CHAPTER - 1

THEORETICAL FRAMEWORK

1.1 INTRODUCTION

There is a general feeling that the conventional methods of classroom instruction have lost ground in the present context. It is being said that the present educational rot is due to the fact that our classroom instruction is teacher-controlled and teacher-paced. Undoubtedly, in the conventional methods of teaching, there is no provision by which the teacher could accommodate simultaneously the individual needs of the slow-learners and fast-learners.

According to Fergus (1970), in the teacher-controlled instruction, either the teacher takes the lesson at so slow a pace that he holds back the fast-learners, or he takes it at so fast a pace that he completely loses the slow-learners.

There is no doubt that lecturing can be extremely useful for motivating students, for giving feel for a subject, and for imparting large amount of information to a large number of people in a short time. But it is also true, lectures have an initial effect usually in the form of euphoria (Covey, 1974). The reason for it is that the large
amount of information imparted in the lecturing situation cannot be retained by students for long. Also, the lecturer model of instruction leads to too much of cramming and isolation from real life situations (Education Commission, 1964-66). And, this sort of situation will continue as long as our teaching is solely based on the lecture method of instruction.

Skinner (1954) lashes out at the lecture model of instruction and suggests its replacement with properly structured learning steps and students advancing through the steps at their own rates. In this regard, Skinner (1954) observes as follows:

It seems that one of the factors of inefficiency in the present system of education is because we teach a set of students at the same rate. It is not only unfavourable to the student who can pace himself faster in a course of study, but more so to a slow-learner. A slow-learner is not necessarily a dullard, but he starts lagging behind in studies as he is unable to move at the speed of the instructor. With a properly structured self-paced course, a slow-learner can rise to a good level of performance. For such a course, the grading system would have to be restructured which will signify the mastery and the amount of learning material student has covered.

Thus, the conventional teacher-controlled instruction has many drawbacks. Ginott (1972) hits out at the conventional methods of teaching and observes that in these methods the children are dependent on their teacher, and dependency breeds hostility. To reduce hostility, the opportunities should be
provided for self-education. The more the autonomy, the less the animosity and the more the self-dependence, the less the resentment of others. Thus, effective learning takes place when students are given opportunities to participate in their own learning. Similarly many other educators (Jones, 1983; Gates, 1950; Mathur, 1983; Kishore, 1983) have also expressed the same kind of views about the lecture method of instruction.

1.2 TEACHING AND LEARNING: NEW MEANINGS

Behavioural theory described learning as the change in an individual's behaviour as a result of instruction and experience. In other words, if as a result of instruction an individual can perform some tasks he could not do before, learning has taken place.

According to Gates (1950), learning is a self-active process and should be organised in a series of progressive approximations for a successful performance by students. In the light of this definition of learning, the activity of teaching should be regarded as a process of stimulating and guiding learning. Thus, the main purpose of teaching is to provide opportunities for learning.

Teaching is now being regarded by many educators, (Mac Feady, 1975; Mathur, 1981; Kishore, 1982 b) as a process of motivating children to learn on their own and enable them to develop the qualities of self-initiative, self-reliance
and independence.

1.3 NORMALLY DISTRIBUTED LEARNING: AN EXPLODED MYTH

It is quite understandable that mental abilities like aptitude and intelligence are normally distributed. Recently, many educators (Carroll, 1963; Bloom, 1971; Block, 1976; Jangira, 1983) have raised serious doubts about the normal distribution of achievement and learning. Ryan and Cooper (1972) hit at the false belief in the normal distribution of curve for learning. According to them, the failure is wrongly determined by the rank order rather than by the student's grasp of the essential ideas of the course.

Generally, we, as classroom practitioners, are not much concerned about the under-achievement by a good number of students and tend to believe in normal distribution of achievement and learning. If after an educative treatment, learning is still normally distributed, the learners have not learnt anything more than he would have learnt otherwise by mere chance. In other words, if after the instruction, the achievement is still normally distributed, the instruction is inefficient and ineffective.

In this respect, Bloom (1968) says that when aptitude for a task is normally distributed and each learner receives optimal instruction, achievement will not be normally distributed; it will be better. In this connection Bloom
further observes as follows:

Most students (perhaps over 90%) can master what we have to teach them, and it is the task of instruction to find the means which will enable our students to master the subject matter under consideration. Our basic task is to determine what we mean by mastery of the subject and to reach for methods and materials which will enable the largest proportion of our students to attain such mastery.

Thus, the crucial outcome of the mastery learning strategy is that it seeks a uniformly high standard of achievement for most students. Carroll (1963) says that the input variables of presenting the learning material and quality of instruction can be easily manipulated so that a good majority of student could reach their optimal performance.

Block (1971) also suggests that in many subject areas almost all students can achieve some defined level of mastery. Therefore, the achievement curve should be skewed towards the higher side after the instruction.

Also, Ausubel et al. (1978) observes that the mastery learning strategy employs criterion-referenced evaluation and whereas traditional instruction usually employs norm-referenced evaluation. In the norm-referenced evaluation, students strive for a position on the curve, whereas in criterion-referenced evaluation students are essentially assessed in reference with themselves. Moreover, criterion-referenced evaluation permits the majority of students to receive A and B
FIG. 1.1 - MECHANICS OF MASTERY LEARNING STRATEGY
grades making the distribution curve to skew to higher end.

Likewise, Jangira (1983) hits at the hollow myth of normal distribution of achievement. He maintains:

It is wrongly believed that when something is taught in the classroom, most of the students will have average learning, some will achieve above average and some of them will achieve below average. Testing is also based on this concept. We, as practitioners, feel contended with this. We are not concerned with under-achievement of the three groups of pupils. Anything short of failure in the terminal examination fails to move us. The myth of this traditional folklore has been exploded and it is being asserted that anything can be learnt by everyone provided it is presented suitably.

Therefore, if a good deal of pupils of a group do not get high grades in achievement tests, it reflects poorly on the quality of classroom instruction.

Bruner (1967) sees learning as the end product of teaching and asserts that anything can be learnt by anyone at any stage provided it is presented properly or taught properly. In other words, the degree of learning by pupils is proportional to the quality of instruction. If the subject matter is presented in the properly structured and sequenced steps, it can be most transferably learnt by students.

1.4 DEVELOPMENT OF MASTERY LEARNING STRATEGY

The principles of operant conditioning in learning have attracted many educators to apply them to classroom instruction.
FIG. 1.2: INTERACTIONS BETWEEN THE STUDENT, STUDY UNIT, PEER TUTORS AND TEACHER
Mastery Learning Strategy (MLS) is an application of operant conditioning for classroom teaching. The theoretical model of mastery learning strategy was presented by Caroll (1968) and practical implementation was done by Keller (1968) and Block (1971).

In mastery learning strategy, each student is given the study material comprising of small learning segments called 'study units'. The student assimilates and consolidates his on-going study unit at his own pace. He is not allowed to move on to the next study unit unless he passes a criterion-referenced test with marks more than the prescribed level of achievement, which is generally 80% to 100% marks (See Fig. 1.1). The student is also given enough individual guidance and corrective feedback by the fast-learners (peer-tutors) and the instructor so as to enable him to achieve mastery on his on-going unit.

Bloom (1971) suggests the following steps for implementing the mastery learning strategy:

1. The course is broken down into small study units covering one or two weeks of instruction.
2. The instructional objectives are specified for each unit.
3. The learning tasks within the unit are learnt by students at their own rates.
4. Diagnostic progressive tests (formative tests or criterion-referenced tests or mastery tests or readiness tests) are administered at the end of each unit to determine whether each student has mastered the unit; and if not, what he still has to do to master it.
**Figure 1.3: Sequence of Tasks in Mastery Learning Strategy.**
5. The procedure for corrective and remedial feedback; such as working with fast-pacers, re-reading specific pages from the study unit and discussions with the teacher; are specified.

6. Retesting is done after every corrective and remedial session. The student is assigned the next study unit only when he demonstrates mastery on his present unit.

Thus, in the mastery learning strategy, the student interacts with the printed study units, the fast-pacers and the teacher. The interaction with the fast-pacers and the teacher are for individual guidance, correction and remediation. (See Fig. 1.2).

There is a profound relationship between behavioural objectives and learning (Bloom, 1971). The students are supposed to achieve mastery on the behavioural objectives after interacting with the study unit at their own rates. The mastery test questions should cover the behavioural objectives specified for the study unit. The specification of behavioural objective works as the standard for the instruction. The learning process is the presentation of learning sequence and the students interaction with it. Mastery tests work as measuring instruments which help in deciding about the students moving on to the next unit or repetition of the unit with remedial feedback (See Fig. 1.3).

1.5 HISTORICAL PERSPECTIVE

The mastery learning strategy was in practice at a small level even a century ago. It could not gain currency
FIG. 14: BLOOM'S THEORY OF LEARNING

STUDENT CHARACTERISTICS ➔ INSTRUCTION ➔ LEARNING OUTCOMES

<table>
<thead>
<tr>
<th>COGNITIVE ENTRY BEHAVIOURS, EFFECTIVE ENTRY CHARACTERISTICS</th>
<th>LEARNING TASK(S)**</th>
<th>LEVEL AND TYPE OF ACHIEVEMENT RATE OF LEARNING AFFECTIVE OUTCOMES</th>
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QUALITY OF INSTRUCTION
because of emphasis on recitation of factual knowledge that time. In 1886, Preston Search used the concept of self-pacing for classroom instruction. Fredric Park and Carleton Washburn also implemented the mastery learning strategy. The noteworthy work in implementing the mastery learning strategy in the forms of 'Dalton Plan' and 'Horison Plan' was done by Helen Parkh in 1920 and Henry Morrison in 1926 respectively (Alberty & Alberty, 1976).

Recently, in the late sixties and early seventies, the impetus was given to the mastery learning strategy by Bloom (1968, 1971 & 1976), Keller (1968), Keller & Sherman (1974), Block (1971, 1974). Bloom's (1976) theory of mastery learning and Keller's (1968) Personalized System of Instruction have their roots in Carroll's Model of School Learning (1963). Bloom's theory (Fig. 1.4) starts with the assumptions about good education. According to Bloom (1976), a good educational system is one which maximizes the percentage of students mastering the substance or content of instruction, where errors are redefined as actions that leave some children behind others with respect to the quality of what is known.

Bloom (1976) further says that the purpose of formalizing the theory of learning is to permit society to move towards a minimal-error system in the process of schooling.

Furthermore, Bloom (1976) describes student characteristics in terms of cognitive and affective entry
behaviours. The instructional component of the model includes specific tasks to be learnt and the quality of instruction, especially with respect to presentation, feedback, and corrective instruction. Learning outcomes include level and type of achievement, rate of learning and affective outcomes.

Leinhardt (1980) finds Bloom's Model useful primarily because many of the themes and elements defined by it recur in less well-defined fashion in other models. Presently, the mastery learning strategy being advocated as a viable alternative to the traditional classroom instruction. Keller (1968) successfully used the mastery learning strategy to teach psychology to college students and his course is known as Keller Plan of Personalized system of Instruction (PSI).

In the recent years, the mastery learning strategy has become a very popular instructional procedure (Traveggia, 1976) as compared to the lecture model of instruction.

1.6 PREMISES OF MASTERY LEARNING STRATEGY

The mastery learning strategy is based on two major premises which have been established and validated by many educators. According to Mergenhausen (1976), the two premises of the mastery learning strategy are as follows:

1. **Students learn at different rates:** Age and grades level are in no way guides to the appropriateness of learning task. A task which is right for one
learner may be wrong for another who has already achieved that learning, or for one is not ready for it. A student should not be allowed to the next learning unless he has mastered it and is ready for the next learning task. This implies that the student should be allowed to learn at his own rate.

2. Learning is incremental: In most instances, the child builds up his learning block by block like a wall, some learning acts are fundamental for other learnings. It is impossible to achieve a complex learning without first having mastered the simple learnings.

1.7 FEATURES OF MASTERY LEARNING STRATEGY

The main features of the mastery learning strategy as observed by Mathur (1983) are as follows:

1. Unit-wise break-up of the subject matter: The content is divided into small units such that each unit is covered by an average student in a specified interval of time at a normal rate of learning.

2. Advance organizers: These are elements which guide the learner about the learning procedure. The advance organizers in the mastery learning strategy are: performance objectives, course policy and grading policy and these are made clear to students before they start learning the unit content.

3. Self-pacing: Each student is allowed to learn a given study unit at his own rate.

4. Consolidation of learning: The student is expected to master the subject of his on-going unit before he advances to the next one.

5. Individual guidance: The individual guidance from the fast-pacers and the instructor is made available for clarification, correction and remediations.
6. **Mastery test or Criterion test**: The student is assessed with respect to an absolute standard of performance called criterion or mastery level which is generally a score of more than 80% on the unit test.

In mastery learning strategy, the student is expected to take charge of own learning at rate appropriate to his capability and potential. Alexander (1975) says that the subject material can always be developed in terms of conditions for satisfactory terminal behaviour, i.e., mastery of the learning material and an error rate of less than 10%.

1.8 **SIGNIFICANCE OF MASTERY LEARNING STRATEGY**

The conventional methods of classroom instruction are under fire from all sides. Therefore, it becomes imperative to look for a method of instruction which would replace the lecture model of instruction without involving extra-expenditure and waiting for new technology. Mastery learning strategy is being advocated as a viable alternative to the conventional methods of instruction.

Pengotra and Kishore (1982) have enlisted the following plus points of mastery learning strategy for its viability to the lecture method of instruction:

1. It has the individual variability in terms of rate of learning,
2. It lays emphasis on the consolidation of learning,
3. It involves a constant interaction between the learner and the learning material. Therefore, the learner is always alert and busy.

4. The self-testing exercises under the mastery learning procedure enable the student to chart his progress towards the prescribed performance objectives.

5. It minimises failure and maximises the chances of success.

6. It lays emphasis on independent study and self-direction.

7. It increases the student motivation and produces greater resourcefulness on the part of the student.

8. It results in better retention of subject matter.

9. It involves team-learning in the form of peer-tutoring and individual guidance, and hence builds up students' self-concept.

10. It provides immediate reinforcement to the student and hence results in effective learning.

11. It results in better mental health of students as the failure in the mastery test does not count against the student.

Mastery learning strategy lays emphasis on structuring and sequencing the subject matter which has been advocated strongly by Bruner (1967) in his learning theory. In his report, Bruner maintains that it is necessary to understand how a student perceives what he or she is learning. An economical mode of instruction is to divide learning into series of steps.

It is always worthwhile for a student to achieve a good level of performance for a learning task prior to his
moving on to the next one. For this, one can easily make the classroom instruction rate-centred. Mastery learning strategy dispenses with the lecturing situation and could be thought of producing better understanding of the subject matter and inducing positive attitudes among students.

Mastery learning strategy has been used successfully to teach various subjects at the college level elsewhere. It could be also used to teach the secondary school students if the research findings could favour it. The present study will reveal the feasibility and viability or otherwise of mastery learning strategy for teaching physics at the secondary school level in the Indian context.

1.9 PREVIEW

The following is a short preview of the subsequent chapters of the present study:

Chapter II is addressed to the review of the related literature. The first few pages of the chapter deal with the theoretical models of mastery learning strategies proposed by various educators. The next part of chapter describes the different components of the strategy like self-pacing, peer-tutoring, criterion-referenced testing, and corrective feedback. Also, the reported research studies have been described in the three main areas, i.e., the strategy development studies, affective consequences studies and
cognitive consequences studies. This split-up of the reported studies in the present investigation is for the area of mastery learning strategy to get a comprehensive picture. Over fifty foreign studies of various kinds and six Indian studies have been reviewed.

The third chapter deals with the plan and procedure of the study. The control and experimental group design used for the present study has been described and illustrated by tables in this chapter. It also includes a short description of the various tools used to collect the relevant data.

In the fourth chapter, the data has been analysed to reach at certain conclusions. The pre-test scores for matching the two comparison group has been done using 't' test. For analysing the post-test scores on various scales, the non-parametric statistical technique of the Mann-Whitney test has been used as the subgroups of low-achievers and high-achievers consisted of six subjects each. For post-test data analysis of the subgroups, the Mann-Whitney test has been preferred as it considers the rank value of each observation.

The fifth chapter describes the findings of the study, conclusions, discussion, educational implications and ideas for further research. The results of the study are positive and encouraging. It has been found that the strategy helps the mediocre students the most, and more students achieve higher grades under mastery learning strategy instructional procedure.