective and ineffective male and female teachers. The sample was identified with the help of the Teacher's Characteristic Description Form (TCDF) and the Education Proforma (EP) which were developed by the investigator. In the TCDF, the characteristic associated with effective teachers were listed and the reactions of
the twenty of the higher secondary schools Principals and an equal number of teachers, education officers, teacher educators and researchers of the NIE were obtained to know whether they were indispensable, desirable or not important. The EP contained all the characteristics considered desirable and indispensable and the principal was asked to indicate which of the characteristics were found in each of the teachers.

The findings of the study were:

(i) The age and the tenure of service were non-differentiating characteristics;

(ii) A great number of ineffective teachers passed examinations while in service;

(iii) The educational qualifications and divisions obtained and continuity of studies in one phase did not differentiate;

(iv) For job motivation, the stage at which the decision to join the profession was taken, the considerations which influenced the choice of profession and the decision to join the profession were the differentiating characteristics;

(v) Of the aspects under the present work, the working conditions and others, the distance between the school and home, the time spent on daily travelling, the additional non-teaching duties,
the nature and satisfaction with them, utilization of free periods, satisfaction with syllabus and incentives for good work were the differentiating characteristics;

(vi) The teachers did not differ in terms of the length of the teaching experience, satisfaction with the allotment of teaching subjects, text books and the mode of transport used for travelling to school;

(vii) Differentiating characteristics with regard to professional growth and desire to attend inservice programmes could be observed while there was no difference regarding the study of professional books and literary pursuits;

(viii) Differentiating characteristics of job satisfaction were general satisfaction as well as the degree satisfaction with work and causes of dissatisfaction. Regarding the views on improvement in school and making teachers work attractive there was little difference;

(ix) On personal and family circumstances specifically marital status financial conditions and leisure time activity, there was no difference;

(x) The groups of effective and ineffective teachers differed on the attitude to teaching, teacher pupil relationship, discipline and punishment, teaching aids, homework and curriculum;
(xi) Views varied as regards improvements needed in the educational system, enhancement of prestige in society, existing teacher training, maintenance of good relationship among the members of the school staff, better teacher pupil relationship, and discipline in the school while both the groups agreed that teachers should have better salaries.

GUPTA B.S: An Experimental Evaluation of the Effectiveness of the Methods of Teaching Geometry in High Schools, Ph.D. Education, Agra University, 1979

The main objectives of the investigation were:

(i) 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;

(ii) to evaluate their effectiveness with respect to knowledge, application and skill objectives;

(iii) to compare their overall effectiveness in the case of high and low groups of mathematical and mental abilities, and

(iv) 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 class-room 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 over all 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-S 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 applications and skill objectives of class IX of low intelligence students.

MOHAMMAD M : A study to examine the effectiveness of methods of teaching mathematics in developing mathematical creativity, Ph.D.Edu, JMI Univ., 1982

The objectives of the study were:

(i) to find out the comparative effectiveness of three methods of teaching and learning for developing mathematical creativity of students;

(ii) to examine whether the methods of teaching had any effect on the development of convergent and divergent thinking components of mathematical creativity, and

(iii) 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 table 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.
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.

GUPTA R.P : A Study of Some Factors considered to be helpful in class teaching, Ph.D.Edn, Luc Univ., 1979

The study was designed:

(i) to devise a suitable checklist of factors considered to be helpful in class teaching;

(ii) to find out which of these factors were helpful in class teaching by student-teachers, teachers, supervisors and M.Ed. students, and

(iii) to find out differences, if any, in the views of student teachers, teachers, supervisor and M.Ed. students about the usefulness of the different factors for actual classroom teaching.

A checklist of thirty six different factors was devised for the purpose. The test-retest reliability of the checklist was 0.98. The sample consisted of 808 subjects out of whom 515 were student teachers, 210 school teachers, 61 training college teachers and supervisors and 22 M.Ed. students.

The main findings of the study were:
(i) The factors mentioned most frequently as helpful were the blackboard work, correcting oral mistakes, explaining difficult points, general knowledge, handwriting, knowledge of the subject, maintaining discipline, power of oral expression, revision of main points, skill in questioning and use of material aids. These were acknowledged to be helpful for class teaching by all the four groups of the sample.

(ii) Next in order of frequency were the factors like correcting written work, drawing figures, dress and appearance, familiar example, home task, loud voice, preparing the plan, removing doubts, showing pictures and the style of reading.

(iii) Spurious factors like completing the registers, dictating notes, faith in God, financial conditions, collecting fees and keeping confidential records, obtained uniformly low frequencies for all the four groups;

(iv) The supervisors marked gestures, methodical procedure, the sense of humour and reciting questions more frequently than the other groups.

(v) The student-teachers group marked, dress and appearance preparation of the plan and handwriting more frequently than the other groups.

(vi) The school teachers group marked correction work, dictation
of notes, faith in God, collecting fees and sound health more frequently than the other groups.

(vii) The M.Ed. students marked the blackboard work, explaining difficult points, maintaining discipline and skill in questioning more frequently than other groups.

DUBEY E.B. : Relationship between pupil characteristics and classroom behaviour of teacher, Ph.D.Edu. Gor.Univ.,1979

The aims of the study were:

(i) to present a detailed process of interaction analysis and its application in the mathematics class of high school;

(ii) to interpret the pupil characteristics and the classroom behaviour of the teacher which were inherent in them;

(iii) to alert the prospective teacher to the importance of understanding the adjustment problems of pupils and teachers, to help him gain insight concerning the nature of teaching and learning process and to aid him achieve competence in the evaluation of classroom instruction; and

(iv) to inculcate among teacher-trainees appreciation of responsibilities inherent in the role of teacher.

The single group design was used in the study. In all, 1000 students of class X studying elementary mathematics from different colleges of Jaunpur
and 100 teachers teaching these students were selected for the study.

The findings of the study were:

(i) The classroom verbal behaviour of the teacher had positive relation with the pupil characteristics;

(ii) The teacher classroom verbal behaviour and the interest of the pupil had positive relation except in aesthetic, social and clerical interest factors;

(iii) The classroom verbal behaviour of teachers had no positive relation with the attitude of pupils;

(iv) The classroom verbal behaviour of teachers had positive relation with the achievement of pupils.


The objectives of the study were:

(i) to isolate the teaching skills involved in Mathematics teaching;

(ii) to prepare a list of teaching skills specific to the teaching of mathematics, determine their behavioural components and develop observation schedules for them;
(iii) to prepare a teaching competence scale for mathematics teaching; and

(iv) to establish the validity of identified skills.

The study was conducted in two phases. In the first phase, an attempt was made to identify the teaching skills specific to mathematics teaching and in the second phase it was attempted to validate the skills through the microteaching approach by conducting an experiment on parallel group design. The sample consisted of 1,200 students of classes IX and X studying in high schools of Varanasi for locating twenty best mathematics teachers. Eight teacher-educators and ten research scholars trained in microteaching acted as experts for finalizing the list of major skills in mathematics teaching. For the validational study, 100 B.Ed. student teachers were included in the sample. The data were analysed by employing t-test, adjustment coefficient of correlation and coefficient of concordance.

The main findings of the study were:

(i) There were at least six distinct and specific mathematics teaching skills which were involved in the teaching of mathematics at secondary school stage. These were skill of developing a concept, skill of developing a principle, skill of applying inductive approach, skill of applying deductive approach, skill of figure drawing and skill of applying problem solving approach;

(ii) Behavioural components of the skill of developing a concept were identification of attributes, making important attributes...
(iii) Behavioural components of the skill of developing a principle were: identifying the concepts related to the principles, recalling component concepts, relating component concepts to form the principle and providing practice;

(iv) Behavioural components of the skill of applying inductive approach were: giving suitable examples, using appropriate verbal and non-verbal media, arriving at generalization and eliciting new examples from the students;

(v) Behavioural components of the skill of applying deductive approach were: clear cut statement of the rule, identifying the constituents terms of the rule giving examples relevant to the rule and eliciting examples from the students;

(vi) Behavioural components of the skill of figure drawing were: identification of the elements of figure drawing using appropriate geometrical instruments, use of appropriate chalk, using appropriate levels, using dotted lines for new construction numbering of figures and appropriate size of figures;

(vii) Behavioural components of the skill of the problem-solving approach were: exposure of the problem, recollecting known relations, finding out necessities required for the solution and
analysing the given data in the light of what is required and the necessities;

viii) Six observation schedules prepared for observing and rating the microlessons on the identified skills had a high degree of inter scorer reliability having coefficient of concordance ranging from 0.69 to 0.87;

(ix) The twelve item teaching competence scale for mathematics teaching had a high degree of inter scorer reliability ($\gamma = 0.69$);

(x) Student-teachers trained in the identified skills through the microteaching approach scored significantly higher at 0.01 level of confidence on the mathematics teaching competence scale than their counterparts trained through the traditional approach on the basis of this fact the validity of the identified mathematics teaching skills was established.


The objectives of the investigation were:

(i) to study the relationship between teacher's demographic variables (sex and age) and teaching competency at the higher secondary level;
(ii) to study the relationship between other presage variables (the teachers attitude towards teaching, interest in teaching, self-perception for his teaching behaviour and intelligence) and teaching competency at the higher secondary level;

(iii) to study the relationship between the teaching competency of higher secondary Hindi teachers and product variables (pupils academic achievements and pupils liking for the teaching behaviour of their teachers);

(iv) to arrive at a cluster of factors (teaching competencies) required for effective Hindi teaching at the higher secondary level;

(v) to develop instructional materials for one of the identified teaching competencies required for the teaching of Hindi at the higher secondary level;

(vi) to study the effect of developed instructional materials on the development of teaching competency among teachers.

The sample for the pilot study consisted of seventy two teaching learning situations in which thirty six Hindi teachers teaching Grades IX, X and Grade XI and their pupils were involved. For the final study, a total number of 220 classroom teaching learning situations were observed. In the final study, forty eight teachers were involved. In addition to these teachers, data related to the students liking of the teachers, teaching behaviour
were collected from 2,340 pupils. The achievement test in Hindi was administered to 766 pupils of Grade IX. For the purpose of validation of the instructional materials, twenty eight student teachers who had offered Hindi as a teaching subject were selected. From these twenty eight student teachers, two equal groups (experimental and control) were formed randomly. The various tools used were the teacher Attitude Scale (Grewal), the Interest Inventory for Teachers (Grewal), the standard progressive matrices a teacher's self-rating scale and a pupil liking scale. The classroom observation schedule and achievement test of Hindi developed by the investigator. The data were analysed by employing Principal Component Analysis, Varimax rotation, t-test correlation and analysis of co-variance.

The findings of the investigation were:

(i) There was no significant difference in the competency of male and female Hindi teachers teaching at the Higher Secondary level

(ii) There was no significant positive correlation between the age of Hindi teachers teaching at the higher secondary level and their teaching competency;

(iii) There was no significant relationship between the attitude of Hindi teachers at the higher secondary level towards teaching and their teaching competency;

(iv) There was no significant relationship between the interest of Hindi teachers teaching at the higher secondary level and their
teaching competency;

(v) There was a significant negative correlation between the self-perception of Hindi teachers teaching at the higher secondary level and their teaching competency;

(vi) There was no significant relationship between the intelligence of Hindi teachers teaching at the higher secondary level and their teaching competency;

(vii) There was a significant positive relationship between the teachers teaching competency and the pupils liking for their teaching behaviour at the higher secondary level;

(viii) There was a significant positive relationship between the teaching competency of teachers at the higher secondary level and the academic achievement of their pupils of Grade IX in Hindi;

(ix) The identified competencies were: giving assignment loud reading, asking questions, introducing a lesson, pacing, managing the classroom, presenting verbal mode, clarification, using the blackboard, using appropriate reinforcement, achieving closure, probing questionnaire, creating interest and improving pupils reading behaviour;

(x) The training of the student-teachers through the instructional materials in microteaching setting improved, the cognitive competency, emotional competency and behavioural competency of
loud reading among the student-teachers of experimental groups sufficiently more than the student teachers of the control group

(xi) After the training through instructional materials in simulated condition, the competency of loud reading among the student-teachers of the experimental group improved significantly more in the real classroom condition than that of the student-teachers of the control group;

(xii) There was no significant difference on the language teaching competency of the student-teachers of the experimental and the control group in the real classroom condition.

ROY J.A. : Study of Teacher Traits Associated with classroom Interaction Patterns, Ph.D.Psy., Cal Univ., 1981

The major objectives of the study were:

(i) to enquire into the relationship between a set of teacher traits and a set of behaviour patterns in the classroom as measured by Flanders Interaction Analysis Category System (FIACS) and

(ii) to explore the possibilities of predicting teacher behaviour from teacher traits and, if possible, to deduce a concrete procedure for such a prediction.

The sample included 200 secondary school teachers of West Bengal. The FIACS, Teacher Personality Inventory, Chatterjee's non-language preference
schedule, Cattell's Culture Fair Intelligence Scale 3 (Forms A and B) and scale of attitude towards teaching as a career were the tools used for data collection.

The findings of the study were:

(i) Significant correlation existed between teacher response ratio (TRR) and self-confidence, leadership, emotional balance and sociability, attitude towards teaching as a career, intelligence and interest in fine arts and literature;

(ii) Significant correlation existed between TQR and self-confidence, leadership, emotional balance, sociability, intelligence and interest in literature, science and sports;

(iii) Significant correlation existed between PIR and self-confidence leadership, emotional balance, sociability, intelligence and interest in literature and sports;

(iv) Significant correlation existed between TRR and self-confidence emotional balance, sociability attitude towards teaching as a career, intelligence and interest in literature;

(v) Significant correlation existed between TQR and self-confidence leadership, emotional balance, honesty and integrity, intelligence and interest in literature, science and sports;
(vi) Significant correlation existed between CCR and self-confidence leadership, emotional balance, sociability, attitude towards teaching as a career, intelligence and interest in literature, science and sports;

(vii) Significant correlation existed between SSR and sociability, and attitude towards teaching as a career;

(viii) Significant correlation existed between PSSR and self-confidence leadership, emotional balance, intelligence and interest in literature;

(ix) The highest significant correlation obtained was 0.539 between TQR and sociability and the lowest significant correlation was 0.198 between TQR and interest in fine arts;

(x) The values of the multiple R obtained for each of the eight dependent variables with all the eleven independent variables taken together were mostly significant at the 0.01 level of confidence except in the case of SSR and PSSR.

The objectives of the study were:

(i) to compare the outcomes of learning mathematics through programmed instruction and conventional methods of teaching;
(ii) to find out whether intelligence, introversion, extraversion, rigidity-flexibility, study habits and previous achievement of students were differently related to their achievement and retention when they learn mathematics through the aforesaid two methods.

The study was conducted on two groups of 189 class IX students matched on the basis of age, socio-economic status and locality of habitat. One of these groups (experimental group) was taught through a linear programme on set theory constructed by the investigator. The other group (control group) was taught through the conventional method of teaching. A test of achievement was administered at the conclusion of teaching. Another achievement test was administered after two months for measuring retention in mathematics. Subjects securing 60th percentile or above and 40th percentile or below on the different variables were called high and low groups respectively. A 2 x 2 x 2 factorial design was used.

The major findings of the study were:

(i) Programmed instruction was a more effective method than conventional teaching not only in relation to achievement but also in relation to retention;

(ii) The personality dimension introversion - extraversion had highly significant effect on achievement and some effect on retention scores, introverts being superior to extroverts. This dimension had little differential effect on achievement or retention through the two methods of teaching employed. However,
introverts with poor study habits achieved better than extraverts with poor study habits when taught through the programmed instruction;

(iii) Intelligence had a significant effect on achievement and no significant effect on retention of achievement. It did not show any differential effect on achievement and its retention through the two methods of teaching employed;

(iv) Good study habits had significant effect on retention of achievement but no significant effect on immediate achievement;

(v) The flexibles achieved higher through the programmed instruction and the rigids achieved higher through the conventional method of teaching;

(vi) Students with high previous achievement achieved and retained higher than those who had poor previous achievement. Students with low previous achievement achieved better through the programmed instruction than those with high previous achievement taught through the conventional method of teaching.


The objectives of the study were :
(i) to develop a likert type scale to measure attitude towards mathematics;

(ii) to find out the relationship between attitude score and parents qualification;

(iii) to find out the relationship between attitude score and parents profession;

(iv) to find out the relationship between attitude score and parent's income;

(v) to find out the relationship between attitude score and family size;

(vi) to find out the relationship between attitude score and type of schools attended by students; and

(vii) to find out the relationship between attitude score and reading facility.

On the basis of opinions from 500 students of secondary schools, seventy attitude statements were prepared of which thirty were finally accepted for the scale. The scale value and the t-value of each statement were computed. The coefficient of reliability by the split-half method was 0.72. A stratified random sample of 505 students (345 boys and 160 girls) was selected from the population of Class X and XI students of Patna Municipal...
Corporation for studying the relationship. Analysis of variance and t-test were employed for the treatment of the data.

The main findings of the study were:

(i) Boys whose parents were better qualified and in prestigious professions, had more favourable attitude towards mathematics than others but this was not true in the case of girls;

(ii) Boys and girls from rich families had more favourable attitude towards mathematics than those from poor homes;

(iii) The types of institutions attended earlier had no impact on attitude;

(iv) Boys and girls with study facilities had more favourable attitudes than others.

GHOSH A.K. : Scholastic Backwardness in the Basic Process in Arithmetic—Diagnosis and Prevention, Ph.D.Edu, Kal Univ, 1982

The objectives of the study were:

(i) to diagnose children's disabilities in specific areas of addition and subtraction in arithmetic with the help of specially developed diagnostic tools; and

(ii) to suggest preventive measures for removing the expected learning disabilities in those areas.
The sample for diagnosis of scholastic backwardness consisted of 200 students of Class II of six primary schools selected from culturally, socially and economically disadvantaged areas, while the experiment was conducted on students of Class I from four primary schools situated in similar disadvantaged areas. The developed diagnostic tools in addition covered nine major objectives, thirty four specific objectives and consisted of 100 test items while those in subtraction consisted of four major objectives, sixteen specific objectives with 100 test items. The test-retest reliability coefficients four tools in addition and subtraction were 0.98 and 0.94 respectively. An individual structured interview was conducted with 20 percent students selected at random from the sample to validate the tools. The validity coefficients were found to be 0.99 for both the tools. For suggesting preventive measures, twenty clusters of disabilities in addition and sixteen in subtraction were identified as the basis for the experimental study. Nine teaching units were specially developed on the basis of qualitative and quantitative analysis of learning disabilities already diagnosed. The experimental groups were treated by Piagetian methods of instruction of the child's conception of numbers; the controlled groups were taught conventionally. Nine independent variables were controlled either by physical or selective manipulation. Kamat's Intelligence Test was used as pretest for covariance design. The diagnostic tools developed were used as post-tests. Conclusions were drawn from covariance analysis.

The conclusions were:

(i) The experimental groups taught by the Piagetian methods achieved more than the control groups taught conventionally;
(ii) The experimental groups showed significantly better achievement than the control groups when both the groups were evaluated on the post-test 15 days after the experiment;

(iii) The experimental groups showed greater motivation in learning.

STUDIES IN ABROAD

Allan Podbelsek: "CSMP : Realisation of a Mathematics Programme for All".

Foundation of CSMP

CSMP (Comprehensive School Mathematics Programme) was developed over a period of several years by mathematicians and mathematics educators from several countries. One of the motivating factors of its founders was the work of the mathematician and mathematics educators whose ideas were published in the year 1963, 'Cambridge Report'. From initial leadership by Burt Kaufman, the federally founded project moved from Southern Illinois University at Carbondale, Illinois to its home at the Central Midwest Regional Educational Laboratory in St. Louis Missouri (CEMREL).

Brief Description of CSMP

The CSMP is a dramatic curricular innovation in elementary school mathematics. During its development, conscious decisions were made about how mathematics should be taught. The most important of these are the following:

Mathematically important ideas should be introduced to children easily and often in ways that are appropriate to their interests and level of sophistication. The concepts (but not terminology) of set, relation and function
should have prominent place in the curriculum. Certain content areas, such
as probability combinatorics and geometry should be introduced into the curri-
culum in a practical, integrated manner.

The development of rich problem-solving activities should have a pro-
minent place in the curriculum. These activities should generate topics,
guide the sequencing of content and provide the vehicle for the development
of computation skills.

The curriculum should be organised into a spiral form which would
combine brief exposures to a topic (separated by several days before the
topic appears again) with a thorough integration of topics from day-to-day.

Whole group lessons should occupy a larger and more important role
in mathematics class and teachers should be provided with highly detailed
lesson plans which layout both content and pedagogical development of
lessons. Furthermore, training in both the content and pedagogy of the pro-
gramme should be made available to the teachers.

These benefits about the teaching of mathematics were translated with
remarkable integrity into the eventual curriculum materials. CSMP is a model
of one very distinctive way of teaching mathematics and is one of the few
that can be studied in detail by mathematics education researchers and tea-
chers. Its implementation and evaluation in schools is,
in a sense, an experimental test of these distinctive features.
Teacher in mathematics education is the most important person. Teacher is the basic element in mathematics education.

In 4th ICME, intensive discussion was held about the elements that make a professional teacher of mathematics.

According to Egsgard,

A professional teacher of mathematics is one who is a good teacher of mathematics.

A good teacher of mathematics is one who uses knowledge and love of mathematics as well as his love and respect for his students to lead these students to enjoy the study of mathematics.

A student who enjoys the study of mathematics will be successful in mathematics. It is only necessary to discover the attitude towards mathematics.

A good teacher must keep good personal relationship with his students. Mutual love and respect should exist between the teacher and the students.

The author, John C Egsgard, gives as much individual attention as possible in a class. Further he uses socratic method of teaching enabling each student to take part in questioning or answering. Students are given enough responsibility to solve a problem by themselves. The author goes
from desk to desk answering questions, praising good work, encouraging weak and giving hints. The author finds that praise and encouragement tend to help the student to try harder whereas sarcasm and sharp criticism cause them to become discouraged and sullen so that they stop making an effort.

Some teachers take delight in making the simple things appear to be complex which is not a sign of a good teacher. A good teacher should make difficult things easily understandable.

The process of learning mathematics is never finished for a good mathematics teacher. For, no matter how well a teacher is prepared, he must continually learn, for example by reading the national and local mathematics journals, by attending meetings of national or local organization of mathematics teachers by taking courses to keep his knowledge upto date. A good mathematics teacher needs to take help from other good mathematics teacher.

In the following, the author gives some of the qualities which are necessary for an individual to become a mathematics teacher:

(i) Only a person with the required knowledge of mathematics for level X should become a teacher at level X.

(2) Only happy persons should become teachers of mathematics;

(3) Only persons who enjoy other people and want to help other people should become teachers of mathematics,
(4) Only teachers who want to become mathematics teachers should become teachers of mathematics;

(5) Only teachers who love mathematics should become teachers of mathematics.

The author who is highly qualified to teach university level mathematics likes to teach high school mathematics. In answer to why he likes to teach high school mathematics, he says the following words:

"I teach students rather than mathematics. Even though the mathematics does not change from year to year, students do. Each year, I have a new group of individuals to be within my classroom. My thirty years in the classroom have been happy ones. I have treated my students with love and respect and they have reciprocated. We all have much fun in my classroom. Yet we all learn. But my attitude of love and respect for the students is not enough for them. They must also be successful. Somehow in each of my classes I have been able to find something that every student can do well. I have been fortunate in being able to do this in classes with four students and in classes with forty five students. The fact that my students have learned and that they have enjoyed themselves learning, has brought me great joy."

HOWARD RUSSEL: Implications of Some Results of the Second International Mathematics Study

Second International Mathematics Study (SIMS) provides some data which speaks about the pace and coverage in Mathematics in secondary level in different countries. These data show substantial variations among countries in the extent to which mathematics education is provided for all students. The data which reveal these variations are coverage data and retention data and the product of these two, i.e. coverage x retention, are presented as
yield. These data may prove to be helpful to consider a shift in mathematics education from content for the elite, to a more marketable mathematics for all. The SIMS data may be helpful because they forshadow relationships among key variables which need to be manipulated if the suggested shift in mathematics education is to take place in the mathematics classrooms of the world, as opposed to taking place only in the minds and the writings of educational leaders.

Regarding the variation of the data, the author says:

What seems to have happened then is that most countries have maintained a 'promotion-by-performance' standard policy and this, in turn, has lead to retardation or failing of significant number of students. The failing of students, or the forced repetition of grades by students thus shows up a slowing of pace, but this type of slowing the pace seems not to have provided any positive outcomes.

Here the author gives more suggestion how to implement mathematics-for-all programme successful.

"I wish to close my contribution to the debate on mathematics-for-all with a brief and simple analysis of the issue of content selection. I wish to suggest that a rationale for mathematics which appeals to the 'new' clients of mathematics, i.e. the middle level students who constitute the backbone of society, must be carefully constructed. I believe that a market oriented rationale is quite appropriate. Such an orientation is likely to be widely accepted if it is true, and if it can be shown to be true, that the students
in the middle and below the middle on our mathematics competence scale will be required to use mathematics or "mathematics-for-all" in their chosen work, in the market place.

Perhaps mathematics educators should be prepared to collaborate with representation of government and business in an effort to identify the generic skills needed in our new core mathematics-for-all. Then we can hope to make significant progress in the quest for mathematics-for-all."

TAKASHI IZUSHI : On the Value of Mathematical Education retained by Japanese Society as a whole

AKIRA YAMASHITA :

A research was conducted "on the value of mathematical education retained by Japanese Society as a whole". This is a research on how school mathematics, which students learned at junior and senior high schools, has been retained by them when they grew up into society.

**Purpose of the Study**

The purposes are classified into the following three:

- The first purpose is to examine the following: Do they remember or understand contents which were learned at junior and senior high school?

- The second purpose is to examine the following: what kind of contents of mathematics are useful to their work?
The Third purpose is to examine what may be called formal discipline. In the first stage of history of mathematical education in Japan, formal discipline was emphasised and Euclidean geometry took a great part as formal discipline for a great guiding principle.

**The Way of Examination**

The examinations were carried out twice.

(1) The first examination: This examination was carried out in 1955.

(a) **Participants**: The number of participants was 976 and they were sampled from the whole society according to their occupations: technologist, teacher, specialist, administrator, office workers, farmer, fisher, seller etc.

(b) **Content**: They were asked to solve problems connected to the following contents:

1. Calculation (including positive and negative number, literal, expression),
2. Round number, percentage
3. Proportion, reciprocal proportion
4. Fundamental figure
5. Solid of revolution
6. Scale
7. Projective figure
8. Word problem (equation of the first degree)
9. Congruence and similarity of triangles
10. Statistics (graph)
11. Pythagoras' theorem
12. Trigonometric function
13. Coordinates
14. Word problem (simultaneous equation)

Furthermore, they were given the following questionnaires corresponding to the problem: "If you understand the content related to this problem, it is useful to your work?"

(2) The Second Examination: This examination was carried out in 1982.

(a) Participants: The participants were graduated from a senior high school belonging to a national university. Their occupations were technologist, scholar, doctor etc and they contributed to the improvement of technology and science in Japan, more or less.

(b) Content: They were asked to solve problems which were mainly related to elementary geometry. The problems were connected to the following contents:

I Questionnaires of elementary geometry
Findings

(a) Knowledge

Simple mathematics knowledge which was learned in junior and senior high school is well remembered by every person, though many years have passed since they learned it.

In the second examination, the objects were chosen concerning the years of graduation from senior high school. It was found that knowledge such as of perpendicular line and plane, which may be observed in daily life are forgotten as the time passes after they learned them.

(b) Usefulness

The objects for the study were classified as follows:

(i) specialist and administrator

(ii) office worker
The contents judged relatively useful for the persons of both \( a \) and \( b \) scales and statistics. The contents of proportion, reciprocal proportion and fundamental figure are thought to be more useful by the persons of \( a \).

Many persons answered correctly the problems of calculation and solids of revolution, but few persons thought that these contents were useful. And many persons judged that content of coordinates not useful to their work.

The persons of \( a \) more than \( b \) think that the contents of proportion, reciprocal proportion and fundamental figure are useful.

(c) The way of thinking

It was examined here whether the attitude of deductive thinking which was obtained by learning elementary geometry still in their mind or not.

It has been a long time since they learned, but they have not forgotten the attitude of thinking deductively.

Younger persons replied that they used mathematics knowledge. But older persons replied that they judged by common sense, though they might use mathematics knowledge unconsciously.

Many members of Japanese Society judge that thinking and reasoning powers are developed by learning elementary geometry. And they judge that knowledge of elementary geometry is useful to their daily life, but not to their work.
AFZAL AHMED : Implications of the Cockcroft Report

Paragraph 334 of the Cockcroft Report begins with the following sentence:

"Low attainment in mathematics can occur in children whose general ability is not low".

From the Cockcroft Report:

"(-----) mathematics lessons in secondary schools are very often not about anything. You collect like terms, or learn the law of indices, with no perception of why anyone needs to do such things. There is excessive preoccupation with a sequence of skills and quite inadequate opportunity to see the skills emerging from the solution of problems. As a consequence of this approach, school mathematics contains very little incidental information. A French lesson might well contain incidental information about France - so on across the curriculum; but in mathematics the incidental information which one might expect (current exchange and interest rates, general knowledge of climate communications and geography, the rules and scoring system of games, social statistics) is rarely there, because most teachers in no way see this as part of their responsibility when teaching mathematics. We believe that this points out in a very succinct way the need which is by no means confined only to course for low attaining pupils - to relate the content of the mathematics course to pupils experience of everyday life".

The Cockcroft Report has pointed out that the mathematics education which many pupils are receiving is not satisfactory and that major changes are essential.
The major changes as far as the teaching approach is concerned are outlined in paragraph 243, the most quoted paragraph of the report -

"Mathematics teaching at all levels should include opportunities for:

- exposition by the teacher
- discussion between teacher and pupils and between pupils themselves
- appropriate practical work
- consolidation and practice of fundamental skills and routines
- problem solving, including the application of mathematics to every day situations
- investigational work

Cockcroft Report (paragraph 465):

"In order to present mathematics to pupils in the ways we have described, it will be necessary for many teachers to make very great changes in the ways in which they work at present (...)"
In France in recent years, studies on the rate of academic failure have revealed the fact that the education system functions by a process of successive elimination of pupils from the normal streams at each level of orientation.

Young children have a potential for abstraction which is not expected. The fact that primary school teachers are often recruited from the students who have the least positive feelings towards mathematics is very worrying in France. It sets up an interlocking process of failure and declining performance is one of the most distressing phenomena of educational system.

Teachers must become aware of those aspects of their teaching practice which create misunderstanding and lack of comprehension; they must not only have a solid knowledge of mathematics that they have to teach but also be capable of understanding how these are to be transmitted in the mathematics class and study the ethnological features of that universe where, in the interrelationship between teacher, pupils and mathematics, communication is threatened by interference which can be called 'socio-logical' (according to P. Bourdieu).

In order to give all pupils access to mathematical culture with its own specific features, it would be necessary, as for physical culture to offer to all the pleasure and the opportunity to carry out exercises (here intellectual and abstract ones). Pythagora's theorem is a classic on the same plane as a play by Shakespeare or a painting by Leonardo da Vinci, and
there is in it an aesthetic wealth that we must try to offer to all. Contrary to those who want to confine underprivileged children to "useful mathematics" (in the sense of creating minimal automatic responses with no practice in deductive reasoning). The author thinks that the teachers must attempt to allow all children to exercise a right to abstraction (for which mathematics teaching offers the best opportunity), the formative element in the loftiest activities of the human mind.

Certain mathematicians, conscious of the collective responsibility they bear for the harm done by misuse of their discipline, recognise that it is their duty to react. Academic failure at the present time is no longer solely the failure of pupils, it is the failure of the whole educational system, and if teachers fail in their struggle against this failure, the responsibility will fall on those whose mission it is to train teachers, in other words, those working in a tertiary education. The mathematical community must conscientiously do its duty towards the school system through the initial training of teachers and in-service training (with special emphasis on recent research on mathematics teaching) for practising teachers, as well as by the development and improvement of the forms of support necessary for all those for whom it can not be provided by the family context.

ANDREW J.C.BEGG : Alternative Mathematics Programmes

Here in this paper the author has questioned the syllabi and teaching method in his country and suggested alternative programmes.

Aims of Mathematics education in Newzealand

Personal - to help students solve the everyday problems of adult life
Vocational - to give a foundation upon which a range of specialised skills can be built,

Humanistic - to show mathematics as part of the country's cultural heritage.

Reason for alternating programme

The author says these are the basics but not sufficient. Further mathematics should be given a warm and human flavour rather than a formal or logical one.

For many students, mathematics is not inherently interesting - indeed they may have been turned off the subject. Usefulness is not enough therefore the author wants motivation and fun in mathematics.

Students sit in a class with varying needs. But they are not given alternative programme. Therefore, alternative programmes are needed.

Teaching

A mathematics programme is part of a total educational package. Teachers and programme-designers must consider the aims of this whole package and then adjust their programme to suit these general aims would include the development of:

- self-respect
- concern for others
- urge to enquire
- skills of communication
- responsibility
- criticism
- cooperation

In order to achieve some of these aims, one must stress cooperative learning, encourage project work and display of work by individuals and groups. Discovery approaches must be used. All students must be given success in their eyes, in their peer's eyes and in their teacher's eyes. The author says as the present ones are not achieving these goals, alternative programmes are needed.

The author has also suggested programmes to suit monocultural or multicultural groups.

Mixed Ability

Students of a particular age-group vary from very talented to those of low ability. Many teachers believe that because of social factors, it is desirable to keep mixed-ability forms. One programme is not suitable for such a group. Therefore, alternative programme is desirable.

Individual or Group Programmes

Traditionally most of the teachers taught their classes as one group. Some of the teachers have tried individual programmes. Having tried both methods, it has been found neither a class approach nor an individual programme is satisfactory. So again the author looks for alternatives. The
author's suggestion is given below in his own words:

"No approach is necessarily correct and variation of style throughout the programme is probably the most desirable answer but within this varied programme, I think we need to use groups to a much greater extent than at present."

Cooperative or Competitive Learning

The author suggests that a group approach is the real-life approach to many problem-solving situations.

It is felt that the student who ranks first in a class deserves praise and reward, but the author believes that this should not be achieved using a competitive strategy which recognises one at the expense of ranking others in lower positions. It can be done with comments rather than with numbers. At the same time, other students also do well in presentation or in attitude while others improve in some facet of their work, and these aspects need positive encouragement and praise too.

When a cooperative group is working together then the whole group should share the praise and encouragement and there is no need to separate out individual skills to achieve our objectives.

Traditional or Alternative Teaching Styles

Teachers still follow traditional teaching styles. But students have changed, their interest in mathematics is different and they are more sophisticated.

In order to cater the present need, the author has given the following suggestions that:
Open-ended approaches should be encouraged through discovery learning and through project activities;

It is often useful to have one group doing projects while another group requires more teacher attention.

In recognition of the short attention span of many young students, period containing 60 minutes should be split into at least 4 shorter periods with a greater variety of activities occurring during the hour.

The range of activity should include not only oral and written work, but also physical activity and a greater use of visuals in teaching.

Varied and interesting stimulation need to be provided over an extended period in order to avoid having the students bored.

**Text-oriented or multi-media**

With the advent of alternative programmes, it is needed to build up numerous supplementary resources as follows:

1. Matchcards and worksheets are needed to direct students into alternative activities such as games for maintenance work, project starters and enrichment.
Computer-assisted learning has obvious applications to remedial, revision and enrichment work;

Films, slides and videos all have their place in providing variation.

Logical or Humanistic Approach

The author prefers humanistic approach, nearing student centred approach. This approach links their work to real life.

Further the author wishes to see a warm approach that treats every student as someone special that works positively to avoid sex or race stereotyping and that builds self-esteem in the students. Once this self-esteem is present, teachers will be amazed at the progress students can make.


This study of Symonds is in two parts. Part-I describes how 32 teachers in a school were ranked by their pupils and rated by the principal on a number of characteristics. This information enabled Symonds to characterise each teacher as more effective or less effective from the point of view of pupils and the principal. Part-II describes how some teachers taken from the top and the bottom of the list were observed while teaching with a view to isolate the characteristics which distinguished the better from the poorer teachers.
The observation reports indicated that the two extreme groups of teachers could be differentiated on three well-defined bases, namely:

(i) The superior teachers liked children while inferior teachers disliked children;

(ii) The superior teachers were personally secure and self-assured, while inferior teachers felt personally insecure and suffered from a feeling of inferiority and inadequacy;

(iii) The superior teachers were well-integrated and possessed good personality organisation, while the inferior teachers tended to be personally disorganised.

RYANS, DAVID G : Characteristics of Teachers - Their Description, comparison and appraisal, Washington D.C., American Council of Education, 1960

This teacher's characteristic study was a study of great magnitude conducted by a team of researchers from 1948 to 1955. It comprised approximately one hundred separate studies, one of which was directed at the identification of characteristics mainly personal and social - which differentiated between uniformly highly and lowly assessed teachers, as determined by a composite observer assessment. Findings were based on the responses of such teachers to a 'Teachers' characteristics schedule.

It was found that there was a general tendency for 'high teachers' to be extremely generous in appraisals of behaviour and motives of others
to possess strong interests in reading and literary affairs, to be interested in music, painting and creative arts in general, to participate in social groups, to enjoy pupil relationships, to prefer non-defective classroom procedures, to manifest superior verbal intelligence, and to be above average in emotional adjustment. On the other hand, 'low teachers' tended generally to be restricted and critical in their appraisals of other persons, to prefer activities which did not involve close personal contacts, to express less favourable opinions of pupils, to manifest less verbal intelligence to show less satisfactory emotional adjustment, and to represent older age groups.


Lamke's teachers were selected on the basis of composite rating by their principals and two observers. It was presumed that the characteristic differences between good and poor teachers would be most prominent if the extremes of groups were examined. So ten best and ten poorest teachers were chosen for the study.

Lamke compared the qualities of good and poor teachers on the basis of Cattell's "16 personality factor test" and a paired comparison scale based on Cattell's "20 Surface Traits". Results on the whole were not conclusive. Lamke, however, felt that certain limited generalisations might be possible on the basis of differences in certain portions of the responses patterns associated with Cattell's Surface Traits. The analysis suggested that some good teachers differed from some poor teachers in as much as good teachers, more than poor teachers were prone to be gregarious, adventurous,
frivolous and more interested in opposite sex, as also to have above average emotional responses and strong artistic and sentimental interests. They were also likely to be more talkative, cheerful, placid, frank and quick, and tended to be more polished, cool and fastidious. Poor teachers on the other hand, were likely to be more cautious and unconventional and to lack emotional responses and artistic and sentimental interests. They had comparatively little interest in opposite sex and were clumsy, easily pleased and more attentive to people.


Using a composite rating derived from practice teaching grades, placement bureau ratings and the principals' ratings, Margaret Jones divided a group of teachers into good and poor teachers.

Her data gathering device consisted of numerous tests including Guilford-Zimmerman Temperament Survey Teachings.

Her data seemed to indicate that some characteristics were common to good and poor teachers, while other characteristics appeared to differentiate good and poor teachers. It appeared for example, that the degree of emotional stability was almost equal among good and poor teachers. Good teachers, however, seemed to be characterised by a preference for quickness of action and efficiency of production. They seemed to be more flexible in numerical abilities and disposition. Significant differences among good and poor teachers in academic ability were indicated. Good teachers in
Jones's study were superior to poor teachers in intelligence, knowledge of subject matter and professional knowledge. Good teachers were somewhat more sociable and dominant than poor teachers.


The first study of any magnitude designed to identify the behaviour pattern distinguishing effective from ineffective teacher was reported by Barr in 1929. Selection of good and poor teachers for this study was made on the basis of supervisory ratings and on the assumption that in the larger school systems the employing officers were more crucial in their selection of teachers and that the lower salaries of smaller systems attracted only poor teachers. The teaching techniques and class-room behaviour patterns of good and poor teachers, thus selected, were observed. General observation included a record of various kinds of materials and equipment in evidence in class room and a detailed record of observable teacher and pupil activities.

Barr found that good teachers as compared with poor teachers were more vigorous, more enthusiastic and happier, less attractive, more emotionally stable, more pleasant and sympathetic and displayed a keener sense of humour. More good teachers than poor teachers appeared not only themselves to be highly motivated but to have more highly motivated pupils also. Discipline appeared to be more or less, a problem in the class rooms of a majority of poor teachers, whereas no disciplinary situation were observed in the class rooms of good teachers. Good teachers asked fewer fact questions and more thought questions than did the poor teachers.
A number of behaviours were found to be common to good and poor teachers. For instance, Barr found both good and poor teachers tending to dominate class-room communication.


Jensen, like quite a few other researchers, employed the technique of critical incidents to determine the behaviour patterns of good and poor teachers. He collected reports from qualified persons - supervisors, teacher educators, student teachers, public school teachers and principals - and asked them to think of outstanding examples from actual experience of teacher competence and incompetence. The approach intentionally omitted those aspects of teaching which appeared to be carried out in an acceptable manner by practically all teachers. It included only those behaviours that seemed to differentiate effective from ineffective teachers.

The critical requirements were described in terms of specific observable behaviours and not in abstract terms with broad generalisations. From the reports he collected, Jensen formulated a set of critical behaviours that appeared to be associated with effective and ineffective teachers.

The critical behaviours were classified under three heads, viz. personal qualities, professional qualities and social qualities. Ample examples of effective and ineffective behaviours under each head have been mentioned in the report. It is indicated for instance that as individuals, effective teachers, as against ineffective teachers, were alert, cheerful, fair and impartial. They tended to exhibit self-control and graciously recognise
and admit their own mistakes. Effective teachers also seemed to like fun and possess a sense of humour.

In terms of professional qualities, effective teachers, unlike ineffective teachers, were able to stimulate pupils through interesting teaching techniques. They were clear and thorough in giving directions and could discipline pupils in a quiet, dignified, positive and fair manner. Good teachers were usually willing to help and guide us against poor teachers who either failed to give help or gave it grudgingly.

Socially good teachers were usually sympathetic, democratic and courteous while poor teachers lacked sympathy and were authoritarian and impolite. Good teachers, as contrasted with poor teachers, were also generous in praising and rewarding.

Kornriech (1969) investigated the acquisition of 'focussing strategy' for solving concept identification problems. In her study, three groups of students received different amount of information while solving twenty four concept identification problems. Discovery group was told nothing, guided discovery group was told every four problems that their approach was incorrect. Programmed instruction group was told one of the rules which defined the strategy every four problems. It was found that significantly more students in the guided discovery group acquired the strategy than in the other two groups. This study suggested that if the training of inquiring skills is systematically built into the teaching programme, a difference favouring the discovery method may well occur. Suchman (1964) also arrived at the same conclusion in his comparative study of inquiring training method
and traditional teacher-directed method for teaching the principles of physics.

Worthen (1968) conducted a study of discovery and expository presentations for teaching mathematical concepts. 432 students of the fifth and sixth grade from sixteen classes in eight elementary schools were involved in the study for an instructional period of six weeks. Prior knowledge of students was controlled by imparting pre-treatment instruction in pre-requisite mathematical concepts for a period of two months. Each teacher was thoroughly trained and was required to teach by each method which increased the extent of experimental control. Amount of verbalization in the teacher's presentation was controlled. The degree to which teachers adhered to the prescribed teaching methods in each treatment was assessed by a questionnaire administered to pupils and observer's rating scale rated by trained observers. All criterion tests were designed by the researcher and included both intellectual as well as attitude measures. Results were analysed by using a technique of analysis of covariance taking intelligence, arithmetic computation and arithmetic problem solving as constant covariates in the analysis of each dependant variable. Pretest scores were used as additional covariates in analysis of the post-test of each instrument administered in both the pre and post test series. Post-test scores on concept knowledge test were used as additional covariates in the analysis of the concept retention and concept transfer tests. The analysis showed that expository learning group was superior to discovery learning group on concept knowledge test administered immediately after instructional period; but on retention tests given after five and eleven weeks discovery group was found to be superior to expository group. There were no significant differences between the scores of
the two groups on transfer test and attitude scales. However, discovery group was found to be superior on both oral and written heuristic tests. Reanalysis of Worthen's data by Worthen and Collins (1971) however, suggested equal effectiveness of the two methods on all criterion measures.

Olander and Robertson (1973) studied the effectiveness of discovery and expository methods in fourth grade mathematics. 190 pupils were taught for thirty one weeks through discovery approach while another 184 used an expository approach. The thirteen teachers were rated on a scale measuring the degree to which each succeeded in using the method assigned. Results showed that subjects taught by expository method were significantly better in computation and subjects taught by discovery method were significantly better in retention of ability to apply mathematics. Subjects scoring lower on the pre-test on computation and application improved more under expository approach and those lower on concepts gained more under discovery approach. On principles and relationships the discovery subjects gained at a greater ratio through out the study.

Loower (1976) explored the differential effects of small group heuristics and expository learning in calculus. The investigator taught two intact classes, one by each method for one semester. In small group heuristic class students worked in groups of three or four to discover the ideas of calculus using instructional material containing questions for investigations. Exploration of concepts proceeded formation. The teacher acted as a consultant giving suggestions for solving problems only when asked. In the expository class the teacher acted as primary source of mathematical knowledge. Formation of concepts preceded exploration. Models of teacher behaviours were carefully prescribed for the two methods and teacher fidelity
to the prescribed models was measured by an inventory that recorded students' perception of the teacher behaviour with respect to models. Each of the evaluation instruments in the study was examined for its content validity and reliability. Measurements were made both immediately after instruction and one month later. Standard analysis of covariance indicated that after instruction there were no significant differences between the two classes on overall calculus achievement or the calculus achievement at the computation - comprehension or applicability analysis cognitive levels; on mathematical problem solving achievement; or on attitude towards mathematics or problem-solving. One month later the evidence again indicated no significant differences between the two classes on any of the calculus achievement measures but indicated significant difference favouring the expository class on problem-solving achievement.

The researcher has made an effort to find out the number of committees and conferences held in the world in order to improve secondary school mathematics education. References were collected from 'ICME IV' and 'Mathematics for All' which give us the desired information.

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