INTRODUCTION

CHAPTER 1

INTRODUCTION

- Need and Significance of the Study
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A human being is a positive asset and a precious natural resource which needs to be developed properly. Education is a process of development. The rise and fall of a nation depends on the success of its educational system. Education is something more than a mere accumulation of knowledge and skills. It must be concerned with developing those skills and attributes that will promote self discipline, responsibility, self expression and confidence.

Educational systems in the developing countries are facing credibility crisis, especially in the manner in which classroom instruction is managed. Inappropriate teaching strategies prevalent in schools is a drawback of the educational system. In the conventional teaching strategy followed in schools, education process is unidirectional. Subjects are taught according to the will of the teacher and little attention is paid to the eagerness, curiosity and capability of the students.

The Secondary Education Commission (1952-53) has rightly remarked that "... Even the best curriculum and the most perfect syllabus remains dead unless quickened into life by the right methods of teaching ..." In order to make education a meaningful and exciting activity and to achieve the objectives of education, appropriate instructional strategies should be used keeping in view the content which has to be taught.
Science is the product of man's conscious effort to understand and control his environment. The teaching method of any particular discipline would be inadequate without considering the methods by which information is acquired in that discipline. Science has a structure which is provided by its basic principles, generalisations and concepts. The scientific and technological orientation of society has profound implications for methods of teaching science. The manner in which society uses the results of science changes very rapidly and the student with an adequate education must have a clear idea of the body of scientific knowledge. Science has influenced the culture of Nations in many ways both social and economic, has changed institutions and even man himself. Science and technology change and control values and ways of thinking. The dependence of Society upon Science and Technology has important implications for determining what aspects of science should be taught and how it should be taught.

Physics is a major science subject. Physics has contributed to bringing about changes in our ways of thinking, attitude, interest and outlook. Hence the Physics education in our schools play a vital role in the development of individuals. In terms of a general education involving Physics, the highly abstract nature of much of the thinking involved in the study of Physics is a problem associated with its teaching and learning.
Physics concepts might be learnt and manipulated without their relevance to real-life situations being explored. A Physics teacher has to search new innovative ideas, techniques and strategies to impart Physics Education. The teacher should not only communicate the matter in text books but also enable the students to ingest concepts and develop interest in learning the subject.

Models of teaching are prescriptive teaching strategies. They are designed to provide guidelines for designing educational objectives, activities and environment. Joyce and Weil (1980) developed more than twenty models of teaching. After the first research study relating to models of teaching by Chitriv (1983), a number of studies were conducted on teaching strategies and found that modern teaching strategies significantly improve Achievement (Sharma, 1986; Passi et al., 1986; Kaur, 1991; Nelson and Pan, 1997; Shah, 2002; Padma, 2007).

Learning involves the integration of thinking, feeling, perceiving and behaving. Learning science is effective only when it develops rational thinking and learning abilities which form the basis of modern life. Learning that truly changes behaviour takes place only when the learner can interact with objects, events or situations (Renner and Stafford, 1972). The learner's approach towards learning is very crucial in the effectiveness of learning.
To improve the learning effectiveness of students, the teacher has to understand the ways in which an individual learns. It is widely accepted that while it is possible to identify common constituent elements of learning, the studying approaches varies at an individual level. Students will develop a way or style of learning and refine that style in response to three groups of factors: unconscious personal interventions by the individual, conscious interventions by the learner and interventions by some other external agent.

The qualitative approach in research on learning has been developed by Marton and Saljo (1976) and Svenson (1977). Students have stable motives and conceptions about what learning might be and they learn in a consistent way. This consistency of motives and strategies used in the learning process is student's learning approach (Entwistle, 1990).

A studying approach is an individual's predisposition to learn in a particular way. The term is used to describe broad, general characteristics of learning approach and it is likely that the preferred learning styles of any one learner will be manifested in all aspects of learning. The term 'studying approach' indicates an interest in the totality of the processes undertaken during learning. For better learning the student has to use techniques or strategies which covers his or her motives, conceptions and intensions and their relationship to distinct learning outcomes.
1.1. NEED AND SIGNIFICANCE

Science education has become an integral part of human life in today's world of 'Information exploration' and 'Information explosion'. Scientific literacy is an essential requirement. As Physics is made a compulsory science subject at secondary school level which decide the selection of many professional courses in future, it has become a dire need to Physics teachers to present it effectively in the classrooms.

There are different approaches to Science teaching propounded by different science educators. There are three approaches to science teaching viz., factual approach, conceptual approach and process approach as identified by Anderson (1965). The conceptual approach to science teaching is better than the factual approach because the students cannot understand the cumulative nature of science by pyramiding facts but by understanding new conceptual structures. Concepts are considered to be the building blocks of knowledge. According to Bruner (1975), attaining a concept is beneficial to the individual in several ways – in identifying the objectives around him, in reducing the necessity of constant learning and in reducing the complexity of environment. If the child does not learn concepts and principles which are lower in hierarchy, the learning of those higher in the hierarchy becomes difficult or impossible (Gange, 1970).
Rosenshine and Barak (1997) suggested that the role played by the individual students information processing capabilities may be a critical factor for improving learning and retention of concepts. The development of teaching models has successfully brought together a unique combination of theory constructions and empirical testing. Research studies of Kaur, (1991), Mahajan (1992), Mohanty (1992), Passi, et al. (1992) and Padma (2007) compared the relative effectiveness of different instructional strategies on Academic Achievement of the learner. Among the various new strategies of Instruction, the Concept Attainment Strategy is very important for science teaching especially physics teaching because it is very helpful in attaining scientific concepts by the learners.

Concept Attainment Model of teaching has been developed, based upon the studies made by Bruner and his associates mainly about the nature of concepts and the strategies of concept attainment. The Concept Attainment Model can be used with children of all ages and grade levels successfully. It is a relatively easy and intellectually powerful strategy of teaching which develops the student's thinking abilities and maximises learning. It is a powerful research-based programme that not only help students to attain essential concepts but also fosters natural thinking ability, allowing systematic and scientific decision in all aspects of life. The concept attainment model is an excellent evaluation tool when
teachers want to determine whether important ideas introduced earlier have been mastered. It quickly reveals the depth of students understanding and reinforces their previous knowledge. This model can also be useful in opening up a new conceptual area by initiating a sequence of individual or group inquiries.

The basic theory of Concept Attainment Model of teaching and results of the research on the practical application of this model was studied carefully by the investigator to know whether this can be adopted to get better academic achievement in Physics in an ordinary school in Kerala. The essential features of Concept Attainment Model are described in Chapter II.

Classroom teaching and learning involve the interaction among teachers, pupils and the curriculum. Any attempt of improvement in the quality of education is ultimately dependent on the quality of instruction imparted in the classroom. Each student in the class differs in his/her studying approach and in dealing with a given situation.

Studying Approach theory had been put forward in 1976 in an attempt to interpret human differences and to design educational models around these differences. This theory had its root in the psycho analytic community. It emphasize the different ways in which people think and
feel as they solve problems, create products and interact. It is concerned with the differences in the process of learning.

Research has helped to increase the awareness of teachers about the differences in the learning characteristics of students but the nature of relationship among studying approaches is not clear. Studying approaches are described as preferences which suggest that one dimension of studying approach is as good as the others. The idea that students have different studying approaches is enticing for educators. First, it highlights the importance of studying process rather than teaching techniques and it thereby raises questions concerning the ideal distribution of power among teachers and learners. Second, it is an egalitarian concept because it focuses on pupil strengths and weaknesses so that the operative term describing learners becomes different rather than 'poor', 'average', 'good' and 'very good'.

Fatini (1980) suggested that we are at a stage in which we should consider designing programmes to fit learners rather than attempting to fit learners to standard programmes. Experience in educational field reveals that students who understand these differences are better able to understand their own learning profiles, to develop flexibility and adaptability in their thinking and to set realistic goals about minimizing learning weaknesses and maximizing strengths.
From the studies surveyed it was found that Concept Attainment Model is worth experimenting in the secondary stage for attaining basic concepts in Physics in a conventional educational context. Most of the studies conducted in western countries and India were concentrating more on subjects like biology, chemistry and languages and the investigator could find inconsistency in the results also. Moreover, the investigator failed to identify any study in Indian conditions related to Physics.

The investigator felt that under the rigid classroom organisation of our schools, Concept Attainment Model can be experimented for maximum attainment of instructional objectives in Physics. It is suitable for attaining concepts in Physics at different levels of secondary school. Considering the above factors and being a Physics teacher it seems worthwhile to examine how good Concept Attainment Model (CAM) can be implemented on experimental basis in learning basic concepts in secondary school Physics.

Considering the above factors the investigator took up the present study as INTERACTION EFFECT OF CONCEPT ATTAINMENT MODEL OF TEACHING AND STUDYING APPROACH ON ACHIEVEMENT IN PHYSICS OF SECONDARY SCHOOL STUDENTS.
1.2. STATEMENT OF THE PROBLEM

The present study is entitled as 'INTERACTION EFFECT OF CONCEPT ATTAINMENT MODEL OF TEACHING AND STUDYING APPROACH ON ACHIEVEMENT IN PHYSICS OF SECONDARY SCHOOL STUDENTS'.

1.3. DEFINITION OF KEY TERMS

1.3.1. CONCEPT ATTAINMENT MODEL OF TEACHING

Concept Attainment is the search for and listing of attributes that can be used to distinguish exemplars from non-exemplars of various categories (Bruner, Goodnow and Austin, 1967).

Concept Attainment Model of teaching is a model of teaching designed to teach concepts and to help students work together to learn information, build concept and solve problems (Joyce and Weil, 1990).

1.3.2. STUDYING APPROACH

Studying Approach refers to orientation of pupils in studying, into which different strategies of learning, styles of learning and associated forms of motivations are merged (Marton and Saljo, 1976, 1997).

Students have stable motives and conceptions about what learning might be and they learn in a consistent way. This consistency of motives
and strategies used in learning process is known as Approaches to Studying (Entwistle, 1990).

1.3.3. ACHIEVEMENT IN PHYSICS

Achievement in Physics refers to proficiency of performance in physics as measured by a standardized achievement test.

1.3.4. SECONDARY SCHOOL STUDENTS

Secondary School Students are students who are studying in standards VIII, IX and X in the schools managed directly/aided by Director of Public Instructions, Government of Kerala.

In the present study standard IX students are taken as representatives of Secondary School Students.

1.4. VARIABLES OF THE STUDY

Variables selected for the present study are the following.

1.4.1. Independent Variables

The following are the Independent Variables selected for the study.

1.4.1.1. Concept Attainment Model of Teaching
1.4.1.2. Objective Based Instruction
1.4.1.3. Studying Approach
The three studying approaches selected are

i) deep approach

ii) surface approach

iii) strategic approach

1.4.2. Dependent Variable

Achievement in Physics is considered as the dependent variable. Test to measure this variable comprised of Achievement test in Physics.

1.4.3. Control Variable

The following are the control variables selected for the present study.

1.4.3.1. Previous Knowledge of the Subject Matter

1.4.3.2. Non-verbal Intelligence

1.5. DESIGN

The Pre-test Post-test Equivalent Group Design was used for the study. Two groups were selected for treatment. Experimental Group was taught through Concept Attainment Model of teaching and Control Group was taught through Objective Based Instruction.
1.6. OBJECTIVES

The objectives formulated for the present investigation are given below.

1.6.1. To compare the mean scores of Achievement in Physics Post-Test I (tested immediately after the treatment) of the Control group and the Experimental group.

1.6.2. To compare the mean Gain scores of Achievement in Physics (Post-Test I minus Pre-Test) of the Control group and the Experimental group.

1.6.3. To compare the mean Retention scores of Achievement in Physics Post-Test II (tested two months after experimentation) of the Control group and Experimental group.

1.6.4. To compare the mean Gain scores of Achievement in Physics (Post-Test II minus Pre-Test) of the Control group and Experimental group.

1.6.5. To compare the mean scores of Achievement in Physics Post-Test I of the groups formed on the basis of Studying Approach.

1.6.6. To compare the mean Gain Scores of Achievement in Physics Post-Test I (Post-Test I minus Pre-Test) of the groups formed on the basis of Studying Approach.
1.6.7. To compare the mean Retention scores of Achievement in Physics Post-Test II of the groups formed on the basis of Studying Approach.

1.6.8 To compare the mean Gain Scores of Achievement in Physics Post-Test II (Post-Test II minus Pre-Test) of the groups formed on the basis of Studying Approach.

1.6.9. To study the main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test I for total sample, Boys and Girls.

1.6.10. To study the main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test II for Total sample, Boys and Girls.

1.6.11. To study the main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test I for Total sample, Boys and Girls when initial differences in select variables namely Previous knowledge of Subject Matter and Non-verbal Intelligence are controlled one by one and in combination.
1.6.12. To study the main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test II for Total sample, Boys and Girls when initial differences in select variables namely Previous Knowledge of Subject Matter and Non-verbal Intelligence are controlled one by one and in combination.

1.7. HYPOTHESES

The hypotheses formulated and tested for the study are the following:

1.7.1. There will be significant difference in the mean scores of Achievement in Physics Post-Test I (tested immediately after the treatment) between Control group and Experimental group.

1.7.2. There will be significant difference in the mean Gain scores of Achievement in Physics (Post-Test I minus Pre-Test) between Control group and Experimental group.

1.7.3. There will be significant difference in the mean Retention scores of Achievement in Physics Post-Test II (tested two months after the treatment) between Control group and Experimental group.
1.7.4. There will be significant difference in the mean Gain scores of Achievement in Physics (Post-Test II minus Pre-Test) between Control group and Experimental group.

1.7.5. Students having Deep Approach to studying, Surface Approach to Studying and Strategic Approach to Studying will have significant difference in their mean scores of Achievement in Physics in Post-Test I.

1.7.6. Students having Deep Approach to Studying, Surface Approach to Studying and Strategic Approach to Studying will have significant difference in their mean Gain Scores of Achievement in Physics Post-Test I (Post-Test I minus Pre-Test).

1.7.7. Students having Deep Approach to Studying, Surface Approach to Studying and Strategic Approach to Studying will have significant difference in their mean Retention scores of Achievement in Physics Post-Test II.

1.7.8. Students having Deep Approach to Studying, Surface Approach to Studying and Strategic Approach to Studying will have significant difference in their mean Gain scores of Achievement in Physics Post-Test II (Post-Test II minus Pre-Test).

1.7.9. There will be significant main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective
Based Instruction) and Studying Approach on Achievement in Physics Post-Test I for Total sample, Boys and Girls.

1.7.10. There will be significant main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test II for Total sample, Boys and Girls.

1.7.11. There will be significant main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test I for Total sample, Boys and Girls when initial differences in select variables namely Previous Knowledge of Subject Matter and Non-Verbal Intelligence are controlled one by one and in combination.

1.7.12. There will be significant main effect and interaction effect of Methods of Teaching (Concept Attainment Model and Objective Based Instruction) and Studying Approach on Achievement in Physics Post-Test II for Total sample, Boys and Girls when initial differences in select variables namely Previous Knowledge of Subject Matter and Non-Verbal Intelligence are controlled one by one and in combination.
1.8. PROCEDURE

The various steps in the procedure for executing the study are summarised as given below.

1.8.1. Sample for the study

Intact groups of students from standard IX were selected as sample for the study. The groups were matched on the basis of Previous Knowledge of Subject Matter and Non-Verbal Intelligence. The experimental group was taught through Concept Attainment Model of teaching and the control group was taught through Objective Based Instruction. Each group consisted of 40 students.

1.8.2. Selection of the Topics for Treatment

A thorough analysis of the syllabus of Physics at Secondary level was done. Investigator made discussions with experts in the field of Physics, Physics teachers at secondary level and educational experts. A number of topics from the Physics syllabus of Secondary School students of Kerala state were found amenable for Concept Attainment Model of teaching and Objective Based Instruction. Due to constrain in time thirty basic concepts were finally selected for the present study.
1.8.3. **Instructional materials and Tools used for the study**

1.8.3.1. **Lesson Transcripts Based on Concept Attainment Model**

The investigator prepared lesson transcripts for CAM as per the suggestions of Joyce and Weil (1992). Thirty lesson plans were prepared for teaching through CAM.

1.8.3.2. **Lesson Transcripts Based on Objective Based Instruction**

Thirty lesson transcripts were prepared for Objective Based Instruction (OBI). The objectives of both type of lesson transcripts (CAM and OBI) were same. Lesson transcripts were prepared on the basis of Instructional Objectives of Bloom's Taxonomy adopted by NCERT.

1.8.3.3. **Studying Approach Inventory (Usha and Ampili, 2002)**

A studying Approach Inventory prepared and standardised by the investigator was used for collecting data on Studying Approach of Students.

1.8.3.4. **Standard Progressive Matrices Test (Raven, 1958)**

1.8.3.5. **Achievement Test in Physics (Usha and Ampili 2002)**

An Achievement Test in Physics developed and standardised by Usha and Ampili (2002) was used as the Pre-Test. The same test was used as Post-Test I and Post-Test II.
1.8.4. Procedure for Data Collection

Procedure for collecting the required data are as follows.

1.8.4.1. Administration of Pre-Test

Pre-Test was administered to the Experimental group and Control group before the treatment was given.

1.8.4.2. Administration of Other tools

Data on Studying Approach was collected from each group by using Studying Approach Inventory and data on Non-Verbal Intelligence was collected from each group using Raven's Standard Progressive Matrices Test.

1.8.4.3. Treatment

Experimental group was taught through CAM and Control group was taught through OBI.

1.8.4.4. Administration of Post-Test I

Immediately after the treatment Post-Test I was administered to each group.

1.8.4.5. Administration of Post-Test II

Post-Test II was administered to each group two months after the treatment.
1.8.5. Analysis of Data

The statistical techniques used for the analysis of data are the following.

1.8.5.1. Test of Significance of different between means
1.8.5.2. Two-way ANOVA with 2x3 factorial design
1.8.5.3. Scheffe Test of Multiple Comparison
1.8.5.4. Two-way ANCOVA with 2x3 factorial design.

1.9. SCOPE AND LIMITATIONS OF THE STUDY

The aim of the study was to find the Interaction Effect of Concept Attainment Model of Teaching and Studying Approach on Achievement in Physics of Secondary School students. The investigator tried to find out how far the learned materials are retained in pupils after each treatment. The study also examined whether changes could occur if the effect of Previous Knowledge of Subject Matter and Non-Verbal Intelligence were controlled.

Precautions were made to get valid and reliable results from the experimental study. The investigator hopes that the study will yield reliable results which can be generalised and it may help teachers and other educationists to modify the instructional programme. It is hoped
that the learning materials prepared for this study will be beneficial to other group of students in successive years.

Even though maximum care and precautions were made, some limitations are anticipated by the investigator which are given as follows.

1. The accessible population of the study was confined to standard IX, the middle stage of secondary level.

2. The Selection of control variables was confined to only Previous Knowledge of Subject Matter and Non-Verbal Intelligence.

3. The Achievement Test in Physics was intended to measure instructional objectives of Cognitive domain only.

4. The items in the Achievement test in Physics were confined to objective type items only, for easy scoring and objective measurement.

5. The selection of topics was confined to thirty basic concepts of Secondary School Physics.

6. Selection of sample subjects were not state wide, but was confined to one revenue district of Kerala.

7. The study was confined to two intact class divisions of standard IX, as this is considered as the representative of Secondary School Students.
8. Same teacher taught both the control group and experimental group. Therefore effect of teacher variation was not studied.

9. Although there were several sophisticated experimental designs, the Pre-Test, Post-Test Equivalent Groups Design only was selected for the present study.

1.10. ORGANISATION OF THE REPORT

Report of the present investigation is organised in the following pattern to get precision and clarity. Each chapter is explained using relevant sections and sub sections.

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Selection of Variables
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CHAPTER 4  ANALYSIS

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Major Analysis
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Tenability of Hypotheses
Suggestions for Improving Educational Practices
Suggestions for further Research