CHAPTER - 3

The competent physician must keep abreast of the latest discoveries in the field of medicine, obviously.

The careful student of education, the research worker and investigator should become familiar with the location and use of source of educational information.

- Good, Ban, Scates -
CHAPTER - III
PEEP INTO PAST STUDIES

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3.0 INTRODUCTION:

It is essential for a research worker, before taking up any research, to peep into the research literature available in the field of his problem in order to develop insight into the problem. It helps the researcher indirectly to frame out an appropriate design for the problem at hand by providing the information with respect to the variables studied and the methods, measures and approaches employed by other researchers. It is also necessary for a researcher to summarise the major research findings. The present chapter, therefore, is devoted to the review of related literature. A number of researches have been carried out in the field of teaching and learning of concepts. Here, some of these researches related to the present problem have been presented. For proper understanding, the researches have been grouped, under the following categories:

(1) Concept learning;
(2) Different strategies of teaching concepts;
(3) Bruner's C.A.M.;
(4) Influence of Student characteristics.
(5) Relevant Researches.
3.1. CONCEPT LEARNING: A REVIEW:

A large number of researches were conducted in order to study the conceptual behaviour of learners, that is, how concepts are acquired by them. These researches were reviewed by Sax (1969), Johnson (1971) and Mayer (1982). These researches were grouped under the following categories:

1. Hypothesis Testing
2. Features of Stimulus Objects
3. Task Variables
4. Prototype V/s Distinctive Features
5. Structures of Categories.

3.1.1. Hypothesis Testing:

Concepts may be learnt either by forming and testing hypotheses about the correct rule or by reinforcement. The Kendlers (1955, 1959, 1962, 1975) observed that there was a developmental change from reinforcement learning in preverbal children to hypothesis testing in older children and adults. Levine (1975) supported this conclusion. Bower and Trabasso (1963, 1964, 1968) concluded that hypothesis testing best described learning in adults, whereas analogous studies with animals favoured reinforcement learning.

3.1.2. Features of Stimulus Objectives:

The degree of abstractness of relevant features has an obvious effect upon concept learning. Heidbreder (1946, 1947)
found that concrete concepts were easier to learn than concepts of geometric or spatial forms. Concepts of abstract numbers were the most difficult to learn. Johnson (1967) found that colour concept was easier to learn than form. In another experiment, concepts based on colour were learnt more quickly than concepts based on angle, but learning was faster if both colour and angle were redundant than if just one feature was relevant (Trabasso, 1963, Trabasso and Bower, 1968). Learning was greatly enhanced if learners' attention was focussed on relevant dimension of a stimulus (Hull, 1920). Similarly, Zeaman and his colleagues found that for mentally retarded subjects, the pattern of learning was similar to that for normal learners if the relevant dimension was pointed out to them.

3.1.3. Task Variables:

Several features of task influence concept learning. Several studies (Bourne, 1966, 1970; Haygood and Stevenson, 1967; Bourne, Ekstand and Dominowski, 1971) indicate that the type of the concept influenced learning. Single value concepts, conjunctive concepts and conditional concepts were easier to learn than concepts involving two values, disjunctive concepts and biconditional concepts, respectively. The learner proceeds from assumption for a simple concept to altering the assumption for a more complex one.
Secondly, the number of relevant or irrelevant attributes influence concept learning. Increasing the number of relevant dimensions decreased solution time (Bourne and Haygood, 1959), whereas increasing the number of irrelevant dimensions or their values made learning more difficult (Bourne, 1966; Bourne and Haygood, 1959; Johnson, 1966).

Thirdly, concept learning is influenced by the type of examples. Hovland and Weiss (1953) and Bourne et al. (1971) found that subject learnt faster from positive examples than from negative examples. This finding was supported by Friebergs and Tulving (1961), Braley (1963), Simon (1968). According to them negative examples alone placed a considerable burden on the memory of a learner. However, some subjects were able to make use of negative examples, if they were given practice. Smoke (1933) observed that students learnt better in the mixed series of positive and negative examples than in the positive series alone. Presence of negative examples prevented errors. Later studies by Hovland (1952), Huttenlocher (1952), Oslon (1963), Cook (1980) and Gibson (1985) confirmed the findings of Smoke's study.

Bruner et al. (1956) have argued that in disjunctive concept formation negative example was more effective than positive example because it eliminated a larger number of possible concepts. Yet, the subjects tended, to prefer
(though incorrectly) to use positive examples to form disjunctive concepts also. Huttenlocher (1962) found that negative examples were highly effective with conjunctive concepts if sufficient information was provided per example. Yudin and Kates (1963) concluded that negative examples helped in concept learning only when they were accompanied by some positive examples.

The way of presenting the examples also affects concept learning. Simultaneous presentation of examples is more effective than the focus condition, which, in turn, is better than successive presentation (Cahill and Hovland, 1960; Kates and Yudin, 1964; Rai, 1968).

Finally, delay of feedback or reinforcement has little or no effect upon concept identification, but delay between feedback and next stimulus actually improves performance (Bourne and Bunderson, 1963). As the post feedback interval lengthens, the improvement continues.

3.1.4. Prototype Versus Distinctive Features:

Concept learning task may be performed by forming an internal prototype, that is, by averaging all the examples into a schematic representation or by focusing on a few distinctive features that characterise the stimulus. According to some researchers (Posner and Keele, 1968, 1970; Posner, 1969,
Franks and Bramford, 1971), learners form prototypes for complex visual patterns. On the contrary, Neumann's study (1977) has shown that when the stimuli were complex, subjects tended to use a distinctive features strategy, but for simpler or more familiar stimuli, there was a higher tendency to rely on prototype abstraction. Apparently there are individual as well as situational differences in the learning tendency to use one or the other strategy.

3.1.5. Structures of Categories:

Learning of "natural" categories in the real world is different from learning of artificial categories (Rosch, 1975a, 1975b). The real situation may disrupt or inhibit awareness of those elements which are necessary for concept learning. People do better in school problems than in real life (Marks and Ramond, 1951). Rosch and others (1976, 1978) found that people could better use "basic level" categories (e.g. table) than "super-ordinate" categories (e.g. furniture) or "subordinate level" categories (e.g. kitchen-table). Children mostly began to classify objects at the basic level.

3.2. DIFFERENT STRATEGIES OF TEACHING CONCEPTS: A REVIEW:

A number of instructional strategies were tried out by the former researchers to ascertain their effectiveness for teaching concepts in different subject areas. These strategies have been classified into following groups:
(i) Definition-cum-example/attribute strategies, and
(ii) Example-cum-nonexample strategies.

3.2.1. Definition-cum-Example/Attribute Strategies:

Anthony (1980) determined whether concept based training was a viable means to acquire higher order test administration skills. The sample comprised 11 school psychology trainees. The concept based training included analysing concept definition, viewing a video taped protocol of a WISC-R administration and discriminating correct from incorrect instances of the administration skills. The non-training group received instruction on the topics unrelated to the target skills. Each subject in both the groups administered the WISC-R before and after the training. They also took a concept identification test. The concept based training group performed significantly better than the non-training group on concept acquisition and test administration skills.

Tanner (1980) determined whether or not the presentation in lab-instruction of definition and examples and non-examples or defining attributes would enhance concept attainment. The sample comprised 140 college/zoolgy students. Concept mastery was tested through multiple choice questions. The effects of instruction coming across the task were also examined. The presentation of Mastery learning examples and non-examples did not have significant effect on concept or task score, but mean task score increased when definitions
were put on the black-board. Task type had a significant effect on task scores. Students scored higher when choosing examples or relevant attributes than when choosing non-examples or irrelevant attributes.

Prupavadee\(^3\) (1980) investigated into acquisition of mathematical concept by using prototype and skill development instructional presentation forms. The sample consisted of third grade children. The first treatment consisted of a list of critical attributes and the best examples. The other one was a presentation from including an expository/inquisitory form and an inquisitory form only. A post test and retention test were administered. The ANOVA results revealed that concept learning was more greatly facilitated by a presentation of the best examples than by a list of critical attributes. No difference was found between the two presentation forms: expository/inquisitory form and inquisitory form only.

Epsten\(^4\) (1981) compared the effects of the training in imaginative symbolic play with the training in classification on the modification of cognitive skills in low SES - preschool children. He also studied, the effect of play training V/s Category training on imaginative play behaviour. The sample comprised 36 children enrolled in two-day care centres. The children in play training group were encouraged to assume different rules and to transform sample props into imaginary objects. Category training focussed on investigating the properties of common objects and
on examining their similarities and differences. The control group was allowed to play in any manner with the play props. The groups were pre-tested and post-tested on the Sigel Object Categorisation Test. The play group improved significantly in their play after training. The play group continued to improve while the category group declined in classification skills over time and became increasingly bored and inattentive.

Eltayeb (1981) examined the effect of pictorial representation - Abstract Picture Treatment (APT) and Realistic Picture Treatment (RPT) on Concept Attainment. The sample comprised 156 sixth graders rank only and assigned to one of the three conditions: (a) the use of the text explaining the concept accompanied by ten abstract pictures; (b) the same text and ten realistic pictures; and (c) on the text. The Gestalt Competion Test and a criterion test were administered. Multiple regression and correlation methods were used for analysing the data. APT was found to be significantly more effective than RPT. Positive and higher correlation was found between APT and concept attainment, while negative and lower correlation was found between RPT and concept attainment.

Vermette (1983) developed and evaluated Exemplar Intensity Model and compared the use of the developed model and the use of the definition alone. Two lessons were designed on the line of exemplars. A control group receiving no instruction helped determine that the two lessons had indeed caused
learning to take place. Exemplar intensity did not affect concept learning. The use of the model resulted in higher achievement than use of the definition alone.

Crisman (1984) compared three techniques of presentation of terms of concept attainment. Twenty-four eleventh grade students were taught two social concepts—one conjunctive and the other relational—with the help of two instructional modes—oral and written. Three techniques of presentation were: definition and critical attributes only, definition and critical attributes followed by four examples, and four examples followed by definition and critical attributes. The California Achievement Test was used. Results indicated that students scored significantly better when examples were presented. The relational concept was attained better when definition and critical attributes preceded examples, but in the case of the conjunctive concept the sequence was not important. There was no significant difference in concept attainment when the oral and written modes were compared.

Learning style appeared as a student characteristic significantly different from student academic achievement.

Boomer (1984) conducted a pilot study and an experimental study to teach language concepts to six physically handicapped and language delayed children with the aid of a computer. The pilot study consisted of administering a real
real object pre-test for three concepts namely, 'over', 'next to' and 'under', teaching the concepts and re-adminis-
tering the test. These concepts were taught one at a time starting with 'over' and as each concept was mastered another concept was introduced and their discriminations taught. The results indicated that 'substantial learning had occurred'. In the experimental study the concept 'next to' was taught to three language delayed subjects using multiple designs with two of these subjects acting as a control at all times. This study consisted of using the computer to collect baseline data on 'next to', teach 'next to' and recollect baseline after the concept was taught. The results indicated that the gains made by two of the three subjects were attributable to the teaching by the computer.

Fancreyer (1984) compared the outcomes of three approaches, namely, a deductive method FEP with the sequence of Formalisation (F), Experimentation (E), and Practice (P), and two inductive methods EFP and EPF. The sample comprised 168 seventh graders. The data were collected by administering four achievement tests at different levels of attainment and a retention test. The deductive group FEP scored relatively high while the EPF group scored relatively low. It was concluded that a deductive method may yield higher achievement than an inductive one for students in grade seven. Definitions can be used as an initial focus or advance organiser.
Jacka (1985) compared two treatments, expository and guided discovery, for teaching defined concepts of Latin and Greek Morphographs. The two treatments were presented in the form of self-instructional programmed booklets and they differed with respect to the point in the learning sequence at which the definition was provided. In the expository treatment the definition of a morphograph was presented prior to the first exercise. In the guided discovery treatment, the same exercises were used, however, the definition was not provided at the outset. The subjects were required to work out the meaning for the morphograph by comparing the examples and they could check the definition finally arrived at with the definition given at the end of the exercises. An immediate and a delayed tests and two transfer tests were administered to collect the data. The data analysis revealed that the guided discovery approach is as effective as the expository method on all measures.

Ceballos (1986) compared inductive and deductive methods in terms of mastery of the concepts and reasoning and thinking ability. The sample comprised 36 fourth graders. The New Jersey Test of Reasoning Skills was administered. A 2 x 2 Factorial Design and ANCOVA were used. He found that there was no significant differences between or within groups. For the age group under study, inductive and deductive approaches were equally effective in promoting concept formation/
attainment and in fostering the metacognitive strategies that are crucial to higher-order thinking.

3.2.2. Example-cum-Non example Strategies:

Joseph (1979) studied the interactive effects of a field dependent/global cognitive style varying on a continuous scale of general mental ability in the acquisition of five mathematical concepts. The sample comprised 90 sixth grade students. The three instructional strategies were deductive, inductive and cued inductive. The deductive strategy identified, defined and presented positive and negative examples with explanation. The inductive strategy identified, concepts and presented labelled positive and negative examples without explanation. The cued inductive strategy presented positive and negative examples with verbal emphasis and direct attention towards relevant attributes of concept. An immediate post-test, an alternate item three-day delayed post-test, Group Embedded Figures Test and The California Test of Basic Skills were administered. The level of general mental ability rather than cognitive style accounted for most of the variance. None of the three strategies was found to be of more beneficial for the sample population. The deductive strategy, however, had a significant value on the multiple regression and a post hoc Scheffe's analysis.
Cook (1980) examined the use of positive instances or negative instances in learning concepts of college algebra and the effects of the treatments on students' attitude towards mathematics. The sample consisted of 71 college students. The students in Group I studied 15 algebra concepts through the use of positive and negative examples while the students in Group II received positive examples only. Both the groups were pre-tested and post-tested on concept acquisition and attitude towards mathematics. The one way ANOVA revealed that Group I learned concepts of algebra significantly better than Group II. Both the groups showed improvement in attitude towards mathematics, but Group I showed a significant improvement whereas group II did not.

Simmon (1980) studied the effects of different kinds of negative instances on identification of familiar "activities" concepts. The sample comprised 60 boys and girls of 7, 11 and 15 years of age. The mode of presentation was one focal positive instance and three instances with a type of information (positive, opposite negative or closely related negative). The dependent variables were the numbers of instances needed to identify the concept and accuracy and consistency of naming the concept. A 4 x 3 x 2 ANOVA with repeated measures revealed that negative instances were less effective than positive ones, older children performed better than younger children, and sex had no significant effect on concept identification. The study suggested that the ability to use positive
instances might develop between ages 7 to 11 and the ability to transform negative instance information in a particular form might develop between ages 11 and 15.

Sheel (1981) studied the effect of negative instances and positive instances on the initial achievement and retention of the selected calculus concepts. The sample consisted of 62 college students. The Lecture-discussion approach was employed. The experimental treatment consisted of positive and negative instances while the control treatment consisted of an equal number of all positive instances. The ANCOVA results revealed that there was no significant difference between the two groups at the initial achievement test or at the retention test.

Hunnicutt (1982) compared three methods of using examples and non examples for teaching social studies concepts. The sample comprised 102 ninth grade students. The three methods were: M₁ presented a rational set of examples and non examples, M₂ presented a set of contiguous examples followed by a rational set of examples; M₃ presented two examples, of each concept. The results revealed that the M₂ group scored the highest on the post-test, whereas the M₃ group scored the Lowest. M₂ differed significantly from M₃, but no significant difference was found between M₁ and M₂ and also between M₁ and M₃.
McKinney et al (1984) examined three methods of teaching concepts reading - recitation method, Gagne's model of presentation of examples and non examples only and Merrill and Tennyson Model. The sample comprised 95 sixth graders. The Merrill and Tennyson treatment consisted of a definition expressed in terms of critical attributes, an expository presentation of examples and non examples and an inquisitory practice presentation. Gagne's model utilised an inductive approach. It consisted of a presentation of examples and non examples only and the students were required to induce a definition or set of critical attributes. The reading recitation treatment consisted of an introduction, silent reading, oral reading and teacher questions. All the three groups were taught two social studies concepts and were post-tested after each lesson. A 3 x 3 x 2 Factorial ANOVA revealed that the Merrill and Tennyson Model was more effective than either Gagne's model or reading recitation treatment. (The researchers reported that this result differed from that of their previous study (1982) conducted on the sample of 102 fourth grades, which showed no significant difference between or among the three treatment groups). No significant treatment aptitude (sex and reading ability) interactions were found.

Gibson (1985) examined the effect of a counter example presented before, and a counter example presented after a sequence of examples on learning of mathematical concepts. He also studied the effectiveness of the counter example strategy
on the learning of algebraic and geometric concepts. The sample comprised 132 fourth graders. A 4 x 2 x 2 Factorial Design MANOVA and a univariate ANOVA were used. He found that the use of the counter examples facilitated learning of more difficult mathematical concepts, but the position of a counter example was not an important factor. The counter example strategy was more effective with geometric concepts than with the algebraic concepts.

Burts et al. (1985) compared the effects of two presentation methods in Merrill and Tennyson design for teaching coordinate concepts. The sample consisted of 101 first grade students from two schools. A randomized post test only design was used. Method I consisted of a response-sensitive presentation (presentation order based on the correctness of student responses. Method II consisted of a response-insensitivities of students (randomly ordered). Method I was presented first in school 1 and second in school 2, while method II was presented in the school 2 and second in school 1. There was also a control group which helped determine whether learning took place or not.

A 32 item multiple-choice test was administered. Reading scores were taken as a covariate. The results on an ANCOVA indicated that the response-sensitive presentation was more effective than a response-insensitive presentation in teaching coordinate concepts.
3.3. A REVIEW REGARDING BRUNER'S C.A.M.

Since Models of Teaching were introduced in India in the last decade, the researchers have studied the effectiveness of Bruner's Concept Attainment Model (CAM) which was developed by Weil and Joyce (1978).

Chitriv (1983) compared the effectiveness of Ausubel strategy, Bruner strategy, and Traditional method on a five-fold criteria of concept acquisition in mathematics, namely, concept knowledge, concept transfer, heuristic transfer, short-term retention, and long-term retention. The relative effectiveness of Ausubel and Bruner strategies was also determined separately for the students of different conceptual style preferences. The sample comprised 127 students of class XI of Science Stream. Raven's Standard Progressive Matrices, Cognitive Style Test, previous knowledge test, concept knowledge test, concept transfer test, heuristic transfer test, concept retention tests I and II were administered. He concluded that Ausubel strategy was superior to traditional method in terms of knowledge, transfer and heuristic transfer of concepts; Bruner's strategy was superior to traditional method in terms of knowledge, heuristic transfer, short-term retention, and long-term retention; Ausubel and Bruner strategies were equally effective in terms of ability to acquire knowledge of concepts. Ausubel strategy was superior to Bruner strategy in terms of concept, transfer;
Bruner strategy was superior to Ausubel strategy in terms of heuristic transfer, short-term retention and long-term retention. Ausubel strategy appeared to be more suitable for teaching mathematical concepts to categorical style students while Bruner strategy appeared to be suitable for teaching mathematical concepts to students of all conceptual style preferences.

Kumara (1985) examined effectiveness of CAM in terms of concepts attainment and students' reaction towards CAM. The sample comprised of 70 students of class V. An attainment test in Science concept and a reaction scale were administered. t-test and chi-square technique were used. She concluded that CAM was much more effective for the attainment of Science concepts by fifth grade students. The students expressed favourable reactions towards CAM.

Pani (1985) compared concept attainment scores of groups taught through Reception and Selection Strategies of concept attainment. She also studied the effect of various personality factors on concept attainment scores of the groups. The sample consisted of 30 seventh grade students of rural area. The Jr. Sr. HSPQ and a concept attainment test were administered. Mann-Whitney U-test was used. She found that Reception and Selection Strategies were equally effective in terms of attainment of Science concepts. No differential
effects of various personality factors were found when the groups were taught through either strategy.

Passi, Singh and Sansanwal (1985-86) undertook a research at national level for developing training strategies for CAM and ITM (Inquiry Training Model) and studying their effectiveness terms of specific teaching competencies of preservice teacher trainees. The measurement tools, namely Indore Theory Check-up (MTC) separately for CAM and ITM Reaction Scales for teacher educators ($RS_1$), teacher trainees ($RS_2$) and school students ($RS_3$) separately for CAM and ITM, and Willingness Scales ($WS_1$ and $WS_2$) were developed. The project was undertaken at two phases: training phase and research phase. At the training phase 45 teacher educators were trained in CAM and ITM - through theoretical discussion, demonstration and peer-practice and feedback in quadro. The training strategies having variations in demonstration and peer-practice were compared in terms of the teacher trainee's understanding of the model, competency in teaching through the model, reaction towards the model and willingness to implement the model in schools. The sample consisted of 321 teacher trainees for CAM and 72 for ITM.

$TC$, $MTC$, $RS_2$, $WS_2$ and $RS_3$ were used. Teaching Analysis Guide (TAG) was used to measure competency of the trainees. The sample was divided into three groups for each model. The three CAM Groups differed significantly so far
as theoretical understanding of CAM, teaching competency, willingness to implement the model and reaction towards CAM were concerned. The reactions of all the three groups were favourable. The mean reaction of the school students taught by the teacher trainees of the three groups did not differ significantly.

Das (1986) studied the effectiveness of three different training strategies in CAM in terms of model competency of teacher trainees at the training as well as at the coaching stage. The researcher also studied the effect of personality factor and its interaction with the training strategies on model competency of teacher trainees at training and coaching stage. The sample consisted of 55 B.Ed. students of DAVV, Indore. The data were collected on 16 P.F. Cattell and on Teaching Analysis Guide and were analysed with one way ANOVA and factorial ANOVA of unequal cell-size. The results indicated that the three training strategies were equally effective in terms of model competency of teacher trainees at the end of training and coaching stage. The effect of personality factor on model competency was not significant at the end of training stage but it was significant at the end of coaching stage. The interaction of personality factor and teaching strategies had no significant effect on model competency of teacher trainees at either stage.
Bihari (1986) studied the effectiveness of three training strategies in learning CAM in terms of teaching competency of student teachers; understanding of the model; coaching through the model; reaction towards the model; and willingness to implement the model. The sample consisted of 55 B.Ed. students of DAVV, Indore. The data were collected on theory check-up (Joyce), MTC, Teaching Analysis Guide, Reaction Scale and Willingness Scale and analysed with ANOVA, ANCOVA and t-test. It was concluded that the three training strategies, namely, PPF in quadro, PPF in pairs and demonstration followed by practice in quadro were equally effective for developing teaching competency of student teachers.

Das (1986) studied the effectiveness of CAM in the teaching competencies of student-teachers; understanding the mode of reaction towards the model; and relation to previous experiences. The sample comprised 16 B.Ed. students of DAVV, Indore. The Reaction Scale and Teaching Analysis Guide were used, CAM was found effective in developing teaching competencies of student-teachers. Training in CAM had affected the teaching behaviour of student teachers at the coaching stage. There was no significant relationship between previous academic achievement of student teachers and their performance on CAM theory but it seemed that previous academic achievement was related with training of CAM.
Sharma (1986) studied the effectiveness of CAM in terms of achievement of students on attainment test based on concepts taught in Chemistry; and reactions of students towards the model. The sample consisted of 67 girls of class IX. Achievement test for Chemistry concepts and Reaction scale were administered, Chi-square test and t-test were used for analysing the data. The mean performance of the experimental and control groups on achievement test did not differ significantly. Students responded favourably towards majority of the statements on Reaction Scale.

Gangrade (1986) compared CAM (Induction type) with CAM (Deduction type) in terms of the number of attributes listed by the subjects while attaining concepts in Science and their reaction towards CAM. She also studied Induction type CAM in terms of the number of hypotheses formulated by the subjects. The sample comprised 45 volunteer girls of Class IX. Both the groups were taught three lessons. They were required to note down attributes and hypotheses of the concept being taught on a worksheet in each lesson. Reaction Scale was administered. The data were analysed with 2 x 3 Factorial ANOVA. The results indicated that the Induction Group could list higher number of attributes as compared to the Deduction group. Irrespective of the type of CAM, the students could list significantly higher number of attributes in the second lesson as compared to lesson 1 and lesson 3. The students in
the Induction group could state significantly higher number of hypotheses in lesson 2 than in lesson 1 and lesson 3. The students showed favourable reaction towards CAM as a whole.

Gangrade (1987) compared the achievement in Science of classes VII and VIII students taught through combination of CAM and Lecture Method (LM) with achievement in Science of those taught through Traditional Method by taking Intelligence, attitude towards Science and previous year achievement in Science as covariates. She also studied the contribution of intelligence, attitude towards Science, achievement value anxiety and previous year achievement in Science in the prediction of achievement in Science of Class VII and Class VIII students taught through combination of CAM and LM. The sample consisted of 104 students of classes VII and VIII. The post-test only control group design was used. Intelligence Test, Science Attitude Scale, Achievement-value-Anxiety, Inventory and a criterion test based on the taught topics were administered. The data were analysed separately for classes VII and VIII with the help of ANCOVA and multiple regression analysis. The combination of CAM and LM was found significantly superior to TM for teaching Science to classes VII and VIII when the groups were matched statistically in respect of intelligence, attitude towards Science and previous year achievement in Science. For predicting achievement in Science of classes VII and VIII students taught through CAM and LM regression
were taught two concepts of Hindi Grammar, viz., Sangya (Noun) and Sarvanam (Pronoun). The groups were pre-tested and post-tested on criterion test. The ANOVA results indicated that MLM was significantly superior to CAM and TM, while the latter two were found to be equally effective.

3.4. INFLUENCE OF STUDENT - CHARACTERISTICS: A REVIEW:

Besides instructional strategy, several student-related factors influence performance of the learners. Keeping this in view, the past researchers studied the relationship of student characteristics with concept learning and achievement in Science.

The findings of the researches to study the feasibility of integrating training in CAM in terms of reactions of pre-service teachers after each stage of training and reaction of school students. Ten volunteering teacher trainees having Science and English as methods constituted the sample. The training consisted of orientation in theory, demonstration and peer-practice and feedback. In the second stage the teacher-trainees taught concepts in Science to school students of Std. VI to X. Reaction Scales RS₁, RS₂ and RS₃ were administered. The data were analysed by computing t values and chi-square values. The results indicated significant impact of peer-practice feedback as well as of practice on performance of students teachers. Both the students and school students expressed favourable reaction towards CAM. It was concluded
that the teaching of Science concepts through CAM resulted in active involvement of students in their learning and encouraged independent thinking.

Chaudhary and Vaidya (1988) compared the effectiveness of CAM, related to the relationship between student-characteristics and concept learning were cited by Sax (1969) and Johnson (1971) Sex.

Mansfield (1960) found insignificant sex difference in concept learning. Elkind (1961), Archer (1962) and Osler (1963) reported that learning of concepts was easier for men than for women.

King (1963) conducted a developmental study of Science concepts and found sex differences at the high school level but not among ten years old.

Joshi (1970) found significant sex differences in the understanding of algebraic concepts.

Rollins (1980) studied the influence of sex on attainment of Science concepts and concluded that the male students attained significantly higher scores on a criterion test.

Simon (1980) found no significant effect of sex on identification of "activities" concepts.
Gakhar (1981) and Jabbal (1981) found that sex did not significantly influence the acquisition of mathematical concepts.

Shephard (1984) reported that there was no significant effect of sex on understanding of formal biological Science concepts.

Lynch (1986) concluded that sex significantly affected the mastery of saptial concepts.

Intelligence:

Mansfield (1960) found insignificant relationship between speed of conditioning in concept learning and WAIS scores.

Osler and Trautman (1961) found that children of normal intelligence learnt concepts through S-R associate learning, while brighter children used hypotheses to develop concepts.

Joshi (1970), Gakhar (1981) and Jabbal (1981) found high and positive correlation between intelligence and acquisition of mathematical concepts.
3.5. REVIEW OF CAM WITH REFERENCE TO OTHER FACTORS:

Research work on CAM with reference to other factors like cognitive style, personality etc., were reviewed in the coming caption too.

Eltayeb (1981) reported that cognitive style did not influence concept attainment significantly. The interaction of cognitive style with Abstract Picture Treatment showed significant effect on concept attainment, while the interaction of cognitive style with Realistic Picture Treatment did not.

Sheel (1981) found no interaction effect of cognitive style and treatment on learning of calculus concepts.

Poslock (1982) found significant effect of interaction between cognitive style and instructional strategies. For broad categorisers, when learning abstract concepts, deductive modes was more advantageous than inductive mode. For narrow categorisers both the modes were equally advantageous.

3.5.1. Personality Factors:

Contessa (1980) found no significant relationship between personality factors and acquisition of Science concepts.
Pani (1985) reported no differential effects of various personality factors on attainment of Science concepts.

Das (1986) studied the effect of personality factor and its interaction with the training strategies on model competency of teacher trainees. He found that the effect of personality factor on model competency was not significant at the end of training stage but it was significant at the end of coaching stage. No significant interaction between personality factor and training strategies was found.

3.5.2. Other Factors:

Rollins (1980) found learning experience to have significant effect on attainment of earth Science concepts. The students with more than two years of Science background attained significantly higher scores.

Gakhar (1981) concluded that SES was significantly correlated with the students' performance on mathematical concept test. Interest in mathematics did not significantly influence the acquisition of mathematical concepts.

Jabbal (1981) found significant effect of age on formation of mathematical concepts. Students senior in age secured better marks.
Chitriv (1983) reported that CAM was suitable to the students of all conceptual style preferences for acquisition of mathematical concepts, whereas AOM was suitable to categorical style students.

Shephard (1984) studied the relationship of background variables of students such as chronological age, SRA Science score, SRA biology sub-score and level of intellectual development to understanding of concepts. Significant correlations were found between both the formal and concrete concepts and all background variables with the exception of age for both classifications of concepts.

Davis (1984) studied the relationship reading ability and concept formation. He found significant difference between poor readers and adequate readers in verbal concepts formation, but not in basic concept formation.

McDonald (1986) studied relationship between locus of control concept attainment strategy (wholist or partlist) and the number of trials for the solution of the problem. The results indicated statistically significant differences between locus of control, strategy utilisation and number of trials used in solving the problem. No interaction effect of locus of control and utilised strategy was found on the number of trials for the solution of the problem.
3.6. **SPECIFIC RESEARCHES IN DETAIL:**

Keeping in view the Research Methodology, the specific researches were reviewed in detail.

3.6.1. **Effect of Advance Organizers and Concept Attainment Model on Teaching Competence**: U.S. Chaudhari and Shobha Vaidya:

There is a wide spread dissatisfaction about the quality of teaching and its outcomes. Therefore, number of innovative practices are being evolved. Latest among the approaches to teaching is the focus on the models of teaching. In our country researches have not been conducted on the various models of teaching. Very recently attempts have been initiated in this direction. (Chaudhari, 1981, 1985-86, Chaudhari and Vaidya, 1989, Malik, 1985 and Gangrade, 1986), Vaidya et al., 1986). In the study cited above facilitate effect of advance organizer model (AOM) and Concept Attainment Model (CAM) have been found. In these studies suggestions have been made to undertake further studies to arrive at precise conclusions.

In the present study an attempt has been made to study the effect of AOM and CAM on teaching competence of student teachers. The problem was analysed in the level of the major objective and further translated into the following null hypotheses:

1. There will be no significant difference between the mean gain scores of the student teachers teaching through three different methods.
(2) There will be no significant difference between the mean gain scores of the student teacher teaching through CAM and AOM.

(3) There will be no significant difference between the mean gain scores of the student teacher teaching through CAM and TM.

(4) There will be no significant difference between the mean gain scores of the student teachers teaching through AOM and TM.

Design of Study:

The present study was an experimental study. The experiment was conducted on the student teachers of B.Ed. (Department of Education, University of Indore). 30 students were selected on voluntary basis, and assigned to three groups on the basis of intelligence. Analysis of variance was similar.

Analysis of variance was used to check whether the mean gain scores obtained on the criterion test by the different group differed significantly. The significance was determined. 'F' value was found significant. Sctffs's 't' test was employed again to find out the significance of 'F' ratio obtained by Analysis of Variance. No significant difference was found in the competency of student teachers teaching through AOM and TM. The findings of this study,
therefore, suggest that the concept attainment model could be used for ameliorating the teaching competence of the student teachers. However, the constraints of the study do not permit wide generalization. In order to arrive at dependable and precise conclusions similar studies should be conducted on a larger sample with greater vigour.

3.6.2. "Effect of Concept Attainment Model upon Pupil Achievement and their self-concept" (Chaudhari and Vaidya)

There are three variations of CAM:
(1) Reception Concept Attainment Model
(2) Selection Concept Attainment Model and
(3) Unorganised Materials Model.

For the present study the investigators have used Reception Concept Attainment Model. CAM has been found effective and conducive to acquiring concepts in various subject areas by the children, and thus to improve their comprehension and attainment, study of relative effectiveness of these models and methods is requisite to give guidance to the teachers to improve their teaching competence.

Hypothesis:
* There will be no significant difference between the mean gain achievement scores of pupils taught through CAM and TM.
* There will be no significant difference between the mean gains of pupils taught through CAM and TM on the measures of self-concept. In this study experiment-control (pre-test - post-test) parallel group design was used. The study was completed in three stages. Pre-test stage and Post-test stage.

Sample:

The study was conducted in the Government Bal Vinay Mandir. Higher Secondary School, Indore. The sample selected was purposive of the population. Out of 150 pupils studying in class 6th of the said school, 76 were selected on the basis of Intelligence and Socio-economic Status were randomly assigned to two groups to be taught through two different methods.

CAM provides a chance to analyse the students' thinking process, and to help them develop more effective strategies for thinking and concept attainment. In this study CAM has been found to facilitate achievement of learners in Hindi Grammar. This has an important implication for teaching grammar to the school children. Therefore, the language teachers may be trained in using CAM to employ it for teaching of grammar.
Reception Model of Concept Attainment can be used in the Indian situation with profit as it does not require elaborate or sophisticated technology except the competence and efficiency on the part of the teachers to develop suitable instructional material according to the syntax of the model.

3.6.3. "Effect of Mastery Learning and Concept Attainment Model on Achievement of Pupils of Varying Intelligence: (Chaudhari and Vaidya, 1989)."

The present study aims at investigating the effect of Mastery Learning Model (MLM) and Concept Attainment Model (CAM) on achievement of pupils of varying intelligence level. The focus of this study is on a comparative study of three methods namely MLM, CAM and Traditional Method (TM).

Hypotheses:

* There will be no significant difference in mean post test achievement scores of high intelligence pupils belonging to MLM, CAM and TM groups.

* There will be no significant difference in mean post test achievement scores of average intelligence pupils belonging to MLM, CAM and TM groups.

* There will be no significant difference in mean post test achievement scores of average intelligence pupils belonging to MLM, CAM and TM groups.
* There will be no significant difference in mean post test achievement scores of low intelligence pupils belonging to MLM, CAM and TM groups.

Sample:

The sample consisted of 114 pupils studying in the Government School of Indore City. The sample was purposive. The pupils were randomly assigned to three groups: One control and two experimental groups. The control group received treatment of traditional teaching, while experimental group one was exposed with MLM and two with CAM.

Findings:

In this study a significant difference was found between the mean achievement scores of experimental and control group. In other words, Mastery Learning was found more effective than the CAM and TM respectively in raising the achievement of pupils. CAM was found more effective than TM. It was also evident from this study that the high intelligence pupils were benefitted more by MLM than CAM and TM respectively. A significant difference between the mean achievement scores of average intelligence pupils belonging to experimental and control group was witnessed. Average intelligence pupils belonging to MLM group scored the highest. Pupils of CAM group were found superior to those belonging to TM, but inferior to those of MLM. Low intelligence pupils
derived greater advantage from MLM but equally profitted from the TM and CAM.

Thus MLM mode of instruction was found more effective in enhancing the achievement of the learners than either CAM or TM. As regards achievement of low intelligence learners, results showed significant difference between experimental and control groups. Experimental group I (MLM) differed significantly from experimental group II (CAM). MLM pupils differed significantly from those of control group. There was no significant difference between the achievement of low intelligence pupils belonging to CAM and TM groups. Therefore, it can be inferred that low intelligence pupils derived greater advantage from mastery learning strategy than the concept attainment and traditional method respectively. Thus, MLM was found superior to CAM and TM respectively. The probable cause of superiority of MLM might be its basic properties i.e., pin pointed specification of learning objectives, minimum level of learning outcomes (criterion based), feedback procedures, learning time and additional material.

The concept attainment model was found more effective than the traditional method only in case of the high intelligence pupils, whereas no significant difference was evinced between the achievement of average and low intelligence pupils.
Findings of this study as regards the facilitating effect of mastery learning strategy is supported by a number of earlier studies.

3.6.4. "Effect of Concept Attainment Model on pupils' achievement in Science" by Sangeeta Malhotra:

If the teacher is to adopt and restructure the learning experiences to meet the observations, interests and capabilities of the learner his approach to teaching should be in relation with objectives of teaching, nature of learner and nature of content.

All this requires training for effective teaching as a pre-requisite condition. Therefore training for effective teaching has become a fundamental goal underlying teacher training programme. A model of teaching is a plan or pattern that can be used for shape curriculum to design instructional materials and to guide instructors in classroom and other setting to the teachers.


The main objectives, Design and Findings of this research are given below:
Objectives:
The investigation was carried out with the following objectives:

1. To study the effectiveness of CAM in terms of (a) attainment of concepts of English; (b) achievement in English; (c) inductive reasoning; and (d) reaction towards CAM.

2. To compare CAM and Traditional Method in terms of (a) attainment of concepts of English; (b) achievement in English; and (c) inductive reasoning separately, by taking intelligence, socio-economic status (SES) and previous achievement in English as covariates.

3. To study the influence of treatment sex, self-concept and their various interactions on: (a) attainment of concepts of English; (b) achievement in English; and (c) inductive reasoning, separately.

4. To study the contribution of intelligence, SES, previous achievement in English and self-concept in the prediction of (a) attainment of concepts of English; (b) achievement in English; and (c) inductive reasoning, separately of the students taught through CAM.

5. To study the contribution of intelligence, SES, previous achievement in English and self-concept in the prediction of: (a) attainment of concepts of English; (b) achievement in English; and (c) inductive reasoning separately, of the students taught through Traditional Method.
6. To study the change in attitude towards English of the students taught through CAM as well as of those taught through Traditional Method.

7. To study the change in students' reaction towards CAM.

The sample comprised of 207 students of class IX. Of these 96 students (56 boys and 40 girls) of Ankur School, Fatehnagar, Amdavad, constituted the experimental group, while 111 students (56 boys and 55 girls) of Diwan Ballubhai Madhyamik Shala constituted the control group. This was an experimental study designed on the pre-test, post-test control group design. There were two groups: Experiment and control. The groups were matched statistically through analysis of covariance with respect to intelligence, SES and self-concept of covariance with respect to intelligence, SES and previous achievement in English. The Experimental Group was taught through CAM while the Control Group was taught through Traditional Method.

Thirteen grammar concepts of English, viz., subjects, verb, object, noun, pronoun, adjective, adverb, preposition, infinitive, gerund, present participle, past participle and question-tag were taught. The Experimental Group and the Control Group learnt the selected 13 concepts in 1060 and 400 minutes respectively. Both the groups
were pre-tested and post-tested. Attainment of concepts of English, achievement in English, inductive reasoning, attitude towards English and reaction towards CAM were the dependent variables. Treatment, sex and self-concepts were the independent variables.

Major findings:

The following were the major findings of this investigation:

1. CAM was found to be effective in terms of attainment of concepts of English, achievement in English, inductive reasoning and reaction towards CAM.

2. CAM was found to be significantly superior to Traditional Method in terms of attainment of concepts of English, achievement in English and inductive reasoning of the students when the groups were matched statistically with respect to intelligence, SES and previous achievement in English.

3. Treatment produced differential effects on attainment of concepts of English, achievement in English and inductive reasoning of the students. CAM was significantly superior to Traditional Method in terms of attainment of concepts of English achievement in English and inductive reasoning.

4. Sex, did not produce significant influence on attainment of concepts of English, achievement in English and inductive reasoning of the students.
5. Self-concept produced significant influence on the students' attainment of concepts of English. The three self-concept groups, i.e., high, average and low, differed significantly from one another in attainment of concepts of English.

6. Self-concept did not produce significant influence on the student's achievement in English.

7. Self-concept produced significant influence on inductive reasoning of the students. The high-self concept group differed significantly from the average and the low self-concept groups, while the latter two did not differ significantly in inductive reasoning.

8. None of the various interactions among treatment, sex and self-concept produced significant influence on attainment of concepts of English, achievement in English and inductive reasoning of the students.

9. Contribution of intelligence was found to be maximum in the prediction of attainment of concept of English in the both the CAM group and the traditional method. Self-concept also contributed substantially in prediction of attainment of concepts of English of both the groups, whereas and previous achievement in English did not contribute substantially in the prediction of attainment of concepts of English of either group.
10. Previous achievement in English alone was found to predict achievement in English of both the CAM Group and the Traditional Method Group.

11. Intelligence was found to contribute substantially in the prediction of inductive reasoning in the case of the CAM Group, but not in the case of the Traditional Method Group. SES, previous achievement in English and self-concept did not contribute substantially in the prediction of inductive reasoning of either group.

12. There was a significant favourable change in attitude towards English in the case of both the groups. However, CAM was superior to Traditional Method in bringing about significant favourable change in the students' attitude towards English.

13. Majority of the students expressed favourable reaction towards CAM at the completion of the first three lessons and at the completion of the treatment. There was a significant favourable change in their reaction towards CAM.

Concept Attainment Model developed by Bruner and his colleagues was used to develop concepts in Science of Std. VIII.

The objectives of her study were:

(1) To develop the certain concept in Science according to the selection of Concept Attainment Model viz., Carbon, Light, Microbial world.

(2) To prepare a teaching strategy syntax according to selection of Model.

(3) To study the effect of CAM - selection strategy in context with the traditional teaching method.

(4) To study the effect of CAM with reference to the sex.

(5) To study the effect of CAM with reference to their intelligence.

(6) To study the interactive effect of sex x intelligence on the achievement of pupils in Science.
Research Methodology:

To study the hypothesis, the investigator had used the ANOVA technique using $2 \times 2 \times 2$ Factorial Design.

Conclusions and Findings:

(1) The CAM technique is found effective on the achievement of Science. This result is supported by the finding of Pande, M.R., Valand, H.C., Daraji and K.C. Gandhi, (1976).

(2) In this study, the I.Q. as one of the independent variable, plays not effective role in achieving the scores in science taught by either way.

(3) There is no any significant sex difference on the achievement of the students in Science.

(4) No interactive effect of I.Q. and Treatment was found significant on the achievement in Science and the boys of student opinion, it is found that students could learn the science concepts with the burden of learning.
3.7. RESUME:

From the review made in this chapter, it is found that the models of teaching are systematic and scientific and they are very essential in helping the children learn concepts during schooling. To build the clear picture of the concept in the mind of the students, it is a basic need for the teachers to use the right and proper techniques or approaches to teach concepts. The Concept Attainment Model developed by Joyce and Weil may be found very fruitful as its base is the thinking process organised by Bruner. So the investigator had to prepare a complete format - programme to develop concept that format for the concept development are prepared and put on civil.
References


