

Science Education

N. VAIDYA

Alexander, Benny, 1990. **A study of the relationship of critical thinking, science aptitude and socio-economic status to the science achievement of second year PUC students.** M.Phil., Edu. *Bangalore Univ.*

Problēm: The development of sound thinking is prized in any scheme of education anywhere in the world. The present study attempts to determine relationships among critical thinking, scientific aptitude and socio-economic status to achievement in science as measured by marks obtained by PUC students.

Objectives: (i) To see whether significant differences in the SES, critical thinking, science aptitude of the second year PUC students would account for significant differences in their science achievement, (ii) to see whether there is a significant difference in the science achievement of male and female second year PUC students, (iii) to examine whether SES, critical thinking and science aptitude of the second year PUC students would correlate significantly with their science achievement, (iv) to find out the amount of variance accounted for by each of the variables namely, SES, critical thinking and science aptitude of the second year PUC students in their science achievement, (v) to find out the amount of variance accounted for by all the predictors put together in the science achievement of the second year PUC students, and (vi) to develop regression equation that would help in promoting

the science achievement levels of the second year PUC students.

Methodology: The sample of the study comprised 400 second year PUC science students studying in Bangalore, who were selected using stratified proportional random sampling technique from 13 colleges, viz. government, corporation and private. The tools used in the study included Scientific Aptitude and Scientific Knowledge Test by Chatterjee, Kerala Cognitive Reasoning Test Series developed by the Kerala University, Socio-economic Status Urban Scale by Kuppaswamy and science achievement marks were drawn from PUC students' public examination. The data so collected were analysed by two-way ANOVA and multiple regression techniques.

Major Findings: (1) High scores on critical thinking, scientific achievement and socio-economic status favoured achievement in science. (2) The three predictors, namely, scientific aptitude, critical thinking and socio-economic status contributed a variance of 15.4%, 8% and 5.36% to the total variance in achievement, respectively. (3) Sex differences in achievement in science favouring males existed. (4) No significant interaction effect between each of the independent predictors taken separately favoured achievement in science. [MKh 0312].

Anwar, G. 1991. **A study of the effect of short-term content enrichment programme to**

overcome the deficiencies of trainees in science subjects in TCH course. Ph.D. Edu. *Univ. of Mysore.*

Problem: This study addresses the problem of evaluation of a short-term content enrichment programme of trainees in science subjects in TCH course.

Objective: To improve the content competencies of TCH trainees in science subjects, with the help of a short-term content enrichment programme.

Methodology: A sample of 160 student-teachers were drawn randomly from five Teacher Training Institutes of Mysore City. The student-teachers were divided into experimental and control groups. Tools used in the study included Diagnostic Achievement Test and Content Enrichment Programme in General Science. The collected data were analysed statistically using analysis of covariance.

Major Findings: (1) There was no significant difference among the experimental and control groups in the content competence in general science before the enrichment programme. (2) There was a significant difference between the experimental and control groups in the content competencies in general science after the enrichment programme. (3) There was no significant difference between the variables—sex, institution, location and SES of student-teachers in the learning of science subjects. (4) There was no significant difference between experimental and control groups in the learning of science subjects in practice teaching before the enrichment programme. (5) There was a significant difference between the experimental and control groups in the learning of science subjects and in practice teaching after the enrichment programme. [BNS 0970]

Aranha, Joyce. 1988. **An experiment in mastery learning in science.** Ph.D., Edu. *The Maharaja Sayajirao Univ. of Baroda.*

Problem: The present study focuses upon the problem of developing a mastery learning strategy (MLS) in science and examines the relationship between pupils' characteristics and their achievement through the strategy.

Objectives: (i) To develop a mastery learning strategy in science for Class V, (ii) to find out the change in academic motivation and study habits of the pupils due to the strategy, and (iii) to find out the relationship between a set of pupil characteristics and their achievement through mastery learning strategy.

Methodology: The sample of the study comprised 58 slow learners studying in Class V, who were selected through cluster sampling procedure. The tools used to collect the data included Shah's Non-verbal Group Test of Intelligence, Jack Frymier's Motivation Scale and Writing Comprehension Test, and Study Habit Inventory developed by the investigator. Correlations were used to analyse the data.

Major Findings: (1) Within the context of mastery learning strategy, it was observed that pupils achieved higher scores on final tests in each of the five units. They also improved in academic motivation and self-concept but with no improvement in their study habits. (2) Pupils liked the learning activities and it reduced rote learning. (3) The MLS generated group cooperation rather than competition while learning. (4) In MLS, the teacher's involvement was much more and this affected the pupil's initiative to learn, learning process and learning outcomes for the better. (5) There was no significant relation between pupil's IQ, study habits and language ability and achievement on MLS and non-MLS. [MSY 0914]

Awasthi, V. 1989. **Developing training strategy for science teaching by using Concept Attainment Model.** Ph.D. Edu., *Devi Ahilya Vishwavidyalaya.*

Problem: This study aims at developing

training strategies in science teaching, using concept attainment model.

Objectives: (i) To develop training strategies in teaching science concepts through the concept attainment model, and (ii) to study the relative effectiveness of the two training strategies, namely continuous demonstration, with pair practice (CDP Practice) and Intermittent demonstration, with quardo practice (IDQ Practice) in terms of selected criteria, viz. understanding the theory of concept attainment model, teaching competency, pupils' reaction, pupils' achievement in science concepts and willingness of the trainees to implement the model in school.

Methodology: The sample of the study comprised 22 B.Ed. science and home science trainees in two groups and 162 Grade IX pupils of Indore. The study was conducted in two phases, that is, college-based laboratory phase and the school-based coaching phase. Pre-test and post-test design was used in the study. The treatment given to the two experimental groups comprised orientation to the concept attainment model, lesson plan guide and teaching analysis guide through lectures and discussions. They were also trained through CDP and IDQP techniques, respectively. The tools used for the collection of data during the two phases of the experiment were Bruce Theory Check-up, Indore Theory Check-up, Teaching Analysis Guide, Reaction Scale and Willingness Scale, Concept-based Achievement Test in Science and Pupils' Reaction Scale. ANOVA and 't' test were used for the analysis of data.

Major Findings: (1) The study indicated that the said training techniques were equally effective in regard to the understanding of the concept attainment model. (2) The IDQP practice group was superior to the CDP group as judged by the teaching competency score. (3) The teaching competence scores of the two groups at the school stage were significantly higher than the ones obtained by them at the end of the laboratory phase. [PKS 0654]

Aziz, Talat. 1990. **A study of the comparative**

effectiveness of the information processing models of teaching in developing certain concepts in chemistry at the secondary stage.

Ph.D. Edu., *Jamia Millia Islamia.*

Problem: It is said day in and day out that teaching of science should be approached conceptually rather than factually. If agreed, it is not a far-fetched goal to strengthen the information processing capacities of children at all levels of education regardless of any school subject. Under this backdrop the present study tries to compare the effectiveness of the information processing models of teaching in developing certain concepts in chemistry at the secondary stage.

Objectives: (i) To develop teaching programmes in specified content areas in chemistry to teach inductively through concept attainment and inductive thinking models, and (ii) to compare the teaching programme based on information processing models with the traditional teaching programme in chemistry with regard to the concept attainment model.

Methodology: The sample comprised 280 students of Class IX selected randomly from the schools of Delhi. It was, however, seen that the students were divided into the control group and experimental group. The tools of the study included an achievement test in chemistry developed by the investigator and the group test of General Mental Ability by S.S. Jalota. The collected data were analysed by analysis of covariance technique (ANCOVA).

Major Findings: (1) It was observed that the pupils exposed to the teaching programme based on information processing model of teaching performed significantly better than the pupils taught through the traditional lecture method. (2) Chemistry could be effectively taught through the model approach. (3) Models approach of teaching was better than the traditional approach of teaching. (4) Concept attainment model and inductive thinking model were effective for teaching science concepts. (5) Thinking could be

taught if appropriate teaching strategies were used as suggested by Taba. (6) Bruner's concept attainment model was effective for attainment of concepts. (7) Mental abilities of the students had no bars on the concept attainment so far as the students of higher average mental ability were concerned. (8) Both information processing models were found superior to the traditional approach for teaching concept-based chemistry. [SPR 0605]

Begum, Khatija H. 1990. **Problems of teaching new science syllabus for Standard VII in Andhra Pradesh and their impact on pupils' achievement.** Ph.D., Edu. Sri Venkateswara Univ.

Problem: The present study is aimed at examining the impact of different problems that the teachers were facing in teaching new science syllabus on the achievement levels of pupils. Hence this study also meant to reveal the impact of certain curricular problems on pupils' achievement in teaching the new syllabus.

Objectives: (i) To examine the difficulty level and suitability level of all lessons and exercise included in the new science syllabus as perceived by science teachers, (ii) to examine the problems involved in the implementation of the students' activities suggested in the new science textbook and the problems therein, (iii) to examine the problems faced by teachers about the content and teaching methods in the in-service training programmes, (iv) to study the nature of execution of the exercises faced by teachers within the context of content, teaching methods, audio-visual aids, suggested pupil activities, level of achievement, and (v) to suggest measures which would improve the quality of science teaching.

Methodology: Using a multi-stage stratified random sampling technique, a final sample of 300 teachers and 1,500 students was selected from three regions representing Andhra Pradesh. Questionnaires, check-lists and achievement tests were used for data collection. Data so

collected were analysed using percentages, chi-square, 't' test, analysis of variance and Kramer's test.

Major Findings: (1) More than 60% of the teachers found the content in the recent syllabus, new as well as overloaded. (2) Dictation of notes by teachers was the dominant method of getting exercises done by the students. (3) Lack of facilities for science teaching continued to bother teachers a lot. (4) It was observed that achievement in science favoured significantly those students, whose teachers had attended an in-service education programme. (5) It is proposed that school conditions need to be improved through, say supply of science kits and handbooks for teachers so that pupils may participate in the teaching-learning process by practising processes of science such as classifying, inquiring and experimenting, etc. [PVD 0121]

Bhattacharya, Madhumita. 1989. **A critical review of work done on the use of computer as an instructional tool for teaching chemistry.** M.Phil., Edu., Univ. of Delhi.

Problem: This study tries to evaluate the status of teaching of chemistry with the help of computers.

Objective: To aim at developing tools for evaluating the effectiveness of available software in chemistry, along with suggestions in regard to the development of software in other areas of chemistry which are likely to be included in the curriculum.

Methodology: An extensive study was conducted by the researcher on the use of computer as an instructional material for teaching chemistry. A questionnaire was also used.

Major Findings: (1) The available software in chemistry were of good quality. However, background knowledge was inferred in most of the chemistry software. (2) It was not always possible to maintain the sequence of content,

especially in games. (3) Most of the available software adopted lecture-cum-demonstration method in a class of 20-40 minutes. (4) Most of the software contained knowledge and discovery levels of teaching but they lacked in reflective level. (5) Computer-assisted instruction could be applied most effectively to an individual or to small groups. (6) The majority of the softwares could be used for concept development. (7) The softwares that have been selected for classroom teaching mainly provided simulation of a real situation thereby assisting students in long-term retention. Most of these softwares were in the tutorial mode. (8) The students got proper feedback. (9) Technical quality of the majority of softwares were satisfactory. The majority of the softwares can be used for concept development. [RDM 0360]

Cheriyian, Molley. 1988. **Facilitations and hindrances to the modernisation of chemistry teaching in the schools of Kerala.** Ph.D., Edu. Univ. of Kerala.

Problem: The study addresses the conceptual and attitudinal aspects of modernisation of chemistry teaching and identifies the modernisation of chemistry teaching in the schools of Kerala.

Objectives: (i) To find out the perceptions of modernisation of the participants in education in Kerala, (ii) to measure the quantum of curricular upgradation and quality of conceptual processing in chemistry textbooks, and (iii) to identify the major facilities and hindrances in the modernisation of chemistry teaching.

Methodology: The sample comprised 69 experts, 42 students and 91 teachers for measurement of attitude; 240 teachers for identification of facilities and hindrances in the modernisation of chemistry teaching; and finally, 123 experts for curricular item validation. Tools and techniques used in this study were: a multi-dimensional frame for textbook analysis, Attitude

Scale towards Modernisation, Schedule to measure Conceptual Dimensions of Modernisation, Questionnaire for information on facilitations and hindrances, and Curricular Item Rating Scale. The data so collected were analysed using percentages, mean, standard deviation, 't' test, correlation and critical ratio.

Major Findings: (1) There was a gap of a decade between the introduction of modern concepts in chemistry and the corresponding modern pedagogical approaches. (2) The overall attitude to the modernisation of science was favourable. (3) The correlation between age and attitude was positive for teachers and negative in the case of experts. (4) Workshops and in-service education programmes organised by the department of education received the topmost rating within the context of modernisation of chemistry teaching. (5) Several facilitating and hindering factors were identified which related mainly to the administrative aspects. [VR 1658]

Darchingpui. 1989. **A study of science achievement, science attitude and problem-solving ability among secondary school students in Aizawal.** Ph.D., Edu. North-Eastern Hill Univ.

Problem: This study examines the relationships among variables such as achievement in science, attitudes towards science and problem-solving ability under certain conditions such as location, socio-economic status, parental education, occupation and typology of school among secondary school children.

Objectives: (i) To study the science achievement, attitude towards science and problem-solving ability of high school students, (ii) to find the interrelationships of science achievement, attitude towards science vis-a-vis problem-solving ability, and (iii) to examine the relative effect of sex, socio-economic status, parental education, parental occupation, family facility, and type of school on science

achievement, science attitude and problem-solving ability.

Methodology: The study sample comprised 812 students of Class IX selected randomly after giving weightage to outside factors such as location and typology of school attended. The tools used to collect the data were the Science Test developed by the investigator, the Science Attitude Scale developed by Grewal, and Problem-Solving Ability Test developed by the investigator.

Major Findings: (1) The study indicated significant relationships between scores on scientific attitude and achievement in science. (2) Significant sex differences in achievement in science and problem-solving ability existed. (3) High socio-economic status, family facility and type of school attended favoured achievement in sciences, scientific attitudes and problem-solving ability. [PPG 0180].

Deshmukh, A.L. 1991. **Science education as a means of social change with special respect to health and hygienic habits.** Ph.D., Edu. Univ. of Poona.

Problem: The study evaluates a specially prepared programme related to health and hygiene habits of elementary school children for bringing about a change in them.

Objectives: (i) To find out to what extent the objectives of science education related to health and hygiene were realised, (ii) to find out the difficulties faced by the families in developing appropriate health habits, (iii) to find out the difficulties faced by the teachers in developing appropriate health habits among pupils, (iv) to prepare a programme for modifying existing health habits of students, and (v) to examine how far students are able to transfer the ideas and principles of health habits to their homes.

Methodology: In this study, a survey of 368 students from Standards I-IV and 482 students from Standards V-VII were taken. For the experiment, the study sample comprised

160 students taken at random from 16 different schools situated in different localities classified as slum, moderate, better and rural. One hundred and four parents were also interviewed. The tools used for the collection of data were check-up sheets, family health cards and observation schedules and check-lists specially developed by the investigator.

Major Findings: (1) Using pre-test post-test control group experimental design, the programme so developed was found to be effective as judged by gains in scores favouring the experimental groups. (2) However, it was noticed that there were some serious difficulties such as loaded curriculum, lack of physical amenities and time, ignorance of parents and failure to practice by the students in their homes what they had otherwise understood in the classroom. [KC 0082]

✓ Dubey, K.K. 1992. **A study of the scientific temper and its measurement.** Ph.D., Edu. Rani Durgavati Vishwavidyalaya.

Problem: Whereas the measurement of scientific temper is a real problem, its development is regarded as one of the most important goals of school science education. The present study attempts at the measurement of scientific temper.

Objectives: (i) To develop a scale for measuring scientific temper along with its appropriate working definition and determination of its ingredients using factor analysis, and (ii) to compare the incidence of scientific temper as judged by scores on the scientific temper test among different groups of teachers and students, such as male and female, urban and rural and science and non-science students as well as teachers.

Methodology: A two-stage stratified sampling method was adopted to select Class XI science and non-science students. It also included two groups of teachers, i.e. science and non-science

teachers. The scientific temper scale devised on the Likert method of summated ratings was used to collect the data.

Major Findings: (1) All the groups of students and teachers manifested scientific temper. (2) Significant differences in scientific temper were noticed between male science teachers and male non-science teachers; female teachers and male teachers, rural girls and urban girls, urban boys and urban girls and finally, male science students and female science students. (3) No significant differences appeared between female science and non-science teachers as well as science students and non-science students. (4) The mathematical structure of tools and tasks as used in this study showed the existence of two factors, namely, curiosity and aversion to superstitions. [NNS 0741]

Durani, P.K. and Sarma, A.L.N. 1982. **Know the life between tide marks.** Independent study. Bhubaneswar: Regional College of Education. (ERIC Funded)

Problem: The study attempts to engender information for the preparation of suitable software (natural history notes, field guides, case study documents, pictorial monographs, instructional materials, training manuals, supplementary readings, etc.) for creating interest and awareness about the puzzling diversity of life thriving in the inter-tidal regions of the Indian seas.

Objectives: (i) To stimulate interest and inculcate environmental awareness regarding the long coastline of the country, (ii) to introduce and institutionalise marine science education in the formal school system, (iii) to undertake a baseline survey of the easily accessible seashores of varied nature, (iv) to collect, identify and catalogue various organisms inhabiting the seashores, and (v) to prepare case study documents.

Methodology: The shores of Visakhapatnam coast, sandy and muddy shores of Godavary,

Estuary, sandy shores of Paradeep, sandy and muddy shores of Chandipur and dynamic fluctuating brackish water environment of the Chilka Lagoon formed the study area for survey and surveillance of the seashore life besides undertaking case studies on the hydrobiology of the pelagic and benthic biots. Standard scientific feasible methods of collection, namely quadrat and litre jars, for phytal and corers, dredge and grab for sedimentary fauna and two nets of bolting silk/organdi veil, plankton collection, preservation, sorting, identification and enumeration were employed in the biological sampling and studies.

Major Findings: (1) The survey brought to light as many as 153 faunal species belonging to all the major invertebrate phyla besides 23 algal species. (2) The case studies brought to light 57 phytal faunal species, 50 meiobenthic harpacticoid copepods and 32 planktonic calanoid copepods besides a large number of undetermined species which eventually turned out to be new to science. [MSG1874]

Ekpo, Johnson. 1991. **Chemistry laboratory safety skills and practices: Students' self-evaluation in selected secondary schools in Akwa, Ibom State.** *Indian Educational Review*, Vol. 26(2): 107-15.

Problem: It aims at assessing safety skills and practices in chemistry as perceived by senior secondary and secondary students in Nigeria.

Objectives: (i) To assess the chemistry laboratory safety skills by students, and (ii) to assess the chemistry laboratory safety practices adopted by students.

Methodology: The sample of the study comprised 300 senior secondary students from 30 randomly selected secondary schools in Akwa, Ibom State. A questionnaire was formulated and administered in this study. The collected data were analysed statistically using percentages and means.

Major Findings: (1) The study indicated that more than 70% students failed to protect their eyes, face, hands and even their body too. (2) They did not wear aprons and gloves while engaged in chemical experimentation. (3) They had poor knowledge about identified emergency facilities and equipment. (4) It also revealed evidence of poor experimental techniques. [SPR 1503]

Ghose, A.M. 1990. **Investigation on non-formal science education and development of inexpensive resource materials.** Independent study. *Visiting Scientist, Calcutta.* [ERIC Funded]

Problem: It is an unusual study which, generally speaking, addressed itself to the formation of suitable guidelines for the development of projects including designing of experiments along with inexpensive resource materials in the area of non-formal education for the benefit of rural and urban pupils drawn essentially from disadvantaged groups who had no possibility of exposure to further formal education. It is a composite project on nutrition, environment and health.

Objective: To develop a programme and investigate some topics such as nutrition (inexpensive balanced diet), use of water hyacinth as a plant growth promoter, and the physical properties of wood.

Methodology: The target group chosen for participation in these studies were selected essentially from socially disadvantaged groups who had little or no possibility of being exposed to further formal education. Both urban and rural participants were involved in the project. The tools used to collect the data included a questionnaire and district health records. The collected data were treated qualitatively and quantitatively.

Major Findings: (1) The study revealed that several participants were actually utilising their knowledge in the preparation of daily food of the family even several months after the termination

of the programme. (2) It was found that the growth rate increased for leafy vegetables, varying from marginal to 30% depending on the type of plants and the extract used. It also established the general methodology of basic agricultural studies. (3) It was found that traditional methods which emphasised familiarity gained through practices was in no way inferior to the methods proposed in the project. On the other hand, persuasion of scientific methods of structural industries at a still higher level would be only rarely needed in actual practice and this did not encourage enthusiastic participation in the programme. (4) A positive correlation was established between the onset of pulmonary diseases and the presence of nitrous fumes among workers in jewellery manufacturing shops. However, the remedies suggested were not acceptable because they hampered production. [VKR1179]

✓ Ghosh, Shibani. 1989. **A critical study of scientific attitude and aptitude of the students and determination of some determinants of scientific attitude.** Ph.D., *Edu. Univ. of Kalyani.*

Problem: The present study attempts to draw the attention of science educators to the concept of 'scientific literacy' and 'scientific enquiry' in the teaching of science and help them with scientific aptitude test and a scientific attitude test for facilitating their job.

Objectives: (i) To find out the extent of academic motivation of the students, sex and strata-wise differences in scientific attitude and aptitude, if any, and (ii) to find out the relation between scientific aptitude, the above stated independent variables and a regression equation of the scientific aptitude on other independent variables.

Methodology: The sample of the study comprised 613 students drawn from 13 schools belonging to different localities; rural-urban, boys schools, girls schools and co-educational schools. The tools used were Scientific Attitude Test, Scientific Aptitude Test, Academic

Motivation Test by Bhattacharya, and Socio-economic Status Scale of Kuppaswami along with structured interview. Correlation, ANOVA and regression analysis were employed to treat the collected data.

Major Findings: (1) It was found that scientific aptitude was significantly related to scientific attitude and academic motivation. (2) No significant difference was observed with respect to sex, socio-economic conditions or place of habitation. [PDR 0637]

Goel, V.P. and Agbebi, E.A. 1990. **Learning physics through lecture-demonstration method (LDM) and individualised instruction method (II).** *Indian Educational Review*, Vol. 25 (4): 84-89.

Problem: The study has attempted to compare the relative effectiveness of the individualised method and the lecture-demonstration method of laboratory instruction on student acquisition of psychomotor and related cognitive skills when the specific behavioural objectives of five physics experiment in the subject area of light were predisposed to students before instruction.

Objective: To compare the relative effectiveness of the individualised method and lecture-demonstration method on acquisition of psychomotor and related cognitive skills among female pupils.

Methodology: Forty-four female Nigerian students studying in Class V whose age ranged from 15 years constituted the sample of the study. The data were collected with the help of an earlier validated tool developed by Goel on Indian students. Mean, SD, 't' test and analysis of variance were used to analyse the collected data.

Major Findings: (1) A significant difference was observed between the groups which followed the individual laboratory method and the lecture demonstration method. (2) The group of students following the individual laboratory method

achieved significantly better on the psychomotor skills than did the lecture-demonstration group. (3) Students who followed the lecture demonstration method achieved at a higher level related cognitive skills than did the group of students which followed the individual laboratory method. [SPR 1464]

Grewal, Avinash. 1988. **Developing, validating and testing the efficacy of self-learning process-based material for the development of some integrated processes in science.** Independent study. *Bhopal: Regional College of Education.* (ERIC Funded)

Problem: A process approach to science teaching acquires prominence which shifts the focus of teaching-learning process to the acquisition of scientific capabilities rather than the transmission of scientific information mechanically. The present study focuses on the need to organise learning experiences in such a manner where learners are exposed to the basic and integrated skills required in dealing with the scientific knowledge.

Objective: To develop and test the efficacy of auto-learning process-based materials for the development of integrated processes of science such as classifying, inferring, interpreting, predicting, hypothesis making and testing.

Methodology: The sample of the study initially comprised 390 higher secondary students from four higher secondary schools of Bihar City, which was reduced finally to 77. Collected data were treated with mean, standard deviation, 't' test and product-moment correlation.

Major Findings: (1) After observing the six processes, it was found that the processes of prediction and interpretation were hardly found in teaching. More commonly used processes were inferring and classifying. (2) The relationship between the sub-groups were found to be significant. (3) The correlations between subscores and the rest of the processes confirmed the validity of the test constructed. [SRA 1109]

Gurumurthy, C. 1990. **A comparative study of the effectiveness of guided discovery approach of doing physics experiments versus Instructed Performance Approach at pre-university level.** Ph.D., Edu. Univ. of Mysore.

Problem: The present study tries to compare the effectiveness of a guided discovery approach of carrying out physics experiments versus instructed performance approach at pre-university level.

Objectives: (i) To compare the effectiveness of carrying out physics experiments by the guided discovery approach vis-a-vis the instructional performance approach, (ii) to study the effect of guided discovery approach and instructed performance approach in terms of knowledge, understanding and application of concepts, principles and facts; practical skills and creative abilities such as fluency, flexibility and originality, and (iii) to study the relative effect of guided discovery approach and instructed performance approach on the performance of pre-university science students, between boys and girls, high and low intelligence levels and finally, high and low socio-economic status.

Methodology: A total number of 92 pre-university students consisting of 66 boys and 26 girls were drawn from two local colleges. They were classified into two groups, experimental and control; and were further matched on achievement, intelligence and socio-economic status. The tools used to collect the data included Achievement Test, Intelligence Test, Socio-economic Status Scale, Skill Test (individual and group), and Creativity Test. Central tendencies, standard deviation, 'F' ratio correlation coefficient, Bartlett test of homogeneity and 't' test were used for analysis of data.

Major Findings: (1) Significant differences were observed between the students of the Guided Discovery Group (GDG) and Instructed Performance Group (IPG) in the mean scores of (a) comprehensive achievement and its components such as knowledge, understanding and

application, and (b) practical skill abilities. (2) No significant differences were present between the GDG and the IPG of the mean scores of comprehensive creativity and its components such as frequency, flexibility and originality. (3) No significant differences were present between pre-creativity and post-creativity test scores in GDG or in IPG. (4) Significant difference between mean scores were observed between the GDG and IPG with respect to their performance in post-achievement test and skill test between the different sub-groups—intelligence levels, SES levels and sex. (5) When the students were classified according to their sub-groups—intelligence, SES and sex—the performance of GDG students was found to be better than that of IPG students on post-achievement and skill test. (6) The effect of GD approach was found to be equally good for high and low intelligent boys and girls, in the performance of past achievement test. (7) No significant mean difference was observed between the GDG and IPG with respect to their performance in post-creativity test (between the different sub-groups). [BNS 0971]

Javlekar, V.D. 1988. **An investigation into the problem of evaluation of the educational importance of exhibits of Nehru Science Centre, Bombay, and its effectiveness in making children of Standard VIII understand scientific concepts.** Ph.D., Edu. Univ., of Bombay.

Problem: It attempts to study and evaluate the effectiveness of exhibits in the context of teaching scientific concepts to secondary school children.

Objectives: (i) To examine the effectiveness of a participatory exhibit in conveying the scientific concept, (ii) to assess the instructional value of the exhibit, (iii) to assess the general effect of socio-economic background of children on learning through this technique, and (iv) to assess the appropriateness of the exhibit from the viewpoint of label, length of label and nature of exhibit.

Methodology: The investigation comprised a pilot study and a final run. In the first phase, 50 students were randomly assigned to four different experimental conditions. The final phase followed the pre-test post-test control group design where 190 students were randomly assigned to the experimental and control groups. Regarding exhibits, five were passive, 62 were active and the remaining seven were interactive. Whereas the control group was taught traditionally using blackboard and demonstration, the experimental group was taught through exhibits. The pre-test and post-test means were compared.

Major Findings: (1) Participatory museum displays helped in conveying scientific concepts more effectively than the other methods. (2) The instructional power of interactive exhibits was found to be greater than that of active exhibits, though the degree of learning was limited. (3) Interestingly enough, the socio-economic status of students did not affect learning through exhibits. (4) No uniform pattern for locating the text of the label was discovered. [GJK 0227]

Joshi, P.K. 1989. **Acquisition of chemistry concepts as related to the variables of educational environment.** Ph.D., Edu. Hemvati Nandan Bahuguna Garhwal Univ.

Problem: It attempts to study the acquisition of chemistry concepts as related to the variables of educational environment.

Objectives: (i) To find out the relationship between the variables of educational environment (related to student, teacher, home and school) and the acquisition of chemistry concepts, and (ii) to find out how far these variables contribute to the prediction of achievement on the chemistry concepts test.

Methodology: The study samples varied within the context of various stages of standardisation and for the final study, 470 Grade X pupils were drawn through stratified random sampling from 15 English medium schools in Dehradun and Mussoorie in U.P.

affiliated to the Central Board of Secondary Education (CBSE). Teacher and School Proforma, and Chemistry Concept Test and School Characteristics Index were prepared and standardised by the investigator. Raven's Standard Progressive Matrices, Kuppuswamy's Socio-economic Status Scale, and Teacher Attitude Scale by Grewal, were the tools used for the collection of data. Data analysis for the final study involved descriptive statistics, correlation, factor analysis and multiple regression analysis.

Major Findings: (1) Intelligence and socio-economic status of the parents were significantly as well as positively correlated with acquisition of chemistry concepts. (2) Variables related to teachers (length of teaching experience and teacher attitude index, etc.) had a significant bearing on the performance of students on the chemistry concept test. (3) In a multivariate analysis, it was seen that whereas the curricular and co-curricular were good predictors of criterion variance, other processes like those of classroom interaction, administrative and tradition were not. (4) Student teacher ratio, class size and total enrolment in school had a negative influence on the acquisition of chemistry concepts. (5) All the five categories of school characteristics, when seen independently, were significantly related to the acquisition of chemistry concept. [KBB 1801]

Kar, D.K. 1990. **A study of relationship between attitude towards and achievement in general science of Class IX students of Cuttack city.** Ph.D., Edu. Utkal Univ.

Problem: The study examines the problem of relationship between attitude and achievement in general science of Class IX students.

Objective: To assess the relationship between the attitude and achievement in general science of Class IX students of Cuttack City.

Methodology: The sample of the study comprised 700 students studying in Class X from 10 high schools of Cuttack City, and also included

74 science teachers and some science experts, professors, educationists, and headmasters of the schools, who were selected through random stratified sampling method. The tools used to collect the data were Questionnaire, Interview Schedule, Achievement Test in Science and Attitude Scale. The collected data were analysed statistically using measures of central tendency, variability, and correlation coefficient.

Major Findings: (1) It was found that the distribution of the attitude score was negatively skewed. (2) Boys were found to be more favourably disposed towards science than girls. (3) There was positive relationship between attitude and achievement. [KCP 0442]

Kayathri Alias Usha, S. 1989. **An investigation into the effectiveness of Jerry Luca's Memory Model in learning botany.** M. Phil., Edu. Alagappa Univ.

Problem: The present study tries to investigate the effectiveness of Jerry Luca's Memory Model in learning certain topics such as cytology and taxonomy in botany at +1 level.

Objectives: (i) To develop and test the effectiveness of memory training model in studying botany along the lines of Jerry Luca's Memory Model, and (ii) to assess the effectiveness of this memory training model in improving the achievement of students in botany and also the effectiveness of Luca's memory training model over the traditional memory training techniques.

Methodology: The sample of the study comprised 60 students both boys and girls (N=30, B=22, G=8) who were assigned for the experimental and control groups studying science in Dr Alagappa Model Higher Secondary School of Karaikudi. They were matched on age, sex, socio-economic status, study habits, IQ measure and achievement. The data were analysed using statistical techniques such as mean, SDs. and 't' test.

Major Findings: (1) It was found that training

through Jerry Luca's Memory Model positively influenced retention of what was learnt in cytology and taxonomy in botany. (2) Students who had been trained through Jerry Luca's Memory Training Model differed significantly in their achievement in botany from those students who had been trained through the traditional memory training techniques. [SM 1733]

Kumar, Udaya Sam. 1991. **The teaching of general science and the development of scientific attitude in secondary school students in relation to achievement in general science.** M.Phil., Edu. Annamalai Univ.

Problem: The study attempts to examine the teaching of general science and the development of scientific attitude of secondary school students in Cuddalore educational district in relation to achievement in general science.

Objectives: (i) To find out the extent of scientific attitude of the secondary school students, (ii) to find out whether there was any significant difference in the perception of teaching science and scientific attitudes of pupils of low effective group, high effective group and average effective group, and (iii) to find out the nature of relationship between the scientific attitudes and achievement of the secondary school students in general science.

Methodology: The sample of the study comprised 402 students drawn at random from eight different schools in Cuddalore educational district of Tamil Nadu. The tools used in the study included the Scientific Attitude Test (SAT) by F.M. Phateed and Pupil's Perception of Teaching Science constructed by the researcher. Mean, standard deviation, 't' test, correlation, and chi-square tests were used for interpreting the collected data.

Major Findings: (1) It was observed that there was a significant difference between the mean scores of boys in the average effective group in respect of perception of teaching of science.

(2) The urban and rural pupils of average group differed in respect of perception of teaching of science. (3) There was no significant difference between the mean scores of scientific attitude of secondary school students of boys and girls in the high effective group in respect of perception of teaching science. (4) There was no significant difference between the mean scores of perception of teaching of pupils of urban and rural areas in the high group. (5) The scientific attitude test scores of boys and girls of the average group differed significantly and there was no significant difference between the means of scientific attitude test scores of the pupils of urban and rural areas of the average group. (6) The mean scores of the scientific attitude test of boys and girls did not differ significantly in the high group and the mean scores of the scientific attitude test of the pupils of urban and rural areas in the high group differed significantly. (7) There existed a relationship between urban boys and urban girls in scientific attitude test scores. (8) The science test scores of urban boys and urban girls were positively correlated. (9) The means of boys and girls in low group did not differ significantly in respect of scientific attitudes. (10) There was a significant difference between the means of the boys and girls in the low group in respect of perception of teaching of science. (11) There was a significant difference between the means of the pupils of urban and rural areas in the low group in respect of perception of teaching of science. [MDa 1401]

Kumari, Meena Shashikala G. 1991. **Effect of intelligence, achievement (biology) and extraversion on the questioning ability of Standard IX pupils in biology.** M.Phil., Edu. Bangalore Univ.

Problem: The study analyses the effect of intelligence, achievement and extraversion on the questioning ability of Standard IX pupils in biology.

Objectives: (i) To find out the difference in the total number and level, knowledge, comprehen-

sion, application of questions asked by male and female students, (ii) to find out the effects of extraversion, teaching competency and intelligence on the number and level of questions asked by the students, (iii) to find out the differences in the number and level of questions asked by students from different levels of achievement, and (iv) to ascertain the joint effects of sex and achievement, sex and teacher competency and sex and extraversion on the number and level of questions asked by students.

Methodology: The sample comprised 152 pupils (78 males and 74 females) studying in Standard IX who were randomly selected and identified at four levels of teaching competency in biology. The tools administered in the study were Otis Self Administering Test of Mental Ability, Eysenck Personality Inventory (extraversion dimension), and Indore Teaching Competency Scale. The collected data were treated qualitatively.

Major Findings: (1) It was observed that intelligence, achievement in biology and extraversion had a significant effect on the number and level of questions asked by the students. (2) Sex had a significant effect on the number and level of questions asked. (3) Level of teaching competence had a significant effect on the number and level of questions asked by students. (4) Boys who were high on intelligence and extraversion asked significantly more questions than girls and also asked significantly more higher level questions than girls. [MKh 0314]

Lehri, G.K. 1988. **A study of life in fresh water leading to preparation of teachers' handbook on fresh water biology.** Independent study. Bhopal: Regional College of Education. [ERIC Funded]

Problem: It is an attempt to examine fresh water biology leading to a teaching handbook, through introductory studies about major aspects of fresh water bodies—physio-chemical

and biological parameters of lakes, interdependence of various phytoplankton, zooplankton, macrovegetation and fish. The study also discusses some of the local examples which can easily be followed by students and can also be used as a handbook for fresh water.

Objectives: (1) To conduct a fundamental ecological survey of three lakes of Bhopal to assess the (a) morphometrical characteristics, (b) physical characteristics, and (c) chemical characteristics, (ii) to collect, identify and study the preservation of local animals and plants found in these fresh-water lakes and their systematic position. (iii) to study the population at different levels of the water body, (iv) to study the interaction of abiotic and biotic components in the lakes, and (v) to study the productivity of lakes.

Methodology: In this study, three lakes, i.e. the upper lake, the lower lake and the Chuna lake, have been chosen for observation. Water samples from each of these were collected every month and analysed for different aspects of the study, i.e. biological, chemical, etc. The tools used in the study included physico-chemical characteristics of water, hydrogen ion concentration, turbidity, alkalinity, hardness types, presence of chlorides, nitrates, dissolved oxygen level in water, biological oxygen demand, phosphate, total solids, suspended solids, and dissolved solids.

Major Findings: (1) The researcher has identified the three species, i.e. phytoplankton species, zooplankton species, and a list of fish observed. (2) It was observed that chlorophyceae covered 34 species of chlorococcales, three species of desmidiiales, five species of cyanophyceae and under bacillariophyceae two species of centrales and four species of pennales. (3) The zooplankton covered 22 species of zooplankton, seven species of aquatic bigs and nine species of benthos. (4) The researcher observed 30 types of fish. [CGVM 1131]

Makkar, S.L. 1991. **Education and scientific research in Japan.** *Indian Educational Review*, Vol. 26 (2): 96-101.

Problem: This study records factual information in regard to educational facilities at various levels of education in Japan.

Objective: To provide information regarding educational facilities at various levels of education in Japan.

Methodology: The researcher studied the education system of Japan as it exists and presented the picture.

Major Findings: (1) Whereas formal education begins at 6+, it is compulsory for nine years, the pattern of education being 6+3+3. (2) Most of the high schools are co-educational and grouped as general schools (providing all-round education including science for all) and special schools (providing instruction in practical subjects such as agriculture, commerce and technology). (3) There are excellent separate science laboratories for the various sciences. (4) Surprisingly enough, junior high school students are introduced to the methods of science while exploring natural phenomena (earth science too is included). (5) Admission to the universities is highly competitive. Specialisation begins at the graduate level. (6) Research facilities are excellent in this country. [VKJ 1501]

Malhotra, V.K. 1988. **A critical study of the existing facilities of science teaching and construction of evaluation instruments for its supervision in different types of secondary schools in Delhi.** Ph.D., Edu. Univ. of Delhi.

Problem: This is an attempt at studying supervisory practices being adopted in the teaching of science in different types of secondary schools.

Objectives: (i) To construct and standardise evaluation-instruments for various studies, e.g. existing facility, supervisory practices, process and organisation of faculty meetings, various growth efforts of the principals, supervisory practices, etc. and (ii) to study the existing condition of teachings of science in different types

of schools with special reference to supervisory practices.

Methodology: The sample comprised 75 students drawn through stratified random sampling method from 15 schools, viz. public, government and central schools. The tools used were evaluation instruments of two parts to be used by subject supervisors and education officer. The collected data were treated using mean, SD, 't' test and F-ratio.

Major Findings: It was observed that the three types of schools differed significantly in the following cases: (1) existing facilities for science-based co-curricular activities. (2) Existing human facilities. (3) The supervision of the theory classes. (4) The supervision of the practical classes. (5) The supervision of science-based co-curricular activities. (6) Supervisory practices of the faculty meetings. (7) Related facilities for the supervisory practices. (8) Welfare of the students. (9) The public schools scored high uniformly. [RDM 0348]

Malik, Achal Kumar. 1992. **Managing computerisation: A study of an educational institution.** *Indian Educational Review*, Vol. 27 (3):16-34.

Problem: The present study tries to investigate the impact of change by the adoption of new technology (computerisation) in the working of an apex educational institution.

Objective: (i) To study the nature and impact of technological change in four areas, viz. organisational structure, work process, motivation and morale of users, measured through degree of satisfaction and productivity of users.

Methodology: A sample of 44 respondents were drawn from an educational institution working with computers for administrative data, research data, word processing and other purposes. A questionnaire based on a five-point scale by the investigator was used as a tool. Frequency and 2x2 contingency tables were used to analyse the collected data.

Major Findings: (1) It was observed that the introduction of technology namely, more use by faculty and less for word processing work was being achieved. (2) Younger manpower of less than 35 years of age showed less resistance to change. Most of them were highly educated and the technological change was planned and introduced for them. (3) Motivation and morale of the users was more or less average. (4) Technological change resulted in increased productivity of users. (5) There was a relationship between the user category and their views on work process. More administrative persons had above average views. (6) There was no relationship between the user category and users' views on motivation and morale as measured through comprehensive scores. (7) There was a relationship between the user category and the users' views on productivity. [VKJ 1537]

Malik, Chander Kanta. 1990. **A study of the impact of investigatory approach upon student-teachers' cognitive appraisal and its implications for Science Teachers' Training Programme.** Ph.D., Edu. *Maharashi Dayanand Univ.*

Problem: It has attempted to study the impact of an investigatory approach upon student teachers' cognitive appraisal and its implications for the Science Teachers' Training Programme.

Objectives: (i) To undertake an experimental try-out of structured reading material on modular basis for developing an understanding of concepts of investigatory approach in student-teachers of science, (ii) to evaluate the impact of four modes of presentation of modular structured reading material, live demonstration, simulated peer teaching, and implementation in actual setting on cognitive appraisal of the group, (iii) to explore the applicability of investigatory approach and its training programme as a viable strategy for preparation of science teachers, and (iv) to evaluate the effect of the various modes of presentation of modular structured reading material, live demonstration, simulated peer

teaching and implementation on student-teachers' classroom functioning as adjudged through a rating scale on observed performance on investigatory approach.

Methodology: The sample of the study comprised 54 B.Ed. student-teachers who were given experimental treatment under four stages. After each stage Candidates Appraisal Scale was administered to ascertain the extent of cognitive appraisal shown by the subjects. The tools used in the study were Modular Structured Reading Material, Live demonstration, Simulated Peer-teaching, investigatory approach singly or conjointly. Mean, standard deviation, 't' test and coefficient of correlation were used to analyse the collected data.

Major Findings: (1) The reactions of science teachers about the Investigatory Approach strategies were favourable. (2) There was an identical cognitive orientation after learning through the modular structured reading material stage. (3) Learning of Investigatory Approach through viewing live demonstrations resulted in the improvement of the cognitive appraisal about the approach. (4) Learning of Investigatory Approach through peer-teaching showed significant improvement in the cognitive appraisal. (5) The cognitive appraisal in each stage of learning differed in a substantial manner, reflecting the distinct stages of learning as differentiable from the continuum of thoughtless to the thoughtful modes of functioning. (6) The maximum gain in cognitive appraisal was at the stage of learning the approach through viewing live demonstrations. (7) Implementation improved the cognitive appraisal but the change in cognitive appraisal was not statistically significant. (8) The student-teachers who learnt Investigatory Approach through structured reading material had much lower gain by this treatment than those who learnt the approach through modular structured reading material, viewing live demonstrations and peer-teaching. (9) The effectiveness of the implementation strategy was dependent upon the initial learning experience.

(10) Satisfactory learning through the training programme determined the workability of Investigatory Approach at the implementation stage. (11) Classroom performance was dependent upon learning and implementational experience. (12) Theoretical acquisition of knowledge of Investigatory Approach did not result in propositional (functional) knowledge of Investigatory Approach. (13) Student-teachers' thinking while learning the Investigatory Approach as inferred from their responses after Stages I, II and III of treatment were in terms of doubts and fears about different dimensions of Investigatory Approach strategies. (14) Student-teachers' thinking after learning through implementation experiences were in terms of suggestions for the effective implementation of Investigatory Approach strategies. [DKC 0100]

Malviya, Dharma Shila. 1991. **A study of attitude towards science and interest in science of school-going adolescents.** Ph.D., Edu. Rani Durgavati Vishwavidyalaya.

Problem: It is an attempt to study the attitude towards science and interest in science among school-going adolescents of Madhya Pradesh.

Objectives: (i) To develop an instrument to measure students' and teachers' attitude towards science, (ii) to measure the students' interest in science, (iii) to study the relationship of attitude towards science and interest in science, (iv) to compare different factors of attitude towards science of boys and girls, and (v) to compare the attitude towards science of teachers and students.

Methodology: The sample of the study initially comprised 200 teachers and 1,000 students, but finally 193 teachers and 820 students of Class X were selected from five divisions of Madhya Pradesh. From each division, two districts were selected, and from each district two schools — one urban boys and girls and one rural boys and girls — were selected through stratified random selection method. Attitude Scale (Likert method

of summated rating scale five-point) and Interest Inventory by Raghu Raj Pal Singh were the tools used to collect the data. Collected data were treated with mean, mode, median, 't' test, one-way analysis of variance and correlation.

Major Findings: (1) A positive attitude towards science was observed among all the six groups of students (boys-girls, tribal school-government school, private school-educational school, rural school-urban school, general castes-backward castes students, and high socio-economic status-low socio-economic status of students). (2) Significant difference between means of rural school and urban school boys and girls revealed that attitude towards science differed in respect of sex in early ages. (3) No significant difference between male and female teachers' attitude towards science revealed that sex had no effect on the attitude towards science in the later years. (4) Significant difference between means of rural school and urban school boys and girls revealed that attitude towards science differed in respect of area. (5) No significant difference between male and female teachers' attitude towards science revealed that sex had no effect on the attitude towards science. (6) No significant difference between experienced and new teachers revealed that an increase in age had no effect on attitude towards science. (7) Significant difference between the mean scores of boys and girls on different factors of attitude towards science and significant in mean scores of students and teachers on different factors of attitude towards science revealed that age, sex, profession and socio-economic status had no effect on attitude towards science. (8) Coefficient of correlation between the different factors of attitude towards science showed moderate correlation with each other. (9) Coefficient of correlation between the different factors of interest showed moderate correlation with each other. The correlation of scientific factor was comparatively higher than other factors. (10) The mean score and standard deviation of the scientific interest factor was higher than other interest factors. This showed

that the students who had got higher positive attitude towards science would also have higher scientific interest. (11) Attitude and different factors of interest, i.e. mechanical, business, scientific, aesthetic were significantly correlated. Attitude and clerical factor of interest was also significantly correlated. Other two factors of interest, namely social and outdoor factors did not show significant relationship with attitude. (12) Obtained value of 'F' on the basis of one-way analysis of variance showed significant difference between the different groups of students in the attitude towards science. (13) The value of 'r' in case of scientific factor was higher than other factors. It clearly showed that the students who had positive attitude towards science also had greater interest in science. (14) A 't' test analysis of attitude scale showed significant positive gains in attitude towards science for the entire groups of students. [NNS 0739]

Mandila, Shyam Singh. 1988. **Attitudes of secondary stage students towards science curriculum and its relationship with achievement motivation.** Ph.D., Edu. Univ. of Rajasthan.

Problem: The study focuses on assessing the attitudes of secondary stage students towards science curriculum and its relationship with achievement motivation.

Objectives: (i) To determine the attitude of science students about science curriculum, (ii) to compare the differences between urban/rural, intelligent/weak, male/female students about the attitudes towards science curricula, and (iii) to determine the extent and direction of relationship between attitude and achievement.

Methodology: A sample of 500 students was drawn through the survey method. The tools included in the study were an Attitude Scale by the investigator and Achievement Motivation Test by Prayag Mehta. The collected data were analysed qualitatively and quantitatively.

Major Findings: (1) Students from rural and

urban schools as well as male and female had favourable attitude towards science curriculum. (2) There were significant differences in some aspects such as scientific temper, and teaching methods. (3) Students from urban schools scored highest on the achievement test. (4) Most of the weak students scored less on the achievement test. (5) Female students scored higher than their male counterparts. (6) Enriched academic programmes helped in developing favourable attitudes. [JKS 0699]

Mitra, J. 1989. **Experimental project to develop need-based and community-oriented self-learning instructional materials in biology for the elementary level rural pupils of the formal system and drop-out children at this stage.** Independent study. *National Council of Educational Research and Training*. [ERIC Funded]

Problem: The present study focuses on the development of need-based and community-oriented self-learning instructional materials in biology for the elementary level rural pupils of the formal system and drop-out children at this stage.

Objectives: (i) To conduct a community survey for identifying various areas of community problems and needs which have direct or indirect relevance to biology education, (ii) to collect resource materials to be used in developing self-learning instructional materials, and (iii) to develop need-based and community-oriented self-learning instructional materials.

Methodology: A survey method was adopted to draw the sample from eight villages of Delhi which included 10 to 25 parents/adult males and females ranging from illiterates to people having education up to elementary school and a few matriculates. The tools used to collect the data included questionnaires and feedback of a six-day workshop.

Major Findings: (1) The researcher identified various areas of community problems and needs

which had a direct or indirect relevance to biology education. (2) On the basis of identification of areas of community problems, nine self-learning modules were developed. They included: how could you make the best use of your food, eye care and eye diseases, hygiene of water, mosquito and malaria, worms that are our enemies, pests—enemies of our crops, plants and soil, plants could cure you, and nature as your physician. [MSG 1169].

Mohan, Radha. 1991. **Effective concept learning in science education: A theoretical instructional mode.** *Indian Educational Review*. Vol. 26 (1):1-13.

Problem: The present study attempts to examine one of the major concerns of science curriculum, namely the problem of generating an effective participatory learning process for the development of scientific concepts keeping in view the learner, the specific learning situation and the nature of concept, through the adoption of appropriate instructional technology.

Objectives: (i) To make a rational analysis of the factors of learning context, instructional strategies, process of development of scientific concept, interaction process and the role of learners in different learning situations, (ii) to identify the steps for concretisation of concepts through a progression process from concrete to quasi-concrete to abstract representation, and (iii) to evolve a theoretical instructional model for effective utilisation of a variety of instructional tools for ensuring proper learning by students.

Methodology: The researcher used rational analysis method of analysing research studies and attempted to present models of unstructured process through diagrams and visuals.

Major Findings: (1) It was observed that in planning instructional strategies, the socio-cultural factors, the educational environment and the learner's style of learning have to be given due consideration. (2) Blending a number of instructional media might be useful in generating

a learning climate that fosters interaction of various components of learning process. (3) In the selection of learning strategy, the active role of the learner, the place of teacher, learning materials and process of concretisation for concept development had to be cautiously designed keeping in view the learning theory evolved by psychologists and educationists like Bruner, Ausubel, Dienes and Piaget. (4) While determining locus of control in the teaching-learning process, the impact of external factors outside the learner as well as internal factors within him/her had to be carefully considered. [PD 1903]

Mohanty, S. 1988. **An appraisal of teaching science in the high schools of Cuttack City.** Ph.D., Edu. Utkal Univ.

Problem: The present study addresses the problem of an appraisal of teaching science in the high schools of Cuttack City.

Objectives: (i) To assess the existing position of teaching science in the high schools of Cuttack City, (ii) to recommend appropriate remedial measures for improving the quality of instruction to increase the efficiency of students in science.

Methodology: The sample of the study comprised 370 students studying in Class X, and science teachers from 28 schools of Cuttack City were also included. The tools used in the study included Questionnaire, Interview Schedule, and Achievement Test in General Science. The collected data were analysed statistically by using mean, median, mode, SD and quartile deviations.

Major Findings: (1) The study revealed that after administering tests in two subsequent years, the performance of the students in the second test was slightly inferior to the first test. (2) Though various factors like pupil ability, the teacher's teaching methods, laboratory facilities were almost the same from year to year. (3) According to the expert, the present syllabus was very tough and it was very difficult to grasp all the concepts in 10 years of schooling. They

also opined that the Board of Secondary Education, Orissa should appoint more experts in science to improve science teaching in the state and also to revise the science syllabus keeping in view the teachers' position, laboratory facilities and the standard of the students. (4) As regards the equipment and laboratory, all the schools were deficient. All the teachers followed the demonstration-cum-discussion method for teaching science which was suitable for their condition. (5) The schools were deficient in audio-visual aids like projectors, overhead projectors, television sets, etc. (6) The outcomes of learning were not properly assessed by the schools. The questionnaire revealed that the outcomes of cognitive domain were assessed to some extent and the outcomes of affective domain were not assessed at all. (7) The science funds available to the schools were very meagre. So the schools could not do a lot for the development of science education by organising science fairs and science exhibitions in the schools. [KCP 0445]

Mohapatra, J.K. 1989. **Four dimensions of the teaching-learning of science: Characteristics and implications.** *Indian Educational Review*, Vol. 24 (3):1-17.

Problem: The present study focuses on studying the pupils' popular preconceived concepts about scientific events related to their day-to-day life observations and the implications of the same for organising suitable teaching-learning strategies through utilisation of their experiences.

Objectives: (i) To study the review of related studies on the origin of scientific concepts formation in the minds of children, (ii) to discuss some of the major characteristics of different alternative concepts in the minds of children, (iii) to identify the role of the teacher and the learner in the teaching-learning process in developing and modifying scientific concepts, and (iv) to determine the implications of various types of concepts development process in the teaching-learning situations.

Methodology: The present study is based on review of related literature regarding the origin of scientific concept formation in the minds of children. The researcher has tried to identify major characteristics of different alternative concepts in the minds of children and related it to the teaching-learning situation.

Major Findings: (1) It was observed that children made a great deal of conceptualisation on the basis of their observation of day-to-day happenings in the environment and in home situations. In this process they formulated alternative concepts about things, objects and events. (2) The science teacher had an important role in helping the child to develop proper concepts about objects and events by utilising children's personal experiences with the rational thinking process. [PD 1437]

Nelliappan, N.O. 1992. **A study of scientific attitude and interests among higher secondary biology students in relation to their learning environment**, Ph.D., Edu. Annamalai Univ.

Problem: The kind of school setting, it is recognised, goes a long way towards the development of scientific attitude. The present study intends to know the relationship between learning environment, development of scientific attitude and interests of higher secondary biology students.

Objectives: (i) To study the relationship between learning environment and scientific attitude and scientific interests, (ii) to study the relationship between the levels of learning environment (high and low) and scientific attitude and interests, (iii) to find out the difference between the levels of learning environment and scientific attitude and interests, and (iv) to find out if there is any significant difference between boys and girls, urban and rural and high and low level learning environment groups in respect of their scientific attitude and scientific interests.

Methodology: The sample of the study comprised 645 higher secondary biology students

covering 380 boys and 265 girls from 19 different schools covering 11 urban and eight rural areas of South Arcot District in Tamil Nadu. They were selected through the cluster sampling technique. The tools used to collect the data were Learning Environment Scale and a Science Interest Inventory constructed by the investigator and a Scientific Attitude Scale by G.M. Patted. The collected data were treated with mean, standard deviation, correlation, phi-coefficient, chi-square, contingency coefficient and critical ratios.

Major Findings: (1) There was a strong relationship between the high and low total learning environment of the higher secondary biology students and their scientific attitude and scientific interests. (2) The total learning environment and the scientific attitude and scientific interests of the higher secondary biology students were significantly related in respect of the entire sample and of the various categories of sub-samples. (3) The high and low total learning environment groups of the higher secondary biology students significantly differed in their scientific attitude and scientific interest and this was true in respect of the entire sample, urban students, rural students, boys and girls. Significant difference was observed only between the high and low learning environment group combinations among the various combinations of sub-samples involving sex, locality and levels of learning environment in respect of the scientific attitude and scientific interests. [MDa 0988]

Pandit, B.L. 1989. **Identification and measurement of chemistry laboratory skills of senior secondary school students of Delhi**. Ph.D., Edu. The Maharaja Sayajirao Univ. of Baroda.

Problem: This study intends to identify various chemistry laboratory skills at senior secondary school level and to find out the effect of various factors on the development of these skills. It also aims at constructing tests to measure chemistry laboratory skills.

Objective: (i) To identify chemistry laboratory skills at Class XII in senior secondary schools, (ii) to construct tests to measure the achievement of students in the chemistry laboratory skills, and (iii) to find the effect of factors such as type of school, sex, type of examination, socio-economic status and out-of-school activities on the development of chemistry laboratory skills.

Methodology: The sample of the study was drawn randomly from the three types of schools of Delhi, viz. public schools, Kendriya Vidyalayas and Delhi administration schools and from each of these schools, students of one section were randomly chosen. The tools used to collect the data included Entry Level Test, Terminal Level Test, Theory Tests and bio-data sheets. To analyse the data descriptive statistics, ANOVA, 't' test and 'Z' test were employed.

Major Findings: (1) The study revealed that from the cognitive and psychomotor domains of learning, a comprehensive list of chemistry laboratory skills were prepared which were needed for Class XII students. Out of the two categories in the comprehensive list, 46 were found relevant to the study. (2) It was possible to construct tests for measuring various chemistry laboratory skills with a high degree of reliability and validity. (3) It was possible to classify several chemistry laboratory skills into major skills. (4) A significant correlation was found between the ability to learn the subject-matter content and the ability to learn cognitive as well as manipulative laboratory skills. (5) There existed a significant school variation in the achievement of chemistry laboratory skills. (6) It was observed that factors such as type of schools, sex, etc. had significant effect on the acquisition of laboratory skills. [MSY 0904]

Phalachandra, B. 1989. **An analytical study of some correlates in the acquisition of science concepts in school children.** Ph.D., Edu. Hemvati Nandan Bahuguna Garhwal Univ.

Problem: The present study tries to critically examine some of the correlates in the acquisition of science concepts in school children.

Objectives: (i) To construct and develop concept achievement tests to measure acquisition of science concepts, (ii) to explore the influence of school environment in the acquisition of science concepts, (iii) to study the relationship that may exist between intelligence, creativity and the acquisition of science concepts, and (iv) to study the influence of socio-economic status on the acquisition of science concepts.

Methodology: The sample comprised 453 students who were selected from 12 elementary schools of Bangalore City. The tools used to collect the data were Concept Achievement Tests, Intelligence Test by Pramila Ahuja, Creativity Test — (Verbal) by Baqer Mehdi, Socio-economic Status Scale by B.G. Sudha, Personal Data Sheet and School Environment Scale. The collected data were analysed with 't' test, product-moment correlation, ANOVA and multiple regression.

Major Findings: (1) Boys were found to be achieving better than girls in all the four concept achievement tests, viz. physical and chemical change, composition of substances, plants growth and its process, animal parts and their functions. (2) The relationship between intelligence and concept achievement was significant. (3) Creativity and concept achievement contribution of creativity measures (fluency, flexibility, and originality) for achievement of four concepts varied from 12% to 30%. (4) It was found that there was significant and positive relationship between school environment and concept achievement. (5) It was found that higher the socio-economic status level, the higher will be the concept achievement. (6) Step-wise multiple regression analysis indicated that out of the 10 independent variables considered, parental qualification alone accounted for about 6 to 16% variation of performance in different concept achievement tests. [KBB 0541]

Prakash, Brahma, 1990. **Effectiveness of concrete materials to enhance learning in physical sciences.** Independent study. *National Council of Educational Research and Training.* [ERIC Funded]

Problem: A large proportion of science concepts of both basic and applied nature require students to operate at the formal operational level of intellectual development. But a large majority of students (at secondary, higher secondary and even at college level) do not use formal operational thinking when dealing with such concepts and problems. They exhibit large differences in their ability to grasp and understand science concepts. This mismatch between the level of pupils' thinking and the intellectual demand of the subject-matter is one of the major causes of learning difficulties in science. The present study was undertaken to assess the effectiveness of concrete materials to enhance learning in physical sciences.

Objective: To study whether concretised instruction helps in learning formal level concepts.

Methodology: The concretised instruction of four formal level science concepts were tried out on Class IX students in two different schools. The instructions to one section of Class IX in each school was subjected to experimental treatment. The two sections in each school (control and experimental) were made equivalent on the basis of a pre-test. The researcher prepared materials for concretised instruction for all the four formal level concepts. A test of multiple choice items was developed and administered to both the groups. The differences were qualitatively analysed.

Major Findings: (1) It was found that the performance of student's learning by concretised instruction was better than those learning by traditional instruction. (2) The average increments in marks of the experimental group of students on concrete level items was 8.8% and that of formal level items, 8.4%. As the tests comprised of items based on different logical

operations and of concrete and formal operational level, the responses of such tests may be used to diagnose the learning difficulties of students. Remedial help can also be provided to them accordingly. (3) The use of concrete materials such as charts, models, analogies, more lucid examples and other manipulable materials based on concrete thoughts and sequencing of instruction in a three-stage cycle were found to help the concrete level operators in understanding the formal level concepts more effectively. The three-stages of learning cycles were introduction, concept formation and concept application. [VKR 1173]

Radhamony, P. 1988. **Lexical morphemic and syntactic analysis of the language of chemistry in the Kerala textbooks (Malayalam version) and its implications for science education.** Ph.D., Edu. Univ. of Kerala.

Problem: The present study analyses the language of chemistry textbooks of Kerala and assesses its implication for science education.

Objectives: (i) To identify the different language groups which enter into the Malayalam chemistry textbook, (ii) to analyse different types of terminology in the textbook and appraise the value of this communication of scientific ideas, (iii) to identify the sub-components in the chemical terminology and analyse how the textbook handles this, (iv) to analyse the different ways of presenting technical terms and chemical concepts, (v) to analyse the different ways of framing technical terms and appraise their value, (vi) to sensitise teachers and textbook writers to the sub-components of language (particularly to chemical morphemes) which are necessary to be mastered in scientific communication, (vii) to identify some typical sentence construction patterns which are used in the communication of chemical information in the book, (viii) to analyse the possibilities of different sentence construction patterns permitted according to Dravidian syntax, (ix) to analyse the various styles

of presentation adopted in the present textbooks and appraise their value, (x) to analyse the merits and defects in the textbook presentation from the point of view of use of language, (xi) to analyse the major possibilities and difficulties in scientific communication using the Malayalam language, (xii) to develop a functional theory of the development of the language of science in Malayalam language, and (xiii) to develop a model for the effective use of presentation of chemistry ideas through Malayalam.

Methodology: The sample of the study comprised 600 pupils, covering 292 girls and 308 boys, who were selected from 16 institutions in eight districts. It also included 200 (91 men and 109 women) teachers and 100 experts. Tools used in the study included analytical pre-constructs learning approach inventory and a questionnaire. The study focused on lexical, morphemic and syntactic analysis.

Major Findings: (1) The syntactical analysis revealed that (a) the Dravidian post-positional structures permitted multiple phrasal arrangements, which may all be correct but with a different emphasis, (b) Malayalam syntax was close to the syntax needed to match experimental procedure with word-by-word commentary, (c) the discourse was often confused by certain usages of language. (2) Analyses of the textbook introduced in 1984 and after showed that whereas the content had been heavily reduced in Standard VIII, the textbook for Standard IX gave several modern concepts. Moreover, lot of figural support had been introduced. (5) The task of formulating recommendations for pedagogical action had been considerably simplified by the appearance of new chemistry books. [VR 1639]

Radhamonyamma. 1988. **Evolving instructional techniques appropriate to the development of various scientific skills among secondary school pupils in Kerala.** Ph.D., Edu. Univ. of Kerala.

Problem: The present study identifies the scientific skills which can be attained by pupils and evolves and tests a suitable method for developing scientific skills.

Objectives: (i) To find out the methods adopted for teaching science in secondary schools, (ii) to list the scientific skills that can be developed through science teaching, (iii) to construct an achievement test based on scientific skills, (iv) to find out the general nature of attainment of pupils in scientific skills, (v) to plan a suitable method for developing scientific skills, (vi) to prepare lesson plans for selected topics, (vii) to try out the method on a representative sample, and (viii) to test the effectiveness of the new method.

Methodology: The sample comprised 50 pupils selected from an urban government boys' school and a rural private girls' school. The pupils were selected through stratified random sampling technique. Tools and techniques used for the collection of the data were observation of classes, an opinionnaire and an achievement test in science prepared by the investigator. Data so collected were analysed using statistical techniques such as central tendencies, mean, standard deviation, CR values and Pearson product-moment correlations.

Major Findings: (1) The study found that whereas the achievement in science as well as acquisition of scientific skill was low, it was observed that the newly evolved method for teaching of scientific skills through tested lesson plans was more effective than the traditional method. (2) The correlations between marks scored in different science subjects were higher for the experimental group as compared to the control group. [VR 1641]

Raghavan, Andal. 1991. **Concept mapping in learning physical science and its relation to scholastic performance, cognitive ability, attitude towards concept mapping and science interest among Standard IX students.** Ph.D., Edu. Univ of Madras.

Problem: The present study focuses on concept mapping used as a teaching-learning strategy in physical science and its relation to scholastic performance, cognitive ability, attitude towards concept mapping and science interest among Standard IX students.

Objectives: (i) To find out the influence of concept mapping on scholastic performance in physical science among Standard IX students, (ii) to find out the relationship between relevant psychological variables in terms of cognitive ability, attitude towards concept mapping, science interest and performance in concept mapping, (iii) to study the significance of difference in scholastic performance between those students who learnt physical science through teaching with concept mapping and those who learnt physical science through teaching without concept mapping, and (iv) to find out the difference in concept mapping performance and scholastic performance among boys, girls and in a coeducation setting.

Methodology: (i) The total sample of 286 Standard IX students covering boys, girls and coeducation students were taken from the state and central board schools. They were distributed in three experimental and control groups. The age of the subjects ranged between 13-14 years. The tools used in the study included concept maps, Scholastic Performance Test in Physical Science, Concept Mapping Attitude Scale, Cognitive Ability Test and Science Interest Inventory. The collected data were treated with correlation, path analysis and path coefficients, analysis of co-variance and critical ratios.

Major Findings: (1) It was found from the path analysis that the relevant psychological variables such as cognitive ability, attitude towards concept mapping and science interest had both a significant direct influence on scholastic performance and an indirect influence through concept mapping. Similarly, concept mapping as a teaching-learning strategy had a significant positive influence over scholastic performance.

The path direction had been the same with boys, girls and coeducation students. (2) On comparing the coefficients of determination, the highest extent of determination had been found between cognitive ability and concept mapping for all the three groups. For coeducation students, 51% cognitive ability accounted for concept mapping performance, for boys it had been 49% and for girls 44%. The contribution of cognitive ability to scholastic performance had been lower in all the three groups: the 19% in case of boys, 37% in the case of girls, and 38% in the case of coeducation students. (3) The experimental and control groups of boys, girls and coeducation students were found to have no difference in the post-test scholastic performance scores in physical science. (4) Girls were found to have performed better than boys in post-test scholastic performance scores in physical science. (5) Coeducation students were found to have performed better than girls and boys in post-test scholastic performance in physical science. (6) Coeducation students were found to have performed better than girls and boys in concept mapping. [DRG 0099]

Rao, Digumarti Bhaskara. 1990. **A comparative study of scientific attitude, scientific aptitude and achievement in biology at secondary school level.** Ph.D., Edu. *Osmania Univ.*

Problem: It is an attempt to compare scientific attitude, scientific aptitude and achievement in biology at the secondary school level.

Objectives: (i) To find out the scientific attitude and scientific aptitude possessed by the secondary school pupils along with their achievements in biology, (ii) to find out the association among scientific attitude, scientific aptitude and achievement in biology of secondary school pupils, and (iii) to compare scientific attitude, scientific aptitude and biology achievement of boys versus girls, English medium versus Telugu medium schools, private versus government schools, residential versus non-residential schools and rural versus urban schools.

Methodology: The sample of the study comprised 600 pupils studying in Class IX, who were selected through stratified sampling method. The tools used in the study included Scientific Attitude Scale of J.K. Sood and R.P. Sandhya, and Kerala University Science Aptitude Test of Nair, et al. The statistical techniques used in this study were mean, SD, 't' test, critical ratio and correlation.

Major Findings: (1) It was observed that the scientific attitude in secondary school pupils was average. There was no influence of sex on scientific attitude. But the pupils studying in private schools, rural schools, English medium schools, and residential schools held relatively better scientific attitudes than their counterparts. (2) The scientific aptitude in secondary school pupils was also average. The pupils of private schools, urban schools, English medium schools and residential schools held a bit more scientific aptitude. (3) The achievement in biology was average. The rural schools, government schools, English medium schools and residential schools were better in achievement. (4) There was a highly significant and positive association among scientific attitude, scientific aptitude and biology achievement. [SSS 0843]

Rao, K.N. and Gupta, M.K. 1990. **Study of science laboratories in secondary schools in selected states.** Independent study. *National Council of Educational Research and Training.* [ERIC Funded]

Problem: This study addresses itself to make a sample survey of science laboratories in secondary and higher secondary schools in the selected states in the wake of the implementation of 10+2 +3 pattern in the country as a result of which science became a subject of study under the core curriculum.

Objectives: (i) To identify the deficiencies and inadequacies in the existing laboratory facilities, (ii) to ascertain if the required number of teacher demonstrations and student practicals are

performed, (iii) to examine if the laboratory is adequately utilised, (iv) to see if the schools are providing separate laboratories, (v) to see if the equipment in the laboratory is adequate, and (vi) to find out if there is any provision for improvisation of science equipment.

Methodology: A multi-stage stratified sampling method was used in drawing the sample of schools for the study. At the first stage, the state was divided into different homogeneous regions (strata) on the basis of geographical, political, and socio-economic factors. Then from each stratum, one or two districts were selected at random. At the second stage, the selected districts were divided into rural/urban and then the schools were stratified into different managements. Finally, from each selected district, a random sample of 10% secondary schools and 15% higher secondary schools were selected so that all managements and rural and urban areas were represented. The tool used in the study included a questionnaire.

Major Findings: (1) It was observed that in Maharashtra, out of 111 secondary schools, 105 were reported to have science laboratories. Almost all schools — 96.7% in urban areas and 92% in rural areas — had science laboratories. (2) Out of 70 higher secondary schools which responded, 59 had science laboratories. In urban areas, 94.7% were having science laboratories as against 71.9% in the rural areas. (3) Out of the 105 secondary schools which had science laboratories, only 26 had separate laboratories, i.e. hardly 25%. In the urban areas, the position was better than rural areas. (4) Out of 58 secondary schools in rural areas, about 60% used one to three hours per week for teacher demonstrations, 20% used four to five hours time and remaining 40% used seven hours and more for teacher demonstrations. In urban schools, the position was slightly better. About 40% schools used laboratories for one to three hours, another 20% used it for four to six hours and the remaining used it for seven hours and above. (5) Time devoted to science practicals differed in

urban and rural schools. The position in urban schools was worse than that in rural areas. (6) In higher secondary classes, 38 out of 59 schools in Class IX, i.e. 60% and 40 out of 59 in Class X, i.e. 70% performed teacher demonstrations. The position in respect of students' practicals was highly satisfactory in Class XI and 89% in Class XII performed more than 15 student practicals. (7) In Rajasthan's secondary school 92.10% rural schools had laboratories as compared to 83.3% urban schools. In the case of higher secondary schools, 94.60% rural schools had these facilities as compared to 90.90% in urban schools. (8) The facility of separate laboratories was available in 91.9% urban schools as compared to 85.7% rural schools. (9) About 50% of school students had the facility of performing experiments individually in physics, 74.74% in chemistry and 81.72% in biology. (10) For performing science practicals, in case of private aided and private unaided schools, only 80% and 66.7% schools respectively allotted adequate time for performing science practicals. (11) Only 27.8% of government schools had the facility for repairing and improving of science equipment. In rural areas this facility was available in 14.8% secondary schools and in urban areas, 66.7% secondary schools. (12) 7.5% of government school charged 6 to 10 rupees as science fee and 75.3% in case of higher secondary schools. [VKR 1182]

Rao, Shardamba. 1988. **Explorations in optimising learning science in schools.** Independent study. *Karnataka: Office of the Field Advisor (NCERT).* [ERIC Funded]

Problem: It is an attempt to explore certain intervention materials which enable in optimising learning science in schools.

Objectives: (i) To find out the extent to which children entering Class VI have assimilated science content up to Class V, (ii) to develop achievement measures in science to cover the content up to Class V in its structural and functional aspects, (iii) to develop scoring

techniques to evaluate the degree of learning through achievement tests in science developed in three languages—English, Hindi and the regional language Kannada, (iv) to develop entry behaviour tests for evaluation of science learning, (v) to study the difference in the amount and content of learning of children from different socio-cultural backgrounds, (vi) to study the science achievement of children with varying background support at home, (vii) to study whether the type of school has any influence on the method and amount of science learning, (viii) to find out whether instructional strategies used by the teacher influence the content and amount of learning, and (ix) to build tangible hypotheses for an intervention programme to optimise science learning.

Methodology: The sample of the study comprised 50 elementary schools of Karnataka, Delhi and Bihar of the students studying in Class VI. The tools used to collect the data included Science Information Test—Forms A and B, Science Achievement Test—Forms A and B and Scientific Skill Test—Forms A and B prepared by the investigator. The statistical techniques used in the study were mean, SD, item analysis, and KR-20.

Major Findings: (1) It was observed that the learning process scores and concept scores were low indicating to the science educator that comprehension was not achieved by giving children bits of information about scientific facts. (2) Science achievement test indicated that very little was retained by children by rote memory. (3) The positive relationship in general between science achievement test scores of children and the educational level of parents provided reasons to believe that strengthening of educational level and also science background of the parents was likely to enhance the science achievement of the children. (4) On science achievement items related to Grades III, IV and V for earth science, physical science and biological science, it was found that irrespective of the region, the scores on earth science in items related to Grade V were

invariably higher than the scores in items related to Grade III, whereas in physical science the reverse was true. In biological science, there was more or less uniform distribution of scores over Grades III, IV and V. [MSG 1160]

Sahni, Renu. 1991. **Cognitive and non-cognitive factors leading to success in computer science: A study in senior secondary schools in Delhi.** Ph.D., Edu. *Jawaharlal Nehru Univ.*

Problem: The problem under investigation is to test the effect of certain cognitive and non-cognitive variables on students' performance in computer science.

Objectives: (i) To study the gender differences in performance, attitude, intellectual commitment and cognitive ability in computer science, (ii) to study the relationship between some specific cognitive skills and performance in computer science, viz. algebra and arithmetic problem-solving skills, procedure and direction following skills, logical reasoning ability, spatial ability, verbal reasoning ability, and (iii) to study the relationship between (a) students' attitude towards computer science and their performance in it, (b) intellectual commitment and performance, (c) performance in computer science and in mathematics, physics, chemistry, English, and overall percentage, (d) family income and performance, (e) educational level of parents and their children's performance, (iv) to determine the significant prediction of success in computer science, and (v) to study the use of computer at home, using calculators, and time worked on computer on the performance in computer science.

Methodology: The total sample comprised 614 computer science students, out of these 526 were considered in two experimental Groups I and II. They were drawn from the schools affiliated to the Central Board of Secondary Education and the Indian School Certificate Examination. The sample also included 88 control group students

who did not opt for computer science and they were drawn from the ISCE Board. Tools used in the study included a battery of seven Cognitive Abilities Tests, Intellectual Commitment Scale, proforma for demographic information of the students, proforma for the teachers of computer science, the list of marks in computer science, mathematics, physics, chemistry, English and the overall percentage were also considered. The statistical techniques used in the study were mean, SD, 't' test, coefficient of variance, correlation and multiple regression analysis.

Major Findings: (1) The performance of male and female students in computer science showed no significant difference. (2) The difference between the scores of male and female students on the attitude scale was not significant. (3) The performance of male students was superior to female students on the tests of algebra problem-solving, arithmetic problem-solving, spatial ability and verbal reasoning. (4) No significant difference was observed in the performance on procedure following test, direction following test and logical reasoning test. (5) Males and females were found to possess highly positive attitude towards computer and computer science and their scores on the attitude scale were equivalent. (6) There was no gender difference in intellectual commitment; both pursued their studies with equal sincerity. (7) The results revealed that both specific and general cognitive skills had highly significant relationship with performance in computer science. Both males and females had highly positive attitude towards computer science. (8) For experimental Group I there was a significant relationship between intellectual commitment and performance in computer science. For experimental Group II intellectual commitment did not show a significant relationship with performance in computer science. (9) The correlation between performance in computer science, mathematics, physics, chemistry, English and overall percentage were highly positive and significant. (10) The correlation between family income and performance in computer science was not

significant for experimental Group I and was negative and significant for Group II. (11) The correlation between educational level of parents and their children's performance was not significant for both the groups. (12) The performance of students having a computer at home was marginally higher than those who did not have one. (13) Using or not using a calculator did not emerge as a potent factor predicting performance. (14) The performance improved when computer time used per week increased beyond 1-2 hours, confirming the effects of practice. [SCG 0153]

Saxena, S.P. 1988. **Sequential attainment of concept in chemistry through periodic table at the secondary stage.** Independent study. Bhopal: Regional College of Education. (ERIC Funded)

Problem: The present study is an attempt to examine the effect of teaching based on structural concepts, considered to be the core concepts, in the learning of chemistry at the higher secondary stage. Further, sequential attainment of concepts in chemistry through the periodic table has been the focus of study. It is advocated that teaching of science be based upon the most powerful concepts preferably, if presented sequentially. In this experimental study the effort is made within the context of the periodic table by using it on Piagetian theory.

Objective: To study the effect of concept-based instructions, using a control and experimental group design.

Methodology: The total sample of the study comprised 80 girls, an achievement test prepared by the investigator served as a tool. The data were analysed statistically using mean, SD, and 't' test.

Major Finding: It was observed that the experimental group taught by discussion method and supplemented by reading material regarding the related concepts gave better results in terms of their performance. [CGVM 1134]

Sharma, Archana. 1989. **Personal and social factors affecting the success and retention of girls in science.** Ph. D., Edu. Agra Univ.

Problem: It is an attempt to study the personal and social factors affecting the success and retention of girls in science.

Objectives: (i) To develop a test on social role models and sex-role stereotypes and to study its role in the achievement of adolescent girls, (ii) to develop a test on perseverance and personal factors and also to study its role in the achievement of adolescent girls, (iii) to develop an attitude scale and study the attitudes of parents, teachers and students in the achievement of girls, (iv) to develop a cognitive style test for high school classes in science on health's model, (v) to compare parallel groups of boys and girls equated on their achievement scores in science with regard to their social role models and sex-role stereotypes, (vi) to study the impact of differing models of cognitive functioning on the achievement of girls, and (vii) to study attitudes of parents, teachers and adolescent students towards the superior achievement of adolescent girls.

Methodology: Using a normative survey method the girl students were studied as subjects in the study. The sample also comprised respective parents and teachers. The tools used included Social Role Model Scale, Sex-role Stereotype Scale, Attitude Scale, a tool to assess Cognitive Style and achievement test. The collected data were treated with inferential statistics.

Major Findings: (1) The role models or sex role stereotype scores were normally distributed. (2) The scores on cognitive functioning styles of girls were significant with the scores on achievement test in science. (3) Women have been found to be more successful than men due to hereditary factors and higher economic status. (4) Women were attitudinally better established than men. [SS 0818]

Sharma, Munishwar Kumar. 1990. **A study of scientific literacy, attitudes towards science and personality traits of students and teachers.** Ph.D., Edu. Univ. of Rajasthan.

Problem: This study investigates the incidence of science literacy, attitudes towards science and the personality traits of certain groups of students and teachers.

Objectives: (i) To study the level of scientific literacy of different groups of students and teachers, (ii) to study attitudes to science of different groups of students and teachers, and (iii) to study personality traits of students and teachers.

Methodology: The study sample comprised science students and science teachers. The tools used in the study included Scientific Literacy Scale, Attitude to Science Scale, and Cattell's 16 Personality Factors Questionnaire. The collected data were treated with ANOVA.

Major Findings: (1) The total sample had higher level of scientific literacy than the theoretical mean. (2) There was significant difference between the general group and the SC/ST group. (3) The total sample had favourable attitude towards science. (4) There was effect of type of school and sex on attitude towards science. (5) There was no significant difference between students and teachers on personality factors. [JKS 0696]

Shishta, Rama. 1990. **An investigation into the effectiveness of guided discovery learning vis-a-vis the conventional approach to the teaching of scientific concepts in life sciences.** Ph.D., Edu. Jamia Millia Islamia.

Problem: The present study investigates the effectiveness of guided discovery learning vis-a-vis the conventional approach to the teaching of scientific concepts in life sciences conceptually rather than factually.

Objectives: (i) To identify through the analysis of subject-matter, conceptual hierarchies of the

concepts of leaf photosynthesis, food chain, purification of air, balance of nature and to identify behaviour specifications of each objective for teaching each concept, (ii) to develop a programme which would help to encourage curiosity and spirit of inquiry amongst the students about the world in which they live, and (iii) to compare the scholastic performance of concept achievement of pupils who undergo a teaching programme based on guided approach of teaching scientific concepts in biology with pupils who undergo the conventional type of programme.

Methodology: The sample consisted of Class VII students belonging to the Delhi Public School, R.K. Puram, New Delhi. Advanced Progressive Matrices and Achievement Test were used to collect the data.

Major Findings: (1) It was observed that the performance of the experimental group was superior to that of the control group on the concept achievement test in photosynthesis. (2) It appeared that the treatment of teaching concepts of photosynthesis with blended strategies and different modes of teaching had brought significant difference in the achievement of biological concepts. [SPR 1785]

Shrivastava, Madhulika. 1988. **An investigation into the scientific aptitude of higher secondary science students in relation to their cognitive style.** Ph.D., Psy. Rani Durgavati Vishwavidyalaya.

Problem: The present study is designed to study the scientific aptitude of higher secondary school students in relation to the cognitive style.

Objective: To assess the scientific aptitude of the students in relation to the cognitive style of those who want to execute their studies in the field of science.

Methodology: The sample of the study comprised 500 students, covering 250 boys and 250 girls, who were randomly drawn from higher secondary schools. The tools used in the study

included Scientific Aptitude Test by K.K. Agrawal, a test of General Mental Ability by M.C. Joshi, Hindi adaptation, and Dogmatism Scale by Hasan, based on the 'D' form of the original Rokeach's scale. The descriptive and inferential statistics were used in the present study.

Major Findings: (1) The male students were better than female students in the area of scientific aptitude as significant difference was found between both the groups. (2) Both the groups of boys and girls were of high scientific aptitude and had insignificant difference on dogmatism. (3) The male and female students of low scientific aptitude had significant difference on dogmatism. [NNS 0735]

Singh, Om Prakash. 1989. **A study for identification of certain skills of science teaching and their effectiveness in relation to their creative ability.** Ph.D., Edu. Univ. of Gorakhpur.

Problem: The present study tries to identify certain skills of science teaching and their effectiveness in relation to their creative ability.

Objectives: (i) To identify certain science teaching skills required for science teaching in secondary schools, (ii) to prepare an observation schedule for observing the teaching competencies of science teachers, (iii) to identify the components of identified science teaching skills, (iv) to compare the effectiveness of the micro-teaching technique with the traditional technique to teacher training in the development of certain science teaching skills, (v) to evaluate the effect of training in micro-teaching technique through Flanders' interaction analysis system, (vi) to study the effectiveness of traditional technique of training and micro-teaching technique in the development of six science teaching skills, (vii) to compare the effectiveness of micro-teaching technique with the traditional technique of teacher training in the development of certain science teaching skills so far as creative thinking is concerned, and (viii) to compare the coefficients

of correlation between the teachers trained through micro-teaching technique and traditional technique of teacher training.

Methodology: The sample of the study consisted of 44 student-teachers out of 165 student-teachers admitted for B.Ed in RHS Degree College, Singraman, selected through stratified random sampling method. The tools included in the study were Flanders' Interaction Analysis, Verbal and Non-verbal Tests of Creativity by Baqer Mehdi, and Science Classroom Teaching Competence-cum-Observation Scheme (SCTCS) by the investigator. The collected data were treated with mean, SD, 't' test and product-moment coefficient of correlation.

Major Findings: (1) The structure of micro-teaching encouraged a combination of theory and practice, research and training, innovation and implementation. The central idea at the core of this concept was that there were certain patterns of behaviours, rather strategies, which were crucial to effective classroom interaction. (2) Combining micro-teaching with interaction might help to make micro-teaching a more potent training experience than would be true without interaction analysis in our present Indian conditions. (3) Although, the traditional technique of training had a significant impact on the modification of teacher behaviour, yet bountiful beneficial results were evidenced when using the innovative technique of micro-teaching and FIACS in the modification of student-teacher behaviour. (4) Micro-teaching combined with FIACS might be useful for teacher training institutions to impart knowledge and practice of both the innovations which might bring more and more awareness among the student-teachers about their classroom behaviour. It appeared that such a training might be of great help for teacher education institutions to produce better teachers. (5) From the point of improving a lesson, micro-teaching technique was again useful as it provided a chance of self-evaluation. The student-teachers could focus their attention on

different aspects of their behaviours and could make a needed change. (6) In the micro-teaching process, the researcher could exercise greater control over variables such as teaching time, content units, etc. (7) The quality of science teaching could be raised through competent science teachers prepared through training of identified science teaching skills in micro-teaching settings. (8) A classroom teacher behaviour could also be modified using micro-teaching feedback device. (9) It might help and develop creativity among student-teachers in a way to generate useful behaviour pattern. (10) It might be helpful for developing the verbal and non-verbal creative values in student-teachers. (11) Criteria for teacher effectiveness could be strengthened by incorporating creativity through verbal and non-verbal behaviour patterns of reasonable basis. [BKS 1724]

Sivadasan, K.R. 1988. **Linking class teaching with science club programme in Kerala.** *Indian Educational Review*, Vol. 23 (3): 156-64.

Problem: The study addresses the problem of development of scientific process skills, scientific attitude and performance skills through teaching of science in schools and science clubs.

Objective: To review some studies carried out to examine the development of scientific process skills, scientific attitude and performance skills through teaching of science and science clubs.

Methodology: The present study is chiefly a review study which considered various variables including scientific skills, scientific attitude and performance skills.

Major Findings:(1) The teaching-learning strategies now adopted in schools are not oriented to the development of scientific process. (2) Members and non-members of science clubs were found having low and non-significant difference under the majority of categories of scientific attitude. (3) The science club members were found significantly better than the non-members in composite performance skill. [JPM 1414]

Sood, J.K. 1992. **The public understanding of science.** Independent study. *Ajmer: Regional College of Education.* (ERIC Funded)

Problem: The present study tries to examine the understanding of science among different groups of science students and the public.

Objectives: (i) To develop instruments to determine the public understanding of science, (ii) to determine the levels of public understanding of science among different groups of students and the public, (iii) to develop an instrument to determine attitudes towards science, (iv) to determine the attitudes towards science among different groups of students and the public, (v) to find out the differences in attitudes towards science in different groups, and (vi) to find out the difference in the understanding of science among different groups.

Methodology: The sample of the study comprised 308 randomly selected students from public schools (88 students) from the rural areas (112 students), and from the general public (108 students). The sample covered 234 males and 74 females. The tools used in the study included the Public Understanding of Science Scale and Attitudes Towards Science Scale developed by the investigator. Mean, SD, 't' test and Pearson Product-moment correlation of coefficient were used to analyse the collected data.

Major Findings: (1) The public understanding of science was higher than the theoretical mean of the scale. (2) The public understanding of science students and the general public had been higher than the theoretical mean. But the public understanding of science of the general public was higher than that of the students. (3) There had been a significant difference between students from public schools and students from rural areas regarding their understanding of science. The students of public schools had a high level of understanding of science. (4) Male and female students differed significantly regarding their understanding of science. (5) There had been a significant difference between the general public

and students regarding attitude towards science. (6) There was a significant difference between students from public schools and students from rural areas, regarding attitudes towards teaching. (7) There was a significant difference between males and females regarding attitudes towards science. (8) There was a significant relationship between public understanding of science and attitude towards science. [Author 1211]

Srivastava, Kumkum. 1988. **Impact of science teaching on the child's concept of physical causality: An experimental study.** Ph.D., Edu. Univ. of Lucknow.

Problem: It attempts to study the impact of science teaching on the child's concept of physical causality.

Objectives: (i) To investigate the effect of some selected science experiences on Grade IV child's concept of Piagetian physical causality, and (ii) to examine the effects of the child's sex, verbal ability, cognitive developmental stage and change in the developmental stage on his/her understanding of the two causal concepts, namely animism (living) and dynamism (floating).

Methodology: The sample comprised 300 children (170 males and 130 females) belonging to the age-group of eight to eleven years who were drawn randomly from five selected schools of Lucknow City. Hindi Vocabulary Test of the Allahabad adaptation of the Stanford Binet Scale and a Hindi version of concept assessment kit conservation (Form A), interviewing and questionnaire were used to collect the data.

Major Findings: (1) The experimental group scored significantly higher than the control group in both the concepts. (2) Experimental group boys performed significantly better than experimental group girls for the concept of living but the difference between the two sexes was non-significant for the concept of floating. (3) The variables of verbal ability and cognitive developmental stage showed no significant effect on the child's understanding of any of the two

causal concepts. (4) A change in the cognitive developmental stage turned out to be a significant variable in the child's understanding of the concept of floating but a non-significant one for the concept of living. (5) The child's participation in the selected science experience tended to accelerate his/her understanding of the causal concepts of living (animism) and floating (dynamism). [RJS 0681]

✓ Srivastava, Veena. 1992. **A study of creativity among higher secondary students in relation to scientific aptitude and attitude towards science.** Ph.D., Edu. Agra Univ.

Problem: The study is an attempt to investigate creativity in relation to scientific aptitude and attitude towards science.

Objectives: (i) To test the significance of difference of creativity scores of the boys of the two groups having more scientific aptitude and less scientific aptitude, (ii) to test the significance of difference of creativity scores of two groups having favourable and unfavourable attitude towards science, and (iii) to test the significance of difference between the mean of creativity scores, scientific aptitude scores and science attitude scores of boys and girls.

Methodology: The sample of the study comprised 1,200 students covering 600 boys and 600 girls who were drawn from higher secondary classes of Agra City. Creativity test by Chauhan and Tiwari, Scientific Aptitude Test Battery by K.K. Agarwal, *Samoohik Mansik Yogyata Pariksha* by R.K. Tandon, and Scientific Attitude Scale by A. Grewal, were the tools used in the study. The data were analysed statistically using mean, SD and CR.

Major Findings: (1) The science students of higher secondary classes having more scientific aptitude were more creative than those having less scientific aptitude. (2) In the field of creativity, the boys having favourable attitude towards science were slightly better than those having unfavourable attitude towards science whereas

the girls with favourable and unfavourable attitude towards science did not differ. (3) The girls were more creative than boys. (4) The boys had more scientific aptitude than the girls. (5) The girls had more favourable attitude towards science than the boys. [SS 1355]

Sundararajan, S. 1988. **An evaluation of the teaching of biology at higher secondary stage in Tamil Nadu.** Ph.D., Edu. Annamalai Univ.

Problem: The present study tries to evaluate the teaching of biology at the higher secondary stage in Tamil Nadu.

Objectives: (i) To determine the extent of awareness as well as the realisation of the objectives of teaching biology on the part of the teachers of biology at the higher secondary stage, (ii) to find out the teaching strategies employed, identify the teaching model used, if any, and also examine the problems faced by them in their teaching of biology, (iii) to determine the adequacy or otherwise of the practical activities organised for the +2 stage biology students, (iv) to evaluate the physical facilities available in schools for the teaching of biology, (v) to evaluate the biology syllabus at the +2 stage in respect of its objectives, selection and organisation of content, (vi) to evaluate the biology textbook used at the higher secondary stage in Tamil Nadu, (vii) to identify the weakness inherent in the present system of external examinations in biology at the +2 stage, both written and practical, (viii) to evaluate the students' achievement in biology and identify the areas of their weaknesses, if any, (ix) to find out the extent to which students at the +2 stage are favourably disposed towards the study of biology, (x) to determine if boys and girls studying in urban and rural schools have the same level of achievement in biology or not and also, if they are similarly disposed towards its study, and (xi) to determine if there is any relationship between the students' achievement in biology and their attitude towards its study.

Methodology: The sample of the study

comprised 1,000 higher secondary students covering 520 boys and 480 girls and 480 urban students and 520 rural students. These students were selected from six districts of South Arcot from 105 higher secondary schools by the random selection method. The sample also included 278 biology teachers and 60 experts. The tools used in the study included a Questionnaire, a Perception Scale, an Inventory of Physical Facilities, an Opinionnaire, an Achievement Test and an Attitude Scale. The collected data were analysed with means, percentages, product-moment correlation and chi-square.

Major Findings: (1) Hierarchy of the objective related to the teacher gave more importance to the knowledge, followed by understanding, application and skills. (2) Generally teachers were found to follow only the expository type of teaching strategies in their teaching of biology. They did not encourage discussion among the students and other student-centred teaching techniques. (3) The higher secondary biology syllabus was related only to the students' abilities and to their real life. It was not conducive to the students learning the scientific method, the development of scientific interests and a favourable attitude towards the study of biology in them and their appreciating the contribution of biology to human civilisation. Moreover, it was overloaded with facts, traditional and product-oriented. (4) The biology textbook too was found to be defective in many respects. It did not include a glossary of technical terms, an index, list of assignments, list of practical activities and list of local fauna and flora. There were many printing mistakes. The technical terms were not fully described and some of the diagrams were not fully labelled. (5) The biology laboratories were in a bad shape. A full complement of chemicals and equipment was not found in many schools and they did not have essential teaching aids, too. (6) Objective type questions were not asked in the final higher secondary examinations conducted by the Government of Tamil Nadu and there were no questions testing the 'Application' objective in biology. Even questions testing the 'Skills'

objective were few. All the questions seemed to encourage rote memory of the students. The practical examinations only tested the knowledge of skills and not the skills themselves. (7) The urban boys did not show greater achievement in biology than the rural boys and the urban girls respectively. But the urban girls showed greater achievement in biology than the rural girls and the rural boys too showed greater achievement in biology than the rural girls, in respect of the four objectives of teaching biology, viz. knowledge, understanding, application and skills. The performance of +2 biology students was the best in respect of the items testing skills and the poorest in respect of the items testing understanding. (8) The majority of +2 biology students had a favourable attitude towards the study of biology. Boys in urban schools did not have a more favourable attitude towards the study of biology than the girls of urban schools and the boys of rural schools. But the boys in rural schools and the girls in urban schools had a more favourable attitude towards the study of biology than the girls of rural schools. (9) There existed a positive relationship between the higher secondary students' attitude towards the study of biology and their achievement in it. [MDa 1281]

Vaidya, N. 1988. **The determination and development of schemes of thought in science during adolescence.** Independent study. *National Council of Educational Research and Training.* (ERIC Funded)

Problem: The present study is an attempt to develop paper-pencil test of Piaget-type tasks to understand various dimensions of adolescent thought and to determine the mathematical structure of these tasks through factor analysis. Further, it is also intended to study the relationship of certain independent variables like age, sex, school, intelligence, personality traits, spelling ability, grammatical ability and total linguistic ability with different dimensions of adolescent thought.

Objectives: (i) To determine the incidence of

performance of logical thinking by tasks, schemes of thought and total adolescent thought through a paper-pencil test of Piaget-type tasks, (ii) to find out the effect of age, sex and typology of school on the performance of Piaget-type tasks, schemes of thought and total adolescent thought, (iii) to find out the effect of intelligence (non-verbal), linguistic abilities, and personality traits on the performance of Piaget-type tasks, schemes of thought and total adolescent thought, (iv) to determine the relationship of performance on Piaget-type tasks, schemes and total adolescent thought with the independent measures of non-verbal intelligence, linguistic abilities and personality traits, (v) to determine the inter-relationship between different Piaget-type tasks and schemes of thought, (vi) to find out the mathematical structure of the tests and tasks used in this study, and (vii) to point out the main educational implications arising out of this study.

Methodology: The sample consisted of 980 students (490 boys and 490 girls) selected randomly ranging in age between 11+ to 16+, studying in Grades VI to XI. Tools used to collect the data were Culture Fair (free)-Intelligence Test (non-verbal) Scale II by Cattell and Cattell, Differential Aptitude Tests (Form LH), Language Usage by J.M. Ojha, Junior Senior High School Personality Questionnaire (HSPQ) by S.D. Kapoor and K.K. Mehrotra, and test of Piagetian type tasks developed by the investigator. Collected data were treated with mean, median, mode, SD, 't' test, CR, analysis of variance, correlation, and factor analysis.

Major Findings: (1) It was found that there was a definite difference in performance on different Piagetian type tasks between different age levels. (2) It was found that logical growth took place during the entire period of adolescence. (3) Piagetian type tasks did not favour any specific gender as a whole. When the scores of eight schemes of thought were tested against sex categories, 23 't' ratios out of 56 were found to be significant and 33 non-significant. (4) It was also found that students of private

schools performed better on all the tasks than those of the government schools. (5) There existed no difference in the performance on scheme of thought between boys of government and private schools. It was the other way in the case of girls. (6) It was found that the measures of intelligence correlated significantly with all the variables of adolescent thought. (7) The total linguistic ability and measures of adolescent thought also correlated significantly. (8) As regards the personality factors and measures of adolescent thought, there was no significant correlation on all the factors. [CGVM 1133]

Vaidya, N. 1991. **Developing teaching-learning strategies for enhancing student achievement in science.** Independent study. *National Council of Educational Research and Training* [ERIC Funded].

Problem: According to Piaget, formal reasoning begins at 11+. The present study attempts to examine whether Piaget-type tasks could be tackled at 10+ or not. If not, could the children of 10+ be trained to tackle those tasks and thereby achieve what we can call acceleration of thought.

Objectives: (i) To collect and survey research findings relevant to classroom teaching in the area of motivation, reinforcement, thinking skills and classroom control, (ii) to relate these research findings to content in science by writing lesson plans and modules, (iii) to test the lesson plans/modules empirically under controlled conditions, and (iv) to develop teaching-learning strategies for the enhancement of achievement in science.

Methodology: A random sampling method was adopted to draw 33 children who were studying in Grade VI of the Mother's School and the Mirambika School. Relevant data were collected using a questionnaire and the modules. The collected data were treated with percentages.

Major Findings: (1) It was possible to discern

a pattern of common thought with coefficients of fluctuations of thought remaining under the permissible limit of 10%. (2) It was possible to accelerate thought under certain conditions such as arranging thought-provoking problems in their hierarchical order but abstract Piagetian schemes of thought were difficult to crack. (3) It was very much possible for children to help themselves in their day-to-day teaching-learning provided, the teacher did not always insist on the right answer. The wrong answers, in fact, revealed the evolving structures of their logical thought. [Author 1202]

Vedamani, Manuel N. and Exemmal, J. 1988. **Developing and testing models of environmental education in botany relevant for the socially disadvantaged children in the schools of Kerala.** Independent study. *Kerala Univ.* (ERIC Funded)

Problem: It is an attempt to identify different factors and develop different models of environmental education in botany relevant for the socially disadvantaged children in the schools of Kerala, which could be handy for teachers and in-service workers.

Objectives: (i) To analyse the textbooks and other materials relating to environmental studies produced by the NCERT and some staff systems from the point of view of components which might facilitate or hinder genuine environmental approach, (ii) to analyse the content and treatment of botany in schools since this area has a relatively high potential for environmental education, (iii) to analyse some worthwhile environmental education models in India and abroad and other relevant materials from the point of view of developing a functional theory of environmental education, (iv) to identify some typical resources other than the textbooks which can be useful for environmental education, (v) to develop some models of tapping the hidden curriculum in ordinary environmental situations, (vi) to develop some models for environmental education in botany representing a reasonable

compromise between environmental education theory and the practical conditions in the majority of Indian schools, (vii) to develop a dialect between situational and structural approaches in the context of environmental education, and (viii) to identify educational settings in Kerala where such models can be tried out on a pilot basis.

Methodology: In the present study, the researcher has used documentary survey, analysis and textbook analysis apart from interviews and observation techniques.

Major Findings: (1) It was observed that from the point of content and approach, the environmental science textbooks did not seem to have made a revolutionary break from what existed 50 years earlier or so at the primary level, but content boundaries were clearly maintained.

(2) A good representation of work experience was found in the book, but cases were not wanting where the representation were either not quite effective or left overtones with questionable implications. (3) On the whole, the pictures satisfied the purpose they were intended for and were attractively printed in colour. (4) The language of the books was quite simple and care was taken to put technical terms wherever possible in a simple form. (5) The Kerala texts attempted to keep close to the national originals. (6) The researcher proposed six models which included (a) Ethno science, cutting into the process of science, (b) Process approach applied to the living world, (c) Application-oriented models, (d) Ecology activity-oriented model, (e) Inter-disciplinary models, and (f) Higher explorations. [CGVM 1141]

Also See

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