CHAPTER I

INTRODUCTION

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CHAPTER I

INTRODUCTION

The information processing system of the human being is a set of ideas that provide anchors for new information or ideas. As this information processing system acquires new information and new ideas, it recognizes itself to accommodate those ideas and thus it is in a perpetual state of change. New ideas and information can be usefully learned and retained only to the extent that they are retainable to already available concepts or proposition, which provide ideational anchors.

A purely information processing approach to education was suggested by David Ausubel in the Theory of Meaningful verbal learning. He firmly espouses the view that each academic discipline has a hierarchically organized structure of concepts, which form the information processing system of that discipline. He conceptualizes the discipline as levels of hierarchically organized concepts that begin with perceptual data at the bottom and proceeds through increasing levels of abstraction until the most abstract concept appear at the top so as to include or subsume less inclusive concept at lower stages of organization. These concepts are firmly linked to data to have a unique structural character. Like Bruner, Ausubel believes that structural concepts of each discipline can be identified and taught to the students and they then become an information processing system for him, an intellectual map which can be used to analyze particular domain and to solve problem within those domains of activities.

The task of the school according to Ausubel is to identify clear stable and organized bodies of knowledge within the discipline. The major task of the educator is to transmit these stable bodies of knowledge in such a way that the learner will incorporate them meaningfully into his own system and they become his own and function for him.

Ausubel favours teacher centred, deductively sequenced teaching sessions but he adamantly opposes passive learning on the part of students.
The teacher is the central figure in the lesson, a major task facing the teacher is encouraging and requiring students to actively think about the new material to be learned and helping them to find relationships not only within the new content itself but also with content previously learned.

Mathematics was taught and learned in India ever since the Vedic Period. Mathematics was given prominence as a separate subject only in the 12th century. Though there had been epoch making discoveries, the situation with regard to Mathematics remain unchanged after AD 1200 up to the advent of British. Much emphasis has been placed on Mathematics teaching and learning in the post independence period in India. The Education Commission (1964-66) recommended mathematics as a compulsory subject for students at school level. That was the era of sets, and the algebra of sets.

The National Policy on Education (1986) has also considered the importance of mathematics in general education and suggests that 'mathematics should be visualized as the vehicle to train a child to think, reason, analyze and to articulate logically. Apart from being a specific subject it should be treated as concomitant to any subject involving analysis and reasoning'. In the recent past, there have been tremendous developments in theories of learning and the science of teaching. The commission points out that, 'In the teaching of mathematics emphasis should be more on the understanding of basic principles than on the mechanical teaching of mathematical computations'.

Mathematical literacy is essential for every child. Mathematics constitutes the core curriculum of several professional courses. Modern mathematics has also attracted the attention of many researchers. The effective teaching of modern mathematics has been a matter of concern/anxiety for educators as well as for teachers who found it difficult to present the concepts in modern mathematics.

Commenting on the then prevailing situation in schools, it observed that in the average school today instruction still conforms to a mechanical
routine, continues to be dominated by the old besetting evil of verbalism and therefore remains as dull and uninspiring as before'. The science of 'mathematics education' is still in its infancy. Content and presentation of content are the two most important and inseparable components in any curriculum. The application of learning theories in content presentation is of very recent origin. Research evidence is inadequate to say anything definite about which method is going to be the most effective for presentation of a particular type of content.

Conceptual understanding of Mathematics, particularly those at the school level has been the concern of educators. Ausubel's model, Bruner's model and mastery learning have been examined.

A close analysis of the nature, type and quality of studies throws adequate light on the status of research in mathematics education. In-depth study of the mathematics curriculum, curriculum renewal, refining teaching methods in mathematics in the light of the advances in the science of pedagogy on the one hand and educational technology on the other are some of the major issues before teacher educators in Mathematics. Proper selection of problems, especially in the area of methods of teaching mathematics, planning long-term studies, trying out various methods of teaching and measuring multi-dimensional outcomes among students as a result of the teaching exercise are the major issues before teacher educators in mathematics. After all, each method of teaching has its limits in developing abilities and skills.

A method/strategy is not universally superior or inferior to the others in respect of content, objectives, grade levels and intelligence. There has to be a systematic effort to develop a hierarchy of content, methods, etc. Research had gone into methods/ strategies of teaching mathematics. The effect of methods has been evaluated on a variety of variables. Though mathematics occupies a place of importance, the researches in this area have been scanty. A look at the research studies in the methodology of teaching and teacher
preparation reveals the need for concerted efforts to try out models of teaching in various areas and at all levels of schooling.

1.1 **NEED AND SIGNIFICANCE OF THE STUDY**

In the present study the investigator makes an attempt to grasp the core and essence of Instructional and Nurturant effect of Advance Organizer model with a greater precision. This will help for educators who plan learning experiences and prepare evaluation devices. It is expected to be of general help to all teachers, administrators, professional specialists and research workers who deal with curricular and evaluation problems of Advance Organizer model. The investigator feels that this work should serve as a constructive help for future researchers. In the present study emphasis is given to certain behaviour that might occur as a result of the Instructional and Nurturant effect of Advance Organizer model. This categorization will work as a framework for those who view the educational process.

The investigator is intended to develop some insight into the principles of development and organization of behaviour of Instructional and Nurturant effect of Advance Organizer model and develop an understanding to the nature and significant of these effect on cognitive and affective domain. Cognitive domain is the domain in which most of the work in curriculum development has taken place and where the clearest definition of objectives are found a phrased as description of student behaviour (Bloom, 1956). Affective domain includes objectives, which describe changes in interest, attitudes, values and the development of appreciation and adequate adjustment. Listing of behaviours appropriate to these objectives is complicated, since the internal or covert feelings and emotions are significant for the affective domain as are the overt behavioural manifestation.

This system of classification should provide basis for building curricula and test. The investigator attempts to classify the phenomena, which would not be observed or manipulated in the concrete form. A hierarchical classification of behaviour belonging to the Instructional and Nurturant effect
will help the user to more clearly understand the effects of Advance Organizer model. Further care was taken to make the classification of Instructional and Nurturant effect of Advance Organizer model to be in tune with the educational, logical and psychological classification system.

The classification is made to have precise and usable definitions and securing a method of improving the exchange of ideas and materials among test workers as well as other persons concerned with educational research and curriculum development.

The investigator has intended to learn all possible behaviour that is likely to exhibit as a result of Instructional and Nurturant effect of Advance organizer model. The classification requires the selection of and appropriate list of symbols to represent all major types of educational outcomes of Instructional and Nurturant effects and clearly describe the intended pupil behaviour. The single set of classification of intended behaviour of Instructional and Nurturant effects are selected so as to cater all range of subject matter, content at different levels of education and in different schools. This classification and grading of behaviours are made so as to represent the Instructional and Nurturant effects of Advance Organizer model to a desired level of perfection. Care was taken to include all desired behaviours and not include undesirable or abnormal behaviours, which are socially disapproved.

Whether or not this classification is an effective and useful tool can be determined only after a sufficient amount of time has elapsed. The investigator has attempted to secure participation of a large number of achievement testers and evaluation specialists in the development of this classification and have accepted their criticism and suggestion in its development.

1.2 STATEMENT OF THE PROBLEM

In tune with the above description, the investigator felt that Advance Organizer Model by Ausubel, from the information processing family of Models of Teaching, (Joyce & Weil, 1992), may be experimented upon for the
simple reason that the present education system is more oriented to acquiring information.

1.2.1 Title of the study

A STUDY ON THE EFFECTIVENESS OF ADVANCE ORGANIZER MODEL IN THE TEACHING OF MATHEMATICS AMONG SECONDARY SCHOOL PUPILS AT DIFFERING LEVELS OF INTELLIGENCE.

1.3 OPERATIONAL DEFINITIONS

The key terms, which need operational definition, are defined below.

Effectiveness: The presentation of ideas or activities involved in a teaching unit that most facilitates the regular and systematic development.

Advance Organizer Model: Advance organizer model is an Instructional strategy based on the theory of Meaningful Verbal Learning as proposed by David Ausubel.

Teaching: Narrowly, the act of instructing pupils or students in any educational institution. Broadly, ‘The act of providing situations or activities designed to facilitate learning on the part of those formally engaged in attending school or informally engaged in learning activities

Secondary School: Secondary school refers to any school recognized by Government of Kerala for imparting instruction to students at terminal stages of school education (Standard VIII IX and X). For the present study the investigator selected standard VIII.

Intelligence: In the present study intelligence is referred to as the capacity to face novel situation, the ability to learn by processing information and the ability to carry on with abstract thinking (Basavanna, 2000).

Differing Levels: It refers to the extent by which, an individual’s intelligent score differs from the reference value mean and thus indicates how far from the mean of a particular distribution each obtained score is located.
1.4 **OBJECTIVES OF THE STUDY**

The study has been designed with the following objectives:

1. To compare Mathematics Achievement of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,
   a. Low.
   b. Average
   c. High, across groups and within groups.

2. To compare Mathematics Achievement with special reference to the Instructional objectives,
   a. Knowledge
   b. Understanding
   c. Application
   d. Analysis
   e. Synthesis
   d. Evaluation
   e. Skill
   of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,
   a. Low
   b. Average
   c. High, across groups and within groups

3. To compare achievement with special reference to Instructional /Nurturant effects
   a. Conceptual Structure
b. Meaningful Assimilation of Information

c. Habit of Precise Thinking

d. Interest in Inquiry

of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model and the other using Conventional Method, when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low.

b. Average

c. High across groups and within groups

4. To compare achievement with special reference to

a. Factor 1

b. Factor 2

c. Factor 3

d. Factor 4

e. Factor 5

of Instructional and Nurturant effects, of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low.

b. Average

c. High across groups and within groups

5. To compare “Retention Scores” on achievement of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low
b. Average

c. High across groups and within groups

6. To compare ‘Retention Scores’ on achievement, with special reference to the Instructional objectives,

   a. Knowledge
   b. Understanding
   c. Application
   d. Analysis
   e. Synthesis
   d. Evaluation
   e. Skill

of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

   a. Low
   b. Average
   c. High across groups and within groups

7. To compare Retention Scores of achievement of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model and the other using Conventional Method, with special reference to Instructional /Nurturant effects

   a. Conceptual Structure
   b. Meaningful Assimilation of Information
   c. Habit of Precise Thinking
   d. Interest in Inquiry
when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low
b. Average
c. High across groups and within groups

8. To compare Retention Scores of Instructional and Nurturant effects, with special reference to

a. Factor 1
b. Factor 2
c. Factor 3
d. Factor 4
e. Factor 5

of two equated groups of Secondary School pupils taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM) when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low
b. Average
c. High across groups and within groups

1.5 HYPOTHESES OF THE STUDY

1. If two equated groups of Secondary School pupils were taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), then there will be no significant difference between the Mean scores on achievement when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low
b. Average
c. High across groups and within groups

2. If two equated groups of Secondary School pupils were taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), then there will be no significant difference between the Mean scores on achievement, with special reference to the Instructional objectives,

   a. Knowledge
   b. Understanding
   c. Application
   d. Analysis
   e. Synthesis
   d. Evaluation
   e. Skill

when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

   a. Low
   b. Average
   c. High across groups and within groups

3. If two equated groups of Secondary School pupils are taught Mathematics one using Advance Organizer Model and the other using Conventional Method, then there will be no significant difference between the Mean scores of achievement with special reference to Instructional /Nurturant effects

   a. Conceptual Structure
   b. Meaningful Assimilation of Information
   c. Habit of Precise Thinking
   d. Interest in Inquiry
when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low  
b. Average  
c. High across groups and within groups

4. If two equated groups of Secondary School pupils were taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), then there will be no significant difference between the Mean scores on Instructional and Nurturant effects, with special reference to

a. Factor 1  
b. Factor 2  
c. Factor 3  
d. Factor 4  
e. Factor 5

when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low  
b. Average  
c. High across groups and within groups

5. If two equated groups of Secondary School pupils were taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), then there will be no significant difference between the Mean “Retention Scores” on achievement when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,

a. Low  
b. Average  
c. High across groups and within groups
6. If two equated groups of Secondary School pupils were taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), then there will be no significant difference between the Mean Retention Scores on achievement, with special reference to the Instructional objectives,
   a. Knowledge
   b. Understanding
   c. Application
   d. Analysis
   e. Synthesis
   d. Evaluation
   e. Skill

when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,
   a. Low
   b. Average
   c. High across groups and within groups

7. If two equated groups of Secondary School pupils are taught Mathematics one using Advance Organizer Model and the other using Conventional Method, then there will be no significant difference between the Mean Retention Scores of achievement with special reference to Instructional / Nurturant effects
   a. Conceptual Structure
   b. Meaningful Assimilation of Information
   c. Habit of Precise Thinking
   d. Interest in Inquiry

when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,
a. Low
b. Average
c. High across groups and within groups

8. If two equated groups of Secondary School pupils were taught Mathematics one using Advance Organizer Model (AOM) and the other using Conventional Method (CM), then there will be no significant difference between the Mean Retention Scores on Instructional and Nurturant effects, with special reference to
   a. Factor 1
   b. Factor 2
   c. Factor 3
d. Factor 4
e. Factor 5

when group is taken as a whole and when groups are taken at differing levels of intelligence, namely,
   a. Low
   b. Average
c. High across groups and within groups

1.6 **PROCEDURE IN BRIEF**

An experimental study was designed by the investigator so as to suit the objectives of the study. In order to conduct the experiment, two division of standard VIII, reported to be comparably similar were selected from Government High School, Marayoor, and Idukki District. It was empirically verified that these groups were equated in terms of “General Mathematics Proficiency Score” and “Intelligence test score”. Before starting each lesson the prerequisite, which is necessary and sufficient for mastering the new topic, was ensured in both the groups. Tools employed for this purpose were pre requisite tests prepared by the investigator and Kerala Non-Verbal Group Test
of Intelligence for Secondary Schools (Nair, 1968). To further substantiate that the groups are equalized, sex and locale of students were equated.

Having obtained two groups, ‘Matched for Mean and SD’ in terms of intelligence, the topics, of standard VIII, was taught, one group using Advance organizer model and the other using Conventional method. The group taught using Advance organizer Model was considered as the experimental group and that taught using conventional method was treated as control group. The study was decided to be conducted using a posttest only equivalent group design.

The investigator took a complete academic year to conduct the experiment. The investigator being the high school assistant of the same school was fortunate enough to conduct the whole experiment herself in both the groups. Immediately after instruction of each unit the investigator administered achievement test related to that topic and the tests prepared by the investigator to measure the Instructional and Nurturant effect of model. The scores obtained for each test were subjected to statistical analysis.

For minute and detailed analysis, students belonging to experimental and control groups were divided into 3 groups and the effect of model based on all these important dependent variables were studied.

Learning and retention of what has been learned may be thought of as a continuous process. It is impossible to measure learning without also measuring retention, for the occurrence of learning can be judged, only by the amount retained and used (Pressey, Robinson and Hurrocks, 1967).

In order to compare the retention of two groups the same test was re-administered to the same group after a gap of two weeks and scores of each individual student determined. Thus every student got a pair of scores. The retention score was arrived at from the pair of scores using the formula

\[
\text{Retention score} = \frac{\text{scores obtained in the second test}}{\text{scores obtained in the first test}} \times 100
\]
These scores are subjected to further statistical analysis. A detailed analysis of retention score was made considering 3 subsamples.

1.7 SCOPE AND LIMITATIONS OF THE STUDY

Though care has been taken by the investigator to make the study as precise as possible, some unavoidable limitations crept into the study. The scope and limitations of the study are described in this section.

The investigation was intended to study the effect of Advance Organizer Model in the teaching of Mathematics among secondary school pupils. Among the Information Processing Models, there are other six models also, according to the classification of Joyce and Weil (1992). But all of them could not be included in the study because of the limited time available and other limitations standing in the way of such a comprehensive study. Investigator selected Advance Organizer Model because of its wider applicability in Indian classroom and also of its easy acceptability. It was felt that trying out this method would help in attracting more teachers to the effective model for reception learning, providing new outlook to the teaching system and maintaining good classroom atmosphere.

The investigator had to limit the experiment to standard VIII pupils. Much care was taken to develop lesson transcript maintaining the salient features of the model. While teaching, care was taken to maintain the expected Syntax, Social System, Principles of Reaction and Support System of the model. It is hoped that the conclusions could be made as reliable as possible within the limitations.

In spite of the limitations, the result of the present study preserves the general representative capacity for Secondary School students of the state. The study does not claim to be an exhaustive one in respect of the variable and experimental design. But the investigator believes that within the limited framework in which the study has been developed, the study would prove useful in improving educational practices.

Analyzing the Instructional and Nurturant effects and determination of classes and their title could be done in an infinite number of ways. The
investigator selects a set of names to classify the effects, which are logically
developed, internally consistent and psychologically sound. Care was taken in
selecting the classification so that it will be a descriptive, complete and sharp
scheme to represent each effect in tune with aforementioned principles and in
arranging them from simple behaviour to complex. Care was taken to arrange
them in hierarchical order consistent with research findings, although it has
probably not been completely satisfactory.

1.7 ORGANIZATION OF THE REPORT

The study has been reported in six chapters.

The first chapter of the report explains the need and significance of the
study and delimits it by defining the title and defining the terms operationally.
Specific objectives and hypotheses formulated in tune with the objectives,
along with the scope and limitations is also explained in this chapter.

The second chapter reflects theoretical overview of Models of Teaching
with special reference to AOM in the information processing family.

The third chapter contains a survey of related studies pertaining to the study.

The fourth chapter describes the methodology adopted for the study. It
includes variables of the study, design of the study, selection of sample, tools
employed for collection of data and statistical techniques used for the study.

The fifth chapter presents the result of analysis made in accordance
with the objectives stated and hypothesis formulated.

The sixth chapter gives a summary of procedure adopted and also
attempts at examining the tenability of the hypotheses followed by the
conclusions arrived at and suggestions made for implementation and
recommendations for further studies.