CHAPTER 2

MASTERY LEARNING STRATEGY —
A THEORETICAL OVERVIEW

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MASTERY LEARNING STRATEGY – A THEORETICAL OVERVIEW

1.0 Introduction

If a nation is keen on the pursuit of excellence and qualitative improvement of education, mastery at every level must be the objective. Mastery learning is a powerful new approach to student learning which can provide successful and rewarding learning experiences now allowed to only a few. It is suggested that all or almost all students can master what they are taught and also provides a compact and interesting way of increasing likelihood that more students will attain a satisfactory level of performance in school subjects. Also it manages each student’s instruction and learning within the context of group based classroom instruction (Bloom, 1968).

2.0 Historical Background

The basic tenets of mastery learning are hundreds of years old. The idea of mastery in different ways stressed by Comenius in the 17th century, Pestalozzi in the 18th century, and Herbert Spencer in the 19th century. Mastery learning received a greater attention during the 20th century. Early attempts were made by
Washburne (1922) and Morrison (1926). Carroll (1963) developed it as a model of school learning and Bloom (1968) shaped it as a working model. Later Bloom's students and their colleagues devoted their attention to develop the practice of mastery learning.

The mastery learning concept was introduced in the American schools in the 1920's with the work of Washburne (1922) and others in the format of the Winnetka plan. The programme flourished during that decade; however, without the technology to sustain a successful programme, interest among developers and implementers steadily diminished. Mastery learning was revived in the form of programmed instruction in the late 1950's in an attempt to provide students with instructional material that would allow them to move at their own pace and receive constant feedback on their level of mastery. According to Carroll (1963), learning is a function of time spent divided by time needed. One important variable related to time needed is student aptitude, which Carroll defines as the amount of learning time necessary for a student to master an objective under optimal conditions. Bloom's (1968) learning for mastery focused new attention on the philosophy of mastery learning. Bloom is widely viewed as the major theoretician and promulgator of mastery learning. He has attempted, through mastery learning techniques, to reduce the amount of time the student needs to learn school related content.
Although students taught for mastery learning may need more time to reach proficiency in the initial stages of a course, they should need less time to master more advanced material because of the firm grasp of fundamentals that they should gain from their initial efforts. Later Bloom and his students have conducted many empirical studies that demonstrate the effectiveness of mastery learning in a wide variety of circumstances.

2.1 Contributions of Washburne (1922)

Winnetka plan of Washburne and his associates is a major attempt of the early 1920's to produce mastery in student's learning. The special features are:

(i) Mastery was defined in terms of particular educational objectives each student is expected to achieve. Here much importance is given to cognitive objectives.

(ii) Instruction is organised into well-defined learning units. Each unit consisted of a collection of learning materials systematically arranged to teach the desired unit objectives.

(iii) Complete mastery of each unit was required of students before proceeding to the next.
(iv) Administration of a diagnostic progress test at the completion of each unit to provide feedback on the adequacy of the students' learning.

(v) Based on the diagnosis, provide supplementary materials for further learning. Here primarily self-instructional materials are used in addition to small group discussion or individual tutoring by the teacher.

Winnetka plan allowed each student to move in his own pace by taking his own time to master a unit. Thus it was a self-paced learning technique.

2.2 Contributions of Morrison (1926)

Henry C. Morrison was a professor at the university of Chicago's laboratory school. According to his teaching procedures, the outcome of all teaching is not memorization of facts, but mastery. Mastery is reached only when planned understandings have been grasped thoroughly. The major features of this teaching procedure are:

(i) Defining Cognitive, affective and psychomotor objectives.
(ii) Division of each subject into units. A unit is typically conceived as a piece of work, based upon a certain quantity of related facts in a text-book or other source. A unit is a generalization and its related facts are developed according to a sequence of steps.

(iii) Mastery is to be attained on the basis of the specified objectives. Each unit should present a specific understanding with such thoroughness that most students achieve mastery. A unit is covered only when all or almost all students thoroughly understood the generalization, its factual origins, its probable reliability, and the kinds of situations in which it could be used in the future.

(iv) Administration of an un-graded progress test at the completion of each unit to provide feedback.

(v) After diagnosis a variety of correctives such as re-teaching, tutoring, re-structuring the original learning activities and re-directing student study habits are to be used.

In Morrison's method each student was allowed the teaching time based on attainment of unit mastery by all or almost all students. Our teaching would undoubtedly be improved if Morrison's thinking were more widely understood.
2.3 Mastery Learning as a Corollary of Programmed Instruction (1950)

The Winnetka plan and Morrison’s method were flourished during 1930’s; however, without the technology to sustain a successful strategy, interest among developers and implementers steadily diminished.

Mastery learning was revived in the form of programmed instruction in the late 1950’s in an attempt to provide students with instructional materials that would allow them to move at their own pace and receive constant feedback for their level of mastery. A basic idea underlying Programmed Instruction was that the learning of any behaviour, no matter how complex, rested upon the learning of a sequence of less-complex component behaviours (Skinner, 1954). The component behaviours are sequentially arranged in the form of a chain and by ensuring student mastery of each link in the chain, it would be possible for any pupil to master even the most complex skills.

The major steps of Programmed Instruction are:

- Complex behaviour is split up into sequential less-complex behaviours.
• Presentation of each component behaviour in small steps called frames.

• After completion of each frame pupil respond to a diagnostic question, which determines the mastery or non-mastery of the component behaviour.

• Immediate feedback. If the response is correct, learning is reinforced and he can proceed to the next frame. Otherwise his error is corrected immediately.

The Programmed Instruction was effective only for some students who require small learning steps, practice and immediate reinforcement. It acted as an important tool to attain mastery but it did not suit as a useful mastery learning model.

2.4 Carroll’s Model of School Learning (1963)

Mastery learning is rooted in Carroll’s Model of school learning. In his Model, Carroll stated that all the variables that directly influence the learning of children in school could be defined in terms of time. “The learner will succeed in learning a given task to the extent that he spends the amount of time he needs to learn the task” (Carroll, 1963). Carroll indicates that if a student is allowed the time he needs to achieve a particular level
and if he spends the amount of time needed, he should achieve at that level.

The model considered degree of learning as a function of the amount of time the learner actually spends on the learning task to the total amount needed.

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\text{Degree of learning} = f\left(\frac{\text{Time actually spent}}{\text{Time needed}}\right)
\]

Carroll used five elements such as aptitude, ability to understand instruction, quality of instruction, opportunity to learn and perseverance to explain the degree of learning a particular task.

2.4.1 Major Propositions of the Model

(i) A student's aptitude has traditionally been seen as an index of the level to which a child could learn in a given amount of time. From this viewpoint children tend to be considered as either good or poor learners. Carroll suggested to view aptitude as an index of amount of time required by a child to learn the subject to a given level. Thus, instead of being aptitude as a measure of ability to learn a particular subject, or of specific learning potential Carroll suggested that it could be viewed as a measure of learning rate. From this
perspective children are seen as being fast or slow learners rather than as good or poor learners.

(ii) The degree of learning for any student in a school setting is a function of the time he actually spends in learning relative to the time he needs to spend. Thus, to the extent that each student is allowed sufficient time to learn a given subject to some pre specified level, and he spends the time needed to learn, the student will definitely learn the subject to the specified level.

(iii) In a school-learning situation, the time a student actually spends learning a subject as well as the time he needs to spend will be determined by certain instructional and personal characteristics. The two major instructional characteristics are the student's opportunity to learn (i.e., the amount of classroom time allocated to learning the subject) and the quality of instruction (i.e., the degree to which the presentation, explanation, and ordering of the elements of the subject are optimal for the student). In addition to aptitude, the relevant personal characteristics are the student's ability to understand instruction and his perseverance.
2.5 Contributions of Bloom (1968)

In the mid 1960's Benjamin S. Bloom began a series of inventions on how the most powerful aspects of tutoring and individualised instruction might be adapted to improve student learning in group-based classes.

Bloom's contribution to the development of mastery learning was to transform the conceptual model of school learning developed by Carroll into a working model for mastery learning. In Carroll's model aptitude was predictive of the rate at which, rather than the level to which, a student could learn. Therefore it should be possible to fix the degree of learning expected of students at some mastery level and to systematically manipulate the relevant instructional variables such that all or almost all students attained mastery.

Bloom argued that if students were normally distributed with respect to their aptitude for a subject and were provided uniform instruction in terms of both quality and time, then their achievement at the subject's completion would be normally distributed. This situation can be represented as in figure 1.
Achievement

Figure 1 Uniform Instruction per Learner

However, if students were normally distributed with respect to aptitude but the kind and quality of instruction and learning time were allowed to vary to suit the characteristics and needs of each learner the majority of students could be expected to attain mastery. This situation can be represented as in figure 2.

Figure 2 Optimal Instruction per Learner

To determine how this result might be practically achieved, Bloom searched various sources of information. He studied ideal teaching learning situations where an excellent tutor paired with an individual student and tried to determine the critical elements in one-to-one tutoring that can be transferred to group based
instructional settings. He also tried to collect information regarding the strategies employed by academically successful students.

Based on the series of studies conducted, Bloom (1968), outlined a specific instructional strategy labeled as ‘Learning for Mastery’ and later shortened it to simply ‘Mastery Learning’ (1971).

The various stages of this strategy are:

(i) The concepts and materials the students are to learn are first organised into instructional units. A unit is composed of the concepts presented in about a week or two of instructional time.

(ii) Initial instruction on the unit by adopting suitable methods.

(iii) A quiz or assessment is given to students for giving students information or feedback on their learning. Bloom called it ‘formative assessment’.

(iv) Suggestions to students as to what they might do to correct the learning difficulties identified on the assessment. Correctives are individualised and students need to work for the mastery of non-mastered concepts. They may point out additional sources of information on a particular topic, such as the page numbers in the course textbook or workbook where the topic is discussed. They may identify alternative
learning resources such as different textbooks, alternative materials, learner centered activities, or computerized instructional lessons, or they may simply suggest sources of additional practice, such as study guides, independent practice or guided practice activities.

**Administration** of a parallel formative assessment when the students complete their corrective activities usually after a class period or two. This is necessary to check on the effectiveness of the correctives in helping students to overcome their individual learning difficulties. It also offers a second chance for the students to succeed and hence serves as a motivational device.

Bloom believed that through this process of formative assessment combined with the systematic correction of individual learning difficulties, all students could be provided with a more appropriate quality of instruction than is possible under more traditional approaches to teaching.

**2.6 Post Bloom Period (since 1971)**

While Bloom turned his attention to develop the theory of mastery learning, a number of his students and colleagues devoted
their attention to develop the practice. Since publication of Bloom’s ideas, extensive mastery learning research has been carried out and successful strategies have been easily and inexpensively implemented at all levels of education and in subjects ranging from arithmetic to philosophy to physics.

At first, the efforts of some of the researchers were concentrated on applying the theory and related practices to the improvement of classroom and then school wide practices. Soon it became apparent that interest in the evolving mastery learning approach had spread far beyond the classroom and school level. Entire local, regional, and even national school systems desired to plumb the potential of the evolving mastery learning approach for their particular problems (Block 1979). As a consequence the efforts of many individuals shifted to the improvement of system wide practices. Since system wide applications of mastery learning practices require the co-operative efforts of many individuals at many levels a network of mastery learning practitioners was formed in the United States. This network, known as the network of outcome-based schools, is affiliated with the American Association of school Administrators. Its primary purpose is to encourage the discussion, summarization, and dissemination of mastery-related strategies, practices and materials. Thus since the mid 1970’s mastery learning has been applied to an ever
increasing variety of school subjects and extended beyond the secondary school level (International Encyclopedia of Education, 1985).

Mastery learning programmes are operating in nations around the world at every level of education, from pre-school to graduate and professional schools. Moreover, evaluations of these programmes show that students in mastery learning classes consistently learn better, reach higher levels of achievement and develop greater confidence in their ability to learn and in themselves as learners (Guskey and Pigott, 1988; Kulik et al. 1990; Anderson, 1994).

3.0 Development of a Workable Group based Mastery Learning Strategy

There has been confusion and misinterpretation, as well as excitement, about mastery learning. Since Bloom first set forth his ideas, much has been written about the theory of mastery learning and its accompanying instructional strategies (Block and Anderson, 1975; Levine, 1985). Still programmes labelled 'Mastery Learning' are known to vary greatly from setting to setting (Burns, 1987). As a result, educators interested in applying mastery learning often find it difficult to get a clear and concise description
of essential elements of the process and the ways to apply them. This entry will shed light on these and other related issues.

3.1 Essential Elements of Mastery Learning

A learning strategy for mastery may be derived from the work of Carroll (1963). The main concern of Bloom and his associates was to transform the major variables of model of school learning in such a way as to utilize them for a strategy for mastery learning.

3.1.1 Aptitude for Particular kinds of Learning

Over the years, aptitude was considered as a relatively fixed and generic ability to perform various kinds of learning tasks. In contrast was Carroll’s (1963) view, that aptitude is the amount of time required by the learner to attain mastery of a learning task. Based on the researches carried out on Carroll’s view, Bloom established that at the top of the aptitude distribution there are likely to be some students (5%) who have a special talent for particular subjects. At the bottom, there are individuals (5%) with special disabilities for particular subjects. In between are approximately 90% of the students for whom aptitudes are predicative of rate of learning rather than level of learning possible. Thus 95% of the students can learn a subject to a high level of
mastery if given sufficient learning time and appropriate types of help.

There is clear evidence that aptitudes may be modified by environmental conditions or by learning experiences in school and in the home (Bloom, 1964; Hunt, 1961). It is highly probable that more effective learning conditions can reduce the amount of time, which all students and especially those with lower aptitudes require to master a subject.

3.1.2 Quality of Instruction

Quality of instruction is the degree to which the presentation, explanation and ordering of elements of the learning task approaches the optimum for a given learner (Carroll, 1963). Available research results suggest that some students learn quite well through independent study while others need highly structured teaching-learning situations. It seems reasonable to expect that some students need more concrete illustrations and explanations than others, some need more examples to get an idea than others, some need approval and reinforcement and some need to have several repetitions of the explanation while others may be able to get it the first time.
The main point stressed here is that the quality of instruction should be assessed in terms of its effects on individual learners rather than on group of learners. A good tutor attempts to find the qualities of instruction and motivation best suited to a given learner.

The strategy assumed that quality of instruction could best be defined in terms of

(i) The clarity and appropriateness of the instructional cues for each pupil.

(ii) The amount of active participation in and practice of learning allowed for each student.

(iii) The amount and variety of reinforcements available to each learner.

### 3.1.3 Ability to Understand Instruction

This is the ability of the learner to understand the nature of the task he is to learn and the procedures to follow in its learning. Ability to understand instruction depends upon the instructional materials and the instructor’s skill in teaching. If the student is able to follow the teacher’s communications and instructional
materials easily, he finds little difficulty in learning the subject. In our highly verbal schools, it is likely that the ability to understand instruction is determined primarily by verbal ability and reading comprehension. These two measures of language proficiency are significantly related to achievement in the majority of subjects, it is suggested that verbal ability determines some general ability to learn from teachers and instructional materials.

Most change in verbal ability can be produced at the pre school and elementary school levels, with less and less change being likely as the student gets older (Bloom, 1964). Improvements in verbal proficiency should result in improvements in the learner's ability to understand instruction. In order to deal with this ability modifications in instruction to meet the needs of individual students are necessary. This can be carried out using various types of instructional aids and techniques and by giving proper help and individual attention to enter the differing needs of the children.

*Small group study sessions* consisting of three or four students are very effective in helping students to overcome their learning difficulties in a cooperative rather than a competitive learning situation. It gives freedom for each person to expose his difficulties
and have them corrected without demeaning one member and elevating another.

**Tutorial help:** The tutor should be someone other than the teacher who brings a fresh point of view about an idea and is capable of detecting student learning difficulties as fostering student self-reliance in learning. **Peer tutoring** is a system of instruction where learners help each other and learn by teaching. The fast learners or the able students in the class teach the slow learners or less able students. This provides an occasion for the more able students to strengthen their own learning as they help others to grasp an idea through alternative explanations and applications.

**Alternative textbooks:** Teacher determine where a learner is having difficulty in understanding the instruction and provide alternative text book explanations if they are more effective at that point.

**Workbooks** can provide drill and practice on specific tasks.

**Individualised instructional materials** are helpful for a student who cannot grasp the ideas or a procedure in the textbook form. Sequentially arranged units, feedback and reinforcement make learning easier. Such materials may be used in the initial
instruction or as students encounter specific difficulties in learning a given unit or section of the course.

**Audio-Visual methods:** Certain pupils may learn a concept best through concrete illustrations and vivid graphic explanations. For these learners, filmstrips, slides, charts, pictures and short motion pictures, which can be used by individual students as needed, may be very effective. Others may need concrete experiences as with laboratory experiments, simple demonstrations and other relevant apparatus in order to comprehend an idea or task. Academic games, puzzles and other interesting devices may be useful.

In the use of all alternative methods and materials of instruction, the essential point to be borne in mind is that these are attempts to improve the 'quality of instruction' in relation to the ability of each student to understand instruction. As feedback methods inform teachers of particular errors and difficulties the majority of students are having, it is to be expected that the regular group instruction will be modified as to correct these problems.

The presence and use of a great variety of instructional materials and procedures should help both teachers and students to overcome feelings of defeatism and passivity about learning. If the student cannot learn in one way, he should be reassured that
alternatives are available to him. The teacher should recognise that it is the learning which is important, and that alternatives exist to enable all or almost all the students to learn the subject to a high level.

3.1.4 Perseverance

Carroll (1963) defines perseverance, as the time the learner is willing to spend in learning. If a student needs a certain amount of time to master a particular task and he spends less than this amount in active learning, he is not likely to learn the task to the level of mastery. In general, perseverance is related to student attitudes towards and interest in learning.

Students vary in the amount of perseverance they bring to a specific learning task. However, if the student finds his past efforts rewarding, he is likely to spend more time on a particular learning task. On the other hand, if he is frustrated in his learning in self-defense he may reduce the amount of time he devotes to it.

Research results support the view that manipulation of the instruction and learning materials will be more effective in helping students master a given learning task, regardless of their present level of perseverance. Frequency of reward and evidence of
success in learning can increase the student's perseverance in a learning situation. As he attains mastery of a given task, his perseverance is likely to increase. Anyhow, the need for perseverance can be decreased to a great extent by improving the quality of instruction.

3.1.5 Time Allowed for Learning

We follow a fixed timetable in every school. The time allowed for each period is too much for certain students and too less for some others. According to Carroll, the time spent on learning is the key to mastery. Since aptitude determines rate of learning, most of the students achieve mastery if they are allowed the necessary amount of time for a particular task. The time an individual needs is likely to be affected by his aptitudes, his verbal ability, the quality of instruction he receives in class, and the quality of the help he receives out of the class. The time needed for mastering a task differs from individual to individual. So in the group instruction this difference can be accommodated to a greater extent by improving the quality of instruction by the proper use of allotted time. The task of strategy for mastery learning is to find ways of altering the time individual students need for learning as well as ways of providing whatever time is needed by each.
3.2 Basic Tasks to be accomplished by the Developers of Mastery Learning Strategy

In the international encyclopedia of education it is advised that educators desiring to plan and implement mastery learning strategy in schools and classrooms must accomplish 4 major tasks, such as (1) Defining mastery (2) Planning for mastery (3) Teaching for mastery and (4) Grading for mastery. Each of these major tasks is divided into several subtasks. Each of the tasks and related subtasks serves an important function within the context of mastery learning (Anderson and Anderson, 1982). A focus on the nature and significance of the tasks and subtasks foster a better understanding of mastery learning.

3.2.1 Defining Mastery

Mastery learning strategy is outcome based, so the first task is to define precisely what is meant by mastery. The related subtasks are:

(i) Identification of the most essential, critical course outcomes or objectives.

(ii) Preparation of the final, summative test. The functions of this test are to assess the degree of student learning over the
entire course and to evaluate the overall quality of student learning. After examining the objectives and related test items a standard of performance is set up. The achievement of which will be accepted as mastery of the course.

(iii) The entire course is divided into a series of smaller learning units. A set of objectives is identified for each unit.

(iv) The units are sequentially arranged so that the facts, concepts, principles, skills and appreciations acquired in one unit are used over and over again in subsequent units.

(v) The last task of defining mastery involves deciding what will constitute mastery of each learning unit. Tests appropriate for the assessment of student learning based on the achievement of the unit objectives are designed. These formatives tests are intended to help teachers identify student errors and misunderstandings. Performance standards are set for each formative test and then mastery performance standards will aid the teacher in the determination of those students who have successfully mastered the unit and those who will require additional time and help if mastery is to be attained.
3.2.2 Planning for Mastery

This includes the designing of plans for helping students acquire the objectives of each unit. The plans must include activities and materials related to the unit objectives and additional, supplementary activities and materials for those students failing to attain the performance standard on the unit formative test.

Planning helps teachers to monitor student learning on a unit-by-unit basis. The evidence gathered from formative tests helps the teacher to take necessary steps to overcome the errors and misunderstandings identified by the tests. Thus the students are able to attain the desired degree of learning.

The subtasks involved in the planning for mastery are:

(i) Design of a general plan for helping all students master the unit objectives. The development of such a plan focuses on two important aspects of high-quality instruction.

- The material relating to each objective should be presented in a way that is appropriate for the vast majority of students in the classroom.
The activities in which the relevant material is embedded should involve or engage the vast majority of students in the process of learning.

This general plan is often referred to as the "original instructional plan" (Block and Anderson, 1975).

(ii) The second subtask involves the preparation of methods for interpreting and using the information gathered from the formative tests. A set of alternative instructional materials and learning activities keyed to each objective on the unit's formative test is developed. These correctives are designed so as to re-teach each unit's objectives, but it should be in ways that differ from the original instruction. Small group study sessions, peer or cross-age tutoring, or alternative learning aids such as different textbooks, workbooks, and audio-visual materials are often used in this regard (Block and Anderson, 1975).

If the correctives are to be used during regular class time, then plans for those students initially achieving mastery on the formative tests must be designed. Anderson and Jones (1981) suggest several options for use with these students.
Option 1. Involves using the initial “masters” as tutors for the “non masters”. For this option to be entirely successful, the students must be willing to serve as tutors, they should have specific tutorial materials available, and they must be trained as tutors.

Option 2. Requires that the initial “masters” be permitted to complete work in other subject areas or engage in nonacademic work, such as recreational reading.

Option 3. Requires that the initial “masters” engage in structured independent study. Students specify what they are to learn, how they will learn and how they are to demonstrate they have learned.

Option 4. Permits the students to engage in “vertical enrichment”. This may consists of materials and activities that allow students to probe more deeply into the content and ideas included in a learning unit by examining the relationships among the content and ideas within or across units.

Planning of time is a very important aspect of this session. Approximate amount of time must be allocated to the original instruction, corrective instruction and testing. Proper planning of time thus provides the opportunity for realistic estimates of the amount of material and objectives that can be included in a
course. It also increases the quantity and quality of time each student spends in learning.

3.2.3 Teaching for Mastery

Inside the classroom "the function of the teacher is to specify what is to be learned, to motivate pupils to learn it, to provide them with instructional materials, to administer these materials at a rate suitable for each pupil, to monitor student’s progress, to diagnose difficulties and provide proper remediation for them, to give praise and encouragement for good performance, and to give review and practice that will maintain pupil’s learning over long periods of time" (Carroll, 1971). The various subtasks of teaching for mastery are:

(i) The Orientation of students: Students are informed of what they are expected to learn, how they will learn it, how they are expected to demonstrate their learning, and how the adequacy of their learning will be judged. They are told about the grading system emphasizing that their learning will be graded relative to a predetermined performance standard, not relative to the learning of their classmates. Also they are told that they will receive extra time and help as needed in order to ensure their learning.
(ii) Teaching each learning unit in sequence using the original instructional plan.

(iii) After the initial instruction of the first unit, the administration of the unit's formative test is performed.

(iv) Based on the formative test results those students who have achieved the performance standard are certified and those who have not are identified.

(v) The students initially classified, as masters are free to engage in enrichment activities or to serve as tutors for their "slower" classmates. The non-masters move to the corrective stage of the mastery learning instructional model.

Formative tests provide information about the adequacy of instruction as well as learning; two phases of corrective instruction can be visualized. The first phase provides corrective instruction for those objectives not mastered by a substantial number of students. This massive non-mastery indicates an instructional problem. As a consequence, additional class time can be taken to provide whole class or large group corrective instruction relating to such objectives.

The cycle of original instruction, formative testing and certification or correction is repeated, unit-by-unit, until all units
have been completed. This cycle is paced by the teacher so that about as much material and as many objectives are covered in the time available. The teacher has two pacing options. If all the time for correctives and enrichment is available outside of regular class period, then the pacing of the instruction proceeds as usual. If some part or all of the time for correctives/enrichment is available during the regular class period, the teacher can adjust the pace of the instruction. Such an adjustment can be made by allowing more time for the earlier units and less time for the later ones. Essentially, time that would ordinarily be spent on later units is borrowed and spent on the earlier units. The assumption underlying this borrowing is that the additional time spent early will yield great time benefits later. Students who learn for mastery at the onset of a course should learn more effectively as the course progress.

3.2.4 Grading for Mastery

The function of grading in mastery learning process is to reward students for the acquisition of the essential, critical course objectives. Thus grades are assigned to students based on their performance on the summative test relative to the pre-determined
performance standard, not based on their performance relative to the performance of other students.

Such mastery grading is designed to engage students in what white (1959) has called “Competence motivation”, that is, the desire to compete against oneself and the objectives to be learned, and to disengage students from what Block (1977) has termed “Competition motivation”, that is, the desire to compete against others. For a better tomorrow competence motivation is preferable to competition motivation.

The various subtasks for the grading for mastery are:

(i) The summative test will be administered to the students and the scores are consolidated for assigning grades.

(ii) All students, whose scores are at or above the mastery performance standard, earn grades of “A” or equivalent. At least two options are available for grading of students who score below the performance standard. A first option, one most consistent with the philosophy of mastery learning, is to assign grades of “incompletes” or equivalent to these students. From a mastery learning perspective these students have not yet spent sufficient time and/or received sufficient help. If this option is selected a so-called “Open
transcript" is required. An open transcript is one that allows students to demonstrate and receive credit for improved levels of performance at any time. A second option is to assign the remainder of the traditional grades (that is "B", "C", "D" and "F") to scores at various gradations below the mastery performance standard. If this option is selected the grades assigned to these students should reflect the number of objectives acquired as evidenced by their performance on the summative test. Even a grade of "F" should indicate the acquisition of some number of objectives.

4.0 Outcomes of Mastery Learning

Bloom (1968) mentioned about the cognitive and affective outcomes of mastery learning. The effectiveness of a mastery learning strategy was found in a test theory course, which used parallel achievement tests in 1965, 1966 and 1967. In 1965, before introduction of mastery strategy, about 20 percent of the students received A grades on the final examination. The final results of the 1967 parallel final examination showed 90 percent of the students had achieved mastery and were given A grades.

If the evaluation system informs the student of his mastery of a subject, he will come to believe in his own competence. When
he has mastered a subject and received both subjective and objective evidence of his mastery, there are profound changes in his view of himself and the outer world. Perhaps the clearest evidence of change is that he develops interest in the subject mastered. He begins to 'like it' and desires more of it. Motivation for further learning is an important result of mastery. Each person searches for positive recognition of his worth and comes to view himself as adequate in the areas where he receives assurance of his success or competence. Thus at a deeper level, subject mastery affects the self concept of students.

The results from approximately 40 major studies carried out under actual school conditions, three-fourths of the students learning under mastery conditions have achieved to the same high standards as the top one-fourth learning under conventional, group based instructional conditions. In studies where a strategy has been refined and replicated, 90 percent of the mastery learning students have achieved as well as the top 20 percent of non-mastery learning students. Mastery learning students also have exhibited markedly greater interest in and attitudes toward the subject learned compared to non-mastery students (Block, 1971).

Anderson (1994) synthesized research on mastery learning, examining outcomes in the areas of achievement, retention, and
affective and related variables. A variety of students showed that mastery learning has a positive effect on achievement at all subjects and results in positive affective outcomes for students and teachers.

These types of dramatic cognitive and affective outcomes suggest that mastery learning strategy cannot be ignored in the planning of future educational practice.