CHAPTER 1

INTRODUCTION

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CHAPTER 1

INTRODUCTION

1.1. Conceptualisation of the Problem.

We live in a cognitive society, which expects thinking skills more than at any time in the past. The people who do not practise to think need not be surprised when others start doing it for them. In the post-industrial, educated bureaucratic societies the prime skills are no longer manual skills but mental skills.

Analytical thinking is the logical, structural and rigorous mode of thought which characterises, for example, the deduction of formal proofs in logic or the systematic testing chains in Mathematics.

Mathematics deals with patterns and relations, and it is an abstract subject. Learning Mathematics involves thinking mathematical ideas. Concepts and generalisations make up the content of Mathematics. To form mathematical ideas, children must use cognitive processes such as comparing and inferring. If teaching stresses concepts and generalisations, children can understand and apply Mathematics more readily. The teacher's role is to encourage children to use cognitive processes. The teacher must avoid thinking for the child.
The instructional process or teaching has traditionally comprised instructors, learners and content. The content to be learned was contained in the text and it was the instructor's responsibility to "teach" that content to the learner. Teaching could be interpreted as getting content from the text into the minds of the learners in such a way that they could retrieve the information when and where necessary and apply it accurately. A more contemporary view of instruction is that it is a systematic process in which every component - teacher, learner, materials and learning environment - is crucial to successful learning. Learning has occurred when students have incorporated new information into their memories that enables them to master new knowledge.

Gagne (1985) developed the cognitive views of learning and instruction. Constructivism is a recent branch of cognitive psychology. The central point of constructivist thinking is that learning is a unique product "constructed" as each learner combines new information with existing knowledge and expressions. The constructivist view of learning is so entwined with one's experiences. Hence the primary role of the teacher is to create appropriate learning environments. According to constructivism, learners actively construct their own understanding of the concepts, phenomena and ideas. The students are not passive vessels having small amounts of extra information poured into them as they learn. Here all new information is approached using knowledge structures. When a new concept is
learned, the constant reworking of knowledge structures is formed in order to incorporate the new information. The cognitive aspect of learning theory deals with the problem of how people gain an understanding of themselves and their environment and how using their cognition, they act in relation to their environments (Bigge, 1981).

1.1.1. Developing Metacognitive Skills

Metacognition is defined as mental activities used to plan, monitor and control problem solving, comprehension, memory and other cognitive processes. Some researchers describe these processes as "thinking about thinking". Many educational psychologists agree that teaching metacognitive skills is one of the more important aspects of education (Flavell, 1985; Sternberg, 1990). Because our knowledge base in all disciplines is expanding at a phenomenal rate, more efficient means of organising and retrieving information are necessary. To cope with the abundance of information, students need to store data systematically, and retrieve and comprehend pertinent content.

According to Perkins (1988), good thinking is not something that comes naturally; it requires developing tactics, strategies, techniques and methods. In the class, it is the teacher's role to ensure that the learning environment has a minimum of obstacles and disruptions. This requires teachers to establish and maintain a
classroom atmosphere that encourages positive attitudes between students of varying abilities and social environments.

Problems that students have in the classroom learning are the result of lack of metacognitive skills. Many students have little cognitive prompting and monitoring. Gullnick and Chinn (1954) suggested the following, which help teachers to capitalise on the difference among their students.

(i). Place the student at the centre of the teaching and learning process.

(ii). Believe that all students can learn.

Bruner (1982) suggested that by helping students discover the context and information within the context of a field of study, teachers can help them remember and apply what they have learned. When students learn on their own it is more meaningful than when they learn as a result of others. To enhance that new information will be remembered, students should be active rather than passive (Glover & Bruning, 1990).

1.2. Need and Significance of the Study.

The Constitution of India provides special concessions to the deprived and the disadvantaged sections of the society, to enable them to catch up with the rest of the population in the process of development. In pursuance of Articles 341 and 342 of the Constitution, certain castes and tribes have been included in the schedule on
the basis of their social and economic backwardness. These are classified as, "Scheduled Castes (SC)" and "Scheduled Tribes (ST)".

Article 46 of the Constitution prescribes that "the State shall promote with special care, the education and economic interests of the weaker sections of the people, and in particular, of the Scheduled Castes (SC) and Scheduled Tribes (ST) and shall protect them from social injustice and all forms of exploitation".

To attain the cherished goal of Universalisation of Elementary Education (UEE), the National Policy on Education (NPE-1986) states that "the new policy will lay special emphasis on the removal of disparities and to equalise educational opportunity by attending to the specific needs of those who have been denied equally so far".

In India, educational disadvantage is a serious issue under consideration. Special emphasis has been laid down for this disadvantaged group in education. The educationally / academically disadvantaged children show progressive decline in intellectual functioning, cumulative academic deficits, premature school termination and high dropout rates. Besides these, their behavioural characteristics include distractibility, poor self-concept, low motivation and impulsive behaviour.

Educationally disadvantaged and advantaged students differ in terms of their cognitive skills, linguistic ability, self-concepts, levels of educational aspiration, locus of control, and social behaviour. Educationally / academically disadvantaged
students are having special difficulty in developing concepts of an abstract nature and generalising. (Bloom et al., 1965).

The term used to label culturally deprived children has undergone a number of modifications since 1960s. First, it was changed from culturally deprived to culturally disadvantaged and then replaced by educationally/academically disadvantaged. Numerous educators believe that some students are ill prepared to succeed in school because their culture places them at an educational disadvantage.

According to Bloom et al. (1965), students having experiences in homes which do not transmit the cultural patterns necessary for the type of learning characteristics of the school and the larger society are called culturally deprived students.

Riessman (1962) reflected that the terms culturally deprived, educationally/academically deprived, under-privileged, disadvantaged, lower classes, and lower socio economic group could all be used interchangeably. Passow (1970) defined the disadvantaged child as one who 'because of social or cultural characteristics, for example social class, race, ethnic origin, poverty, sex, geographical location, etc. comes into the school system with knowledge, skills and attitude which impede learning'.

Educationally/academically disadvantaged children's communication capabilities are elementary. Analytic conversations with adults at home are limited.
These children learn, think and speak largely about concrete matters of immediate importance. Generalities and long-range goals are seldom discussed or recognised. Katz (1969) states it in this way, “In crowded lower-class homes, where mothers often are away at work during the day and both parents lack intellectual sophistication, the child’s early efforts at verbal and cognitive mastery are less likely to be favourably reinforced than in middle-class homes, resulting in lower expectations of reward for intellectual effort”.

Some educators who subscribe to the theory of educational disadvantage are pessimistic about the possibilities that school can overcome its presumed effects. It is possible to combat the characteristics attributed to the educationally disadvantaged. Additional funding to schools that are having educationally/academically disadvantaged students programs, such as 'Head Start' and 'Upward Bound', is earmarked in the United States to compensate for student’s educational disadvantage.

According to Datcher-Loury (1989), there are substantial variations in children’s outcomes across families that are identical in parent’s education and work history, family income, family size, and other standard measures of social and economic well being. Differences in family behaviour and attitudes have large and important long-term effects on children’s academic performance.
Passow (1990) is of the opinion that there is no need of providing a less challenging curriculum and limited achievement goals for educationally disadvantaged children. Through this curriculum students receive more instruction in factual and lower level skills - drill and practice - and less in higher order skills. This hampers the ability of educationally disadvantaged students to develop thinking skills, lowers their learning expectations and stigmatises them as inferior.

Although the poor students from low socio-economic strata are likely to suffer from biomedical problems, it is unlikely that these problems are major cause of their lack of achievement in regular education system. Research does not support the contention that they inherit less intellectual potential than others.

Through individuals outside the family - such as teachers, neighbours, community groups, agencies, and so on - the educationally/academically disadvantaged students can be encouraged to set high achievement goals for themselves. Performance of educationally disadvantaged students can be improved by providing opportunities in curriculum and instruction. Some effective instructional practices can increase in disadvantaged students the outcomes such as more positive attitudes about school, improved achievement, higher self-esteem and aspirations, and other characteristics of successful students.

Education of the disadvantaged population groups is the main concern of all the developing countries. India too is concerned about the education of the
disadvantaged children. Education for all is the major thrust of all governmental and non-governmental efforts in the post independence era with a view to fulfilling the constitutional obligation within a specific period. Though statistically the situation has changed considerably since independence, much remains to be done if the goal is to be achieved by the end of this century.

According to Khaparde (1996), the reasons for educational disadvantage are mainly poverty, social discrimination, uneducated parents, lack of minimum educational facilities, etc. Lack of curriculum relevance, including the uninspiring teaching-learning process, is often the reason that adversely affects schooling, particularly for children from the groups, which are educationally disadvantaged, thereby perpetuating the cycle of educational disadvantage.

Therefore, innovative approaches based on research will have to be evolved in order to handle the learning difficulties of the educationally / academically disadvantaged groups. Teachers can make a difference in the life of the pupils and more so in the life of the educationally disadvantaged groups. There are a variety of approaches to pedagogy based on the systematic use of principles of human learning. Teaching in all fields from Arithmetic to Zoology depends for its efficacy on the use of procedures adopted. Sometimes concepts are taught effectively by teachers who have little or no theoretical understanding of the underlying processes. However, frequently all teaching fails to produce conceptual learning, producing
instead, the rote learning. In the systematic development of pedagogy, adventitious conceptual learning is not sufficient. It is essential for the teachers to develop their own concepts of conceptual learning to gain insights into how pupils learn concepts and how teachers might enhance the process (Stones, 1994).

Many of the problems encountered by the teachers are attributable to inadequate conceptual analysis. Each of the subconcepts merited an analysis of its own and further, more detailed analyses down the conceptual hierarchy. Teachers' imaginations provide the way in which the pedagogic principles and their own knowledge of the field of study come together to provide elegant solutions to problems related to teaching. Each teacher must deal with all students' population in equal manner and try to foster their curiosity, creativity and make them all active participants in the teaching-learning process. The whole educational process has to be humanised, and building up of interpersonal relationship can effectively contribute to academic exchange and improvement.

In the traditional teaching, teacher adopts an authoritarian role. While teaching, little emphasis is given to the eagerness, curiosity and capability of the pupils. Pupil participation is limited to answering questions asked by the teacher. According to Bruner (1993) the process of education should enable children and youth to learn to gather and process information that will become organised into stable mental structures to assist them in problem solving.
The National Policy on Education (1986) favours a child-centred approach and places importance in the acquisition of problem solving skills and interdisciplinary relationships.

Explosion of knowledge made it practically impossible for the teacher to impart the ever-expanding study material within the constraints of time and syllabus. Most of the teachers adopt easier and conventional methods like lecturing or explaining the content given in the textbooks. Today, a large number of teaching methods is available. Joyce and Weil (1985) published models of teaching under the Information-processing family, the Personal family, the Social family and the Behavioural systems family. Attempts have been made in Indian Universities too, to develop models of teaching and lessons that can be directly used by teachers in secondary and higher secondary schools. The DiSEE Model of Teaching developed by Subhash and Sivadasan (1990), for instance was found very effective for teaching at higher secondary level.

Mathematics is a core subject in our education system both at primary and secondary levels. The study of Mathematics is indispensable in one's life due to the wide range of its applications in the present technological society. Everybody requires applying Mathematics to life situations. The National Policy on Education (1986) has visualised Mathematics as a vehicle to train children to think, reason, and analyse and articulate logically. Since the quantitative treatment, measurement,
analysis and reasoning are being increasingly used in many other subjects, the relevance of Mathematics is emphasised both in the context of the day to day problems in the child’s environment and in the context of the child’s learning in other concerned subject areas.

In India, the Kothari Commission on National Education (1964) recommended that every student should study Mathematics compulsorily for ten years. The National Policy on Education (1986) also reiterated the importance of the teaching Mathematics in school education. The Programme of Action (1992) recognised the fact that the quality of teaching Mathematics in our schools has not been satisfactory.

In India, researchers in the field of education are probing alternative ways and means of teaching Mathematics during the last two decades. Thus a lot of research has been going on into the theories of learning and applications of these theories to the development of teaching strategies and models. In Mathematics, logical sequence of basic concepts is very important. Therefore a thorough understanding of the concepts and development of logical processes of thinking are essential for effective learning of Mathematics. Since Mathematics is a subject of significance by itself and also concomitant to other subject areas, it is a compulsory subject at the school level. Experience has shown that the majority of students normally fail in Mathematics at the end of class X (NCERT, 2000). Kajapeer (2001)
probed the reason for failure and backwardness in the subject and found it as the existing gap between research in the subject and its classroom practices.

According to McCloskey (1967) “Disadvantaged children have not developed sufficient cognitive and reasoning skills essential for typical rates and dimensions of school progress. These deficiencies accumulate partly from prolonged restriction to the limited experiences of culturally and intellectually improvised homes and neighbourhood. Environment in the form of different kinds of toys, objects, tools, clothing, parental love and incentives, social condition, cultural influence along with motivational and emotional experiences set the foundation stone for the infrastructure of human cognitive processes. If these environmental incentives, instead of stimulating, misdirect or halt human progress, they are named as "Deprivation Effect". The process of deprivation being the resultant effect of number of forces interacting continuously overtime is named as "prolonged deprivation". It is often substituted by "social disadvantage", 'cultural differences, "educationally disadvantaged, or academically disadvantaged".

A review by Wang et al (1990) indicated that metacognitive abilities are one of the most important variables, which affect students' progress. Biggs (1985) found that many students did not appear to have these skills, even at the upper end of secondary school. It is important to know whether metacognitive abilities are just a consequence of high general abilities or could be taught to pupils. An investigation
of this done by O'Sullivan and Pressley (1984) found teaching metacognitive skills improved students' learning. This indicates that metacognitive abilities may have an effect on progress in school and could be a useful target for teaching.

There do exists a large number of studies that clearly indicate the prolonged deficiencies caused for academic / educational disadvantage of the students. Those deficiencies can not be removed by overnight. They have a history of generations. All the deficiencies thus accumulated lead to the underdevelopment of cognitive and reasoning skills of the children. While admitting that the deficiencies related to family, social and cultural environments can be removed slowly and gradually by the Nation with its schools and plans, the schools can simultaneously help children develop their cognitive and reasoning skills by appropriate instructional strategies. In this context, the investigator was motivated to enquire if the Concept Attainment Model of teaching would be more effective than the traditional methods for this development.

There are studies exhibiting relation between cognitive abilities/ achievement in different school subjects and prolonged deprivation. Crain and Weisman (1972); Rath (1974); Singh and Sharaf (1977); Mishra and Tripathi (1980), and Panda (1978, 1983) have made researches on impact of deprivation on cognitive abilities and achievement in school subjects. Siller (1957) demonstrated that upper class children exceeded their counterparts at lower socio-economic level in acquiring
concepts. Again Skypek (1967) confirmed significant relationship between attainment of number concepts and socio-economic status. Studies of Kaplan (1968), Gilgudia (1972) and Baker (1973) highlighted the performance of educationally disadvantaged group over their counterparts in the higher groups on attainment of concepts. Specifically, Baker's study (1973) pointed out a lower rate of concept attainment among disadvantaged children than their counterparts. Hence, the educationally/ academically disadvantaged group has some conditions that halt their attainment of concepts.

Our Constitution aims at “education for all”. And among the school subjects Mathematics is the queen of all subjects. In learning Mathematics the stress is given to attainment of concepts because of its logical structure. There arises the need for a teaching strategy, which can be used for teaching concepts effectively. If the concept attainment model of instruction has a positive influence on the achievement in mathematics of academically disadvantaged students, this knowledge can be used to solve problems of academically disadvantaged students and they can be brought into the mainstream.
1.3. **Statement of the Problem.**

It can be said that in no areas other than mathematics, there is constant and systematic emphasis on the conceptual approach. Teaching of mathematics can be equated to the development of conceptualised construction. Once the natural numbers and their properties have been isolated as they were, by more abstract thinking, which is able to reflect on the result of intention, Mathematics at once becomes a more conceptualised construction. It can be seen that Mathematics is a product of pure thought and mathematics learning is essentially based on basic mathematics concepts, gradually building up of logical super structure of various combination and applications at the concepts. Therefore it is sure that level of mathematics achievement depends upon the basic requirement of concept attainment.

Can the Concept Attainment Model of instruction be effectively used for Mathematics instruction? Is it feasible for academically disadvantaged students? Can the performance of educationally disadvantaged students be better using Concept Attainment Model of instruction? Can the Concept Attainment Model of instruction be effectively used for developing cognitive skills? When the studies were reviewed, it was found that the concept attainment model is an effective strategy for classroom instruction, but whether or not it can make a steady progress in the learning by academically disadvantaged students who constitute a considerable number in our
class room. The investigator assumes that a model of instruction for the attainment of concepts is effective for the students who are academically disadvantaged. Based on this assumption, the following problem for this study is formulated.

"EFFECT OF CONCEPT ATTAINMENT MODEL OF INSTRUCTION ON ACHIEVEMENT IN MATHEMATICS OF ACADEMICALLY DISADVANTAGED STUDENTS OF SECONDARY SCHOOLS IN THE KERALA STATE”.

1.4. Definition of Key Terms.

The key terms used in the study are Concept Attainment Model of instruction, Achievement in Mathematics and Academically Disadvantaged Students. Their operational definitions are given below.

1.4.1. Concept Attainment Model of instruction.

The Concept Attainment Model developed by Joyce and Weil (1985) is based on Bruner’s Theory of Concept Attainment. It is an indirect instructional strategy that uses a structured inquiry process. The Concept Attainment Model is an inductive teaching strategy designed to help students of all ages learn concepts and practise analytical thinking skills. The Concept Attainment Model is designed to capture the essential features of concept learning while at the same time extending the thinking skills of students (Egan and Kauchak, 1988). It is the search for and identification of attributes that can be used to distinguish examples of a given group or category from non-examples.
1.4.2. **Achievement in Mathematics.**

The misconception about achievement in any subject is that it is the students' skill in remembering the content area of the subject that they study. Tests in achievement are therefore prepared to assess students' knowledge in the subject matter only, but in this study, developing students' cognitive skills which is the principal goal of education has been included. The concept of achievement in Mathematics has a dual goal of achieving the subject matter competency and developing cognitive skills. The investigator therefore includes the development of cognitive skills as a part of achievement of students.

1.4.3. **Academically Disadvantaged Students.**

Academically Disadvantaged Student is one who is not succeeding or underachieving in schools due to limited proficiencies. Certain students especially children of poor parents are brought up in inferior cultural environments that deprived them of the skills, attitudes and acceptable behaviours that are transmitted to students who grow up in the superior middle class culture. As a result they are inadequately prepared to succeed in schools either academically or behaviourally. Educationally / academically disadvantaged students are unable to succeed in schools because their culture places them mentally disadvantageous (Grossmann, 1995). Passow (1970) defined them as one because of social or cultural characteristics, for examples, social class, race, ethnic origin, poverty, geographic
location, sex, etc., which impede learning. Wedge & Essen (1982) defined them as that group of children who failed to thrive, who failed to mature as much, who have failed to achieve as well in school as other children.

In this study, considering the related literature the investigator identified the academically disadvantaged students by calculating an Academic Disadvantage Index by putting appropriate weightage to their cognitive ability, home learning environment, self concept, attitude towards mathematics, mathematics interest, achievement motivation, and study habits.

1.5. **Hypotheses.**

The study aims to find out the effectiveness of Concept Attainment Model of instruction on achievement in mathematics of academically disadvantaged students. It is assumed that the educational disadvantage affects the attainment of concepts of the subjects that students learn. And also, the achievement in mathematics including development in cognitive skills depends upon the method of teaching adopted. Educationally disadvantaged and advantaged students differ in terms of their cognitive skills, linguistic ability, self-concepts, levels of educational aspiration, locus of control, and social behavior. Educationally disadvantaged students are having special difficulties in developing concepts of an abstract nature and generalizing them. In learning Mathematics the stress is given for the attainment of concepts because of its logical structure. There arises the need for a strategy that can be used
for the teaching of concepts effectively. On the basis of these assumptions the following hypotheses are formulated. The following hypotheses, if proved tenable, would help us select an appropriate strategy to teach academically disadvantaged students.

**Major Hypothesis.**

The achievement in mathematics and the cognitive ability of the academically disadvantaged students taught in Concept Attainment Model of instruction are significantly higher than that of the academically disadvantaged students taught in Conventional Teaching Method.

**Hypothesis I.**

There is no significant difference in the achievement in mathematics and in the cognitive ability of the academically disadvantaged and of the academically advantaged students when they are taught using Concept Attainment Model of instruction.

**Hypothesis II.**

The relative progress in achievement in mathematics and in the cognitive ability, when taught using Concept Attainment Model of instruction and Conventional Teaching Method, is higher for the academically disadvantaged students than the academically advantaged students.
Hypothesis III.

The intelligence and socio-economic status of academically disadvantaged students who learned mathematics using Concept Attainment Model of instruction have only minimal influence on their achievement in mathematics and also on cognitive ability.

1.6. Objectives of the Study.

The main objectives to collect data to prove the Hypotheses are:

(i) To find out the achievement in mathematics of the academically disadvantaged students taught using Concept Attainment Model of instruction and Conventional Teaching Method.

(ii) To find out the cognitive ability of the academically disadvantaged students taught using Concept Attainment Model of instruction and Conventional Teaching Method.

(iii) To find out the achievement in mathematics of the academically advantaged students taught using Concept Attainment Model of instruction and Conventional Teaching Method.

(iv) To find out the cognitive ability of the academically advantaged students taught using Concept Attainment Model of instruction and Conventional Teaching Method.

(v) To assess the intelligence level of the academically disadvantaged students.
(vi) To assess the socio economic status level of the academically disadvantaged students.

(vii) To examine the influence of socio economic status and intelligence of academically disadvantaged students on their achievement in mathematics and also on cognitive ability when taught using Concept Attainment Model of instruction.

1.7. Scope and Limitations of the Study.

The present study is an experimental study aimed to find out the effectiveness of Concept Attainment Model of instruction in the learning of academically disadvantaged students. The scope, the definition and the objectives of the study have been formulated after locating the problem of how to help the disadvantaged students by teaching them using a modern method. One of the content areas taken is "Sets" which is a fundamental requirement for any further study and application in different areas of mathematics.

The Concept Attainment Model holds promise for future because the schools of the future will be designed not only for learning but also for 'thinking'. It is expected that the findings of the study will help the curriculum planners to make needed changes in the content of the Mathematics textbook. By structuring the contents of a subject the curriculum designer can highlight the 'broad' principles of the subject matter and 'connectecness' between the facts. Structured pattern of the
learning experiences prevents rapid loss of memory and narrows the gap between the advanced and elementary knowledge.

The experimental method was found most appropriate for the present study. A sample consisting of 505 students was taken for the study. The investigator selected topics from mathematics textbook of standard VIII of the Kerala State Syllabus. Only 32 concepts from three chapters were selected for the study. Instead of equated groups, only intact classroom groups were selected. This was delimited by conducting pretest and posttest and adopting the technique of ANCOVA to analyse the test scores. A sincere attempt was made from the part of investigator to make this study as precise and objective as possible.


The study has been reported in six chapters as follows:

**Chapter I.** This chapter deals with the conceptualisation of the problem, need and significance of the study, statement of the problem, definition of key terms, hypotheses, objectives of the study and scope and limitations of the study.

**Chapter II.** The theoretical background of the Models of Teaching with special reference to Concept Attainment Model of instruction is presented in this chapter.

**Chapter III.** A survey of related studies pertaining to the present study is included in this chapter.
Chapter IV. In this chapter the methodology adopted for the study is described. The variables used, the selection of tools used, the standardisation of tools for data collection and the statistical procedures adopted for analysing the test scores are included.

Chapter V. It deals with analysis of data and interpretation of test results.

Chapter VI. This chapter gives the summary of procedures adopted, followed by the conclusions arrived at, educational implications of the study and suggestions made for further research.
References:


Introduction


