CHAPTER - II
CHAPTER II

REVIEW OF RESEARCHES AND HYPOTHESES

This chapter has been devoted to a brief and critical survey of researches available so far on mastery learning. It is hoped that the review of these studies will prove useful in identifying the important findings arrived at by the researchers. Knowledge of their accomplishments and limitations will provide a deeper insight into the nature of the problem and may guide the investigator to direct the research efforts to fill up the gaps and remove imbalances and inadequacies wherever they are revealed by this analysis of the available researches.

This review will take into account mainly the studies focusing on mastery learning concept and strategies, effect of mastery learning concept and strategies, effect of mastery learning strategy on pupils’ cognitive outcomes and affective outcomes.
2.1 Mastery Learning Concept and Strategies

Over the past thirty five years, considerable interest has grown in the concept of mastery learning. But the ideas of mastery learning are not altogether new. In fact, the fundamentals of mastery learning were described in the early years of the twentieth century by Washburne (1922) and Morrison (1926), and can be traced to such early educators as Commenius in the 17th Century, Pestalozzi in the 18th Century and Herbert in the 19th Century (Bloom, 1976). The increased interest in the mastery learning strategy and its effectiveness in teaching are well documented by the growing body of researches on quality of instruction and effective schools, which provide numerous examples of successfully using various elements considered basic to mastery learning strategy. As manipulation of the learning time allowed to each learner, the quality of instruction through various feedback learning corrective devices or use of alternative materials appropriate to the needs of the individual constitute important element of mastery learning strategy, considerable attention has been given to them by educators and researchers. A number of studies reported by Block (1971, 1974), Block and Burns (1976) and Bloom (1976) have brought out the effectiveness of mastery learning strategy at all levels of
education and in such different subjects as Arithmetic, Philosophy, Physics and Geography.


Block (1971), who has summarized nearly forty studies including those made by Bloom (1968). Kim (1980) has noted that these studies report significant effects on students’ cognitive and affective development and the rate of learning. Block concludes that a planned use of objectives, diagnostic problems and review prescriptions systematically raise the number of students achieving mastery from 40 percent under control conditions to 80 percent, or above under mastery conditions. Mastery learning methods also contribute to increasing the learner’s interest in and better aptitude for the subject learned than more traditional approaches. According to
Block, feedback/correction procedures may be able to offset the strong effects that IQ usually has on the achievement of students under typical classroom instruction. These studies also indicate that mastery learning strategy can compensate learning deficiencies of culturally deprived children. Similar findings characterize the results of almost fifty studies summarized by Block (1974) in his book Schools Society and Mastery Learning.

Results of the studies conducted by Block and Burns (1976) show that students who learn in an environment that allows for testing, diagnosis, continued learning and retesting exhibit greater content learning that do students involved in a more traditional learning environment. Block and Burns (1976) reviewing literature on mastery learning found that in 97 comparisons of average achievement test scores, involving various types and number of students and various subject matter areas, mastery taught students scored higher than non-mastery taught students 89% of the time and significantly higher 61% of the time.

Denton and Seymour (1978) tried to determine if the acquisition of higher order intellectual processes is tenable for secondary level teaching candidates when the
independent variables are unit pacing and different remedial strategies for mastery learning. The results of this investigation indicate that the remediation strategy which specifies in detail how to correct deficiencies appears to be most appropriate for less intense pacing, while less specific remediation are appropriate for time compressed programmes.

Miller and Ellsworth (1979) investigated the effects of time constraints and unit mastery requirements. They examined the effects of prior academic achievement and instructional approach on the number of instructional units attempted and completed as well as the amount of content retained for 180 Universities students enrolled in a mastery or modified mastery approach to instruction course. The mastery approach provided for unlimited retesting and relearning trials over nine instructional units constrained by an end of the semester time limit. The modified mastery approach allowed for only two trials per unit and had no unit perfection requirement for advancement. They found that regardless of the learning approach used, higher prior achievement students attempted more units, completed more units and retained more information. The study further revealed that students under a limited, two trial approach
attempted more units, completed as many and retained more course content than unlimited trial students.

Jones (1983) found that preservice elementary teachers did grow in their development of logical reasoning when exposed to a one semester course in elementary school science methods which emphasized mastery of science processes.

Arlin (1984) attempted to assess both mastery proponents’ and mastery critics’ claim in the context of learning time differences. His study indicates that if equal learning time is desired, as in many current forms of schooling, then inequalities of achievement outcome appears to be an inevitable concomitant. If equality of achievement outcome is chosen as an end, as in mastery learning then inequality of time seems necessary as a means.

Marshal (1986) in her study conducted on nursing programme concluded that all-mastery-group was found more positive about their learning experiences than the some-mastery-group. The all-mastery-group earned higher grades. Royal (1986) compared personalized system of instruction (PSI)
and conventional method. His study revealed that PSI was superior to conventional method in areas of immediate and short term learning.

King (1987) came to the conclusion that research is still needed to find a more effective method of teaching. He compared a group – paced mastery learning model with an individually programmed mastery learning model in the teaching of reading to high school students. Neither model brought the hoped for growth, in most areas the results were almost indistinguishable from one treatment to the other. Callahan (1987) chose a new field for experiment and conducted his study to test the effectiveness of mastery learning procedures as proposed by Bloom in psychomotor area. The purpose of his study was to determine the effects of mastery learning approach on learner achievement of basket ball shooting skill and concomitant student state anxiety. The results indicated that the mastery learning students were somewhat higher in skill level and lower in anxiety level than traditional pupils, but not at a statistically significant level.

Slavin (1987, 1990) reviewed mastery learning literature and found that convincing evidence was still needed to prove that mastery learning can accelerate achievement
in general in elementary and secondary schools. He argued that there were clear indications that the tests used as the dependent measures were designed to cover the objectives taught in the mastery learning programmes without regard to what was taught in the control group. Kulik et al. (1990), however, do not agree with Slavin. They described a variety of results from a variety of programmes. They covered cognitive and affective outcomes; effects of programmes on course completion and student study time; findings from Grade-I through college; and results from programmes modeled after Bloom's system of learning for mastery and Keller’s personalized system of instruction. They also examined the effects on average performance and variation in performance as well as looked at main effects and interactions.

A meta-analysis of findings from 108 controlled evaluations revealed that mastery learning programmes have positive effects on the examination performance of students in colleges, high schools, and the upper grades in elementary schools. The effects appear to be stronger on the weaker students in a class, and they also vary as a function of mastery procedures used, experimental designs of studies, and course content. Mastery programmes have positive effects on student attitudes
toward course content and instruction but may increase student time on instructional tasks.

Guskey and Pigott (1988) also obtained similar results while making a meta-analysis of 46 studies on group-based applications of mastery learning strategies. Their study revealed that such applications yield consistently positive student learning outcomes, as well as several teacher variables. Variation in the size of the effect across studies was found to be quite large, however, and homogeneity tests indicated that the studies do not share a common effect size. Several factors were explored as possible explanations for this variation, including the subject area to which mastery learning was applied, the grade level of students involved, and the duration of the study.

Numbers of studies have attempted to test the effectiveness of frequent testing and feedback. Kulhavy (1977) reviewed the research on feedback effects in written instruction. He concluded that feedback corrects error and error-correcting action of feedback is more effective when it follows response about which the student felt relatively certain. He noted that delay of feedback increases the effectiveness of feedback and suggested that presearch availability must be controlled if feedback is to be
effective. Kulik and Kulik (1988), using meta-analysis, found that delay of feedback is beneficial only under controlled and somewhat artificial conditions and that immediate feedback is recommended for conventional educational purpose. Bangert-Drowns, et al. (1991) reviewed 58 effect sizes from 40 reports. They found that feedback effects varied with control for research availability, type of feedback, use of pretests, and type of instruction and could be quite large under optimal conditions. This study suggests that elaborate feedback may be more important in the building of conceptual frameworks, drawing of inferences, or applying of rules in complex situations.

There are studies which proved that frequent testing is also an effective teaching strategy for more efficient learning. Kulik, et al. (1986), cited by Kika, et al. (1992), stressed that testing not only promotes student learning but also encourages the development of extrinsic characteristics such as more frequent study, increased interest in the subject area, and positive attitude towards the subject.

Kika, et al. (1992) investigated the effect of frequent testing on the performance of high school algebra students. The results of the study indicated a definite
improvement in performance during the weekly versus biweekly testing. This outcome was replicated each time that more frequent testing was in effect. Low and middle-achieving students showed the higher gains.

2.2 Students Cognitive Outcomes of Mastery Learning


Analysis of forty studies carried out under different school conditions by Block (1971) led him to conclude that despite the varying backgrounds possessed by the subjects, mastery learning strategy was effective in bringing most of the students to a high degree of achievement by the end of the course. He found that in general, mastery strategies enable about three-fourths of students to learn to the same performance standards as the top fourth of students learning under conventional, group-based instructional approaches. For subjects where most of the students have achieved the pre-requisite learnings, mastery procedures appear to be able to almost eliminate the effects of individual differences on level of achievement.

Fagan (1975) examined the relationship of mastery procedures and aptitude to the achievement and retention of transportation environment concepts by seventh grade students. An eighty per cent criterion level was required for mastery on the formative tests. The investigator found that mastery procedures did not facilitate achievement or retention.
Myers (1975) studied the effects of mastery and aptitude on achievement in an Introductory College Geography course. The study showed some evidence indicating that the mastery treatment had some impact on achievement scores of low aptitude students. However, the investigator did not find it prudent to claim that the treatment was effective as the number of students involved in the study was very limited. The study also found that the mastery treatment took more time for low aptitude students than it did for the middle and higher aptitude students.

Block and Burns (1976) made a comprehensive summary of the effects of mastery learning school studies as well as Keller Personalized Instruction Studies (largely at the college level). They compared the experimental and control classes on level of achievement as well as relative variability of achievement scores. The results of the study showed enhanced student achievement when taught through mastery learning strategy.

Yildiran (1977) conducted a study on the effects of levels of cognitive achievement on selected learning
criteria under mastery learning and normal classroom instruction. The study was concerned mainly with retention, transfer, lower and higher mental processes and positive effect or interest in the learning task. The study reported that the three cognitive criteria (retention, transfer and level of mental processes) are influenced more by the level of learning than rate of learning, aptitude, I.Q. or previous scholastic achievement. The study further revealed that levels of learning produce effects which are associated with good learning and that its influence is greater than that of more stable characteristics like the rate of learning and aptitude or I.Q.

Denton and Seymour (1978) examined the influence of unit pacing and mastery learning strategy on the acquisition of higher order intellectual skill. The results of this investigation indicate that the remediation strategy which specifies in detail how to correct learner misconceptions is optimal for instructional system with few time constraints, while less specific remediation prescriptions are appropriate for intense, short-term instructional systems. However, the clarity and focus of the remediation activities and contingencies for reinforcement contribute substantially to higher order cognitive achievement.
A study was designed by Kim (1980) to investigate how teachers' instructional climate and instructional conditions interrelate to bring forth mastery implementation which in turn, is associated with student academic achievement. Teacher climate, in this study, is defined as a part of the school learning climate, and consists of teacher expectations, evaluations and academic norms of school. The study reported that teacher expectations and evaluations for student performance are positively related to student academic achievement; the combined effectiveness of teacher climate plus instructional conditions on mathematics is more significant that that on reading.

Bauman (1980) applied a mastery learning model to an undergraduate course in teacher education. Results of the study supported the use of the mastery learning model as an alternative method of teaching an undergraduate course in teacher education. It presented substantial evidences that the mastery learning strategy did have a positive effect on students' perceived cognitive development both at the module and course level.

Burkman and Brezin (1981) attempted to determine the effects of a modified mastery learning system on achievement in an individualized high school physical science
course. The study reported that medium mastery standards were most strongly associated with higher achievement for each dependent variable. Comparing high and low standards, high was better for easy content while low was better for hard content.

Hallada (1982) applied mastery principles in an instructional design for effective learning in General College Chemistry. A field experimental research design was used for 50 students in a treatment group, identified by their relatively low cognitive pre-measures, and 300 students in a comparison group. An instructional design was developed for the treatment group, and the progress of both groups was followed during their first term in General College Chemistry. The two groups showed at beginning significant academic difference, but at terms end, both had completed their same syllabus, and both had achieved the same 83% level of satisfactory grades. Student achievement for the treatment group was significantly higher than predicated from cognitive pre-measures, and both groups showed an overall high degree of student course satisfaction.

In a study by Brooks (1982) effects of mastery instruction on the learning and retention of science process skills were investigated. He made comparison in student
achievement and retention between mastery-instructed classes and non-mastery instructed control groups. The study indicated no significant differences in levels of achievement between mastery and non-mastery groups, average or above - average students. It was further reported that while mastery instruction may not be significantly better than non-mastery instruction in effecting achievement gains when equal amount of time is spent in both modes of instruction, the mastery learning strategy can sometimes produce a more permanent mastery of sequentially organized materials (high process skills) than an equivalent time non-mastery instructional design.

Schielack (1982) attempted to assess the relative merits of a modified version of Keller’s Personalized System of Instruction (PSI) and a conventional lecture-discussion method with respect to achievement in mathematics. He suggested that achievement in mathematics can be expected to be higher for PSI than for lecture treatments.

An examination of the effects of a mastery learning strategy on student cognitive achievement in high school basic drafting classes was made by Reed (1983). The concomitant variables of grade level, grade point average, parents’ educational
level, previous experience, and gender were also tested to determine if they could account for a significant level of variance in student cognitive achievement in high school basic drafting. The study revealed no significant difference in the scores between the two groups.

An investigation was carried out by Pratt (1983) to see the effects of the application of the concepts of sequencing, mastery and reinforcement on student achievement in Basic English Skills. It was found that the effect of treatment was statistically significant to a high degree.

Soto (1983) worked to assess the extent to which group instruction supplemented by mastery of the initial cognitive pre-requisites approximates the learning effectiveness of one-to-one tutorials methods. Four different learning conditions were provided:

a) Enhanced initial cognitive entry behaviour plus mastery learning, a maximal group instruction.

b) Conventional group instruction, a minimal quality of instruction and two intermediate qualities of instruction,
c) Mastery learning, which used the feed-back corrective procedures and,

d) Conventional group instruction plus enhanced initial cognitive behaviour.

It was revealed that the achievement attained is strongly determined by the learning conditions provided. It emerged that the average students in the maximal learning conditions group was above 95% of the students in the conventional group.

Clark et al. (1983) designed their study to examine the effectiveness of a group-based teacher-paced mastery learning instructional model in undergraduate education courses. Two of six sections of a required education course on teaching handicapped children in regular classrooms were imparted instruction by using mastery learning strategy. The results indicated that the students in mastery learning sections scored higher on a common final examination, achieved higher course grades, and were absent less often than students in sections
taught by more conventional methods. Srivastava (1983) found that instruction in mathematical modeling using mastery learning strategy results in greater acquisition and retention of modeling skills than instruction in mathematics modelling led to saving in time taken to master a physics unit and shortening of the time required to master each objective. The effectiveness of master learning in the foreign language classroom was tested by Holden (1983). The study compared two classes taught by the same instructor, one with a mastery learning treatment and one without. Pre and Post-test measures revealed that on diagnostic test of grammar skills and vocabulary knowledge mastery-taught students had significantly higher scores than non-mastery taught students, regardless of the instructor, and despite small sample sizes. Master learning proved effective in helping students with different learning rates to master material and to feel positive towards learning French.

A quasi-experimental study of mastery learning strategies in the teaching of Intermediate French in a suburban high school was attempted by Kuhn (1985) to ascertain whether the concepts proposed by Benjamin Bloom were appropriate for foreign language study. The results indicated that there was a significant difference between the experimental and
control groups on the summative examination. Royal conducted his research to develop a PSI, to test its effective teaching the elements of art, as compared to conventional methods of instruction, to compare retention levels, and to examine perceptual gain. PSI compared to conventional methods in areas of immediate learning and short-term retention was found to be superior. No difference in perceptual gain was not found in either group.

The effects of contrasting mastery learning on performance among high- and low-achieving students were seen by Fuchs, et al. (1986). They found that when principles of mastery learning were adhered to more rigorously as an alternative mastery learning system, achievement among high-achieving students was enhanced. In a more general way, this result added to a growing body of evidence indicating that high- and low-achieving students perform differently under various instructional conditions, and that low-achievers might benefit from more direct, structured, elaborated instruction and more frequent, detailed, clear feedback. Ehlers (1986) noticed that unmodified mastery learning as an instructional method in algebra may enhance mathematics achievement. He examined the influence of age on achievement and found that students
‘under 21’ age group may demonstrate higher achievement than those in the ‘21 and over’ age group in a college algebra class taught by modified mastery learning techniques.

Sullivan (1987) compared outcomes of mastery mathematics and traditional mathematics among junior high school students enrolled in general, remedial and resource mathematics classes. The research questions focused on two major areas, achievement gains and implementations issues such as acceptance by students and teachers, problems encountered, and costs involved. He found that test scores varied significantly according to their instructional method used. Full year gain scores revealed that the original mastery mathematics group achieved significantly higher gains than the traditional group in all areas. Mika (1987) reports that differences in learning rates between varying achievement groups will diminish over time when instruction adheres to the parameters of mastery learning theory. According to the theory, low achievers become more efficient as they build a knowledge base, reduce the time needed to learn and consequently increasingly close the achievement gap between themselves and higher achieving studies. Anuforo (1987) investigated the effects of mastery learning techniques on students’ achievement in the study of English language syntax.
and recommended the use of mastery learning techniques as a better method of teaching English language syntax.

The effects of group-based mastery learning and enhanced cognitive entry behaviours on algebra achievement were examined by Anderson (1988). The study focused on two experimental groups and two control groups taught by different teachers. The experimental groups were taught for eighteen weeks under mastery learning conditions. The control group received traditional instruction. During the final week of experiment all groups were given both a teacher-made test as well as standardized, normative reference test. Both of the experimental groups performed better on the teacher made test than their control group counter-parts. On the standardized post-test, the afternoon experiment group out performed its control group. However, the morning control group performed better than its corresponding experimental group. Jantjes (1988) found that when the conditions of learning are appropriately improved to meet the cognitive and affective needs of most students, their levels of achievement and affect are significantly enhanced, and their initial cognitive differences are greatly decreased over time.
The effects of mastery learning and wait time on student achievement in seventh and eighth grade mathematics was analysed by Olson (1988). There were three independent variables which were studied: mastery learning, wait time and gender. The results for grade seventh were that mastery learning, wait time and gender had significant effects on student achievement as measured by the CRT with mastery learning, wait time, and females having the greater post-test achievement. The results for grade eight showed interactions with the independent variables. The interactions had females having the greater achievement when combined with the treatment of mastery learning and wait time and males having higher achievement as a control group and with mastery learning and wait time. Mastery learning was a positive and significant main effect for the CRT post-test. Wait time was a negative and significant main effect for the CRT post-test. Salim (1988) studied the effects of mastery learning strategy on the chemistry achievement of secondary school students as related to their gender and aptitude at a school in Sabha (Libya). The investigator found that the mastery learning students had significant achievement gains in chemistry. Although, females and males did significantly better under mastery learning, the instructional strategy appeared to reduce gender differences. The study further revealed that although, all
aptitude students benefited from mastery learning, high and average aptitude students befitted more than low aptitude students.

The impact of enhanced initial cognitive entry behaviours and mastery learning on student achievement was examined by Earnheart (1989). The study samples consisted of 93 black, low socio-economic statuses, third grade students in a rural public school in Tunica country, Mississipi. These students were randomly assigned to four classes, each of which experienced different set of learning conditions, group – 1 learning conditions were enhanced initial cognitive entry behaviour plus mastery learning, group – 2 used mastery learning alone, group – 3 experienced enhanced initial cognitive entry behaviour plus conventional instruction, group – 4 control group experienced conventional instruction alone. All three experimental groups scored significantly higher than the control group at 0.05 level of significance. The result of this study support Bloom’s theory pertaining to mastery learning and enhanced initial cognitive entry behaviours with regard to achievement.
In India studies to investigate the effects of mastery learning strategy on cognitive outcome of the pupils started in the eighties. The studies conducted by Mathur (1983), Hooda (1983), Yadav (1984), Chand (1984), Patadia (1987), Vaidya (1989) and Koul and Chand (1989) can be cited in this context.

Mathur (1983) made a comparative study of Individually Guided System of Instruction (IGSI) and conventional teaching approach on XI grade pupils in the subject of Physics. Twenty one units of physics were taught. The mastery level to be attained in assessment of the unit by the IGSI taught students was 70 per cent or above for going on to the next unit. Results showed that 75 per cent of the students taught by IGSI scored above 70 per cent, while only 25 per cent of the group taught by conventional method scored above 70 per cent in summative test.

Hooda (1983) studied the effect of mastery learning strategy on pupils’ achievement in mathematics. The sample consisted of pupils studying in two sections of class VI in the city of Indore. One section constituted the control group and the other experimental group. Teaching of mathematics through
mastery learning strategy was the experimental treatment. Control group was taught through conventional method. It was found that the group of students taught mathematics through mastery learning strategy showed significantly higher gain in the achievement than the group of pupils taught mathematics through conventional method. Hooda and Jarail (1983) carried out a study aimed at finding out the effects of mastery learning strategy on different dimensions of verbal and non-verbal creativity of children. The study revealed that students in the experimental group scored significantly higher than those in the control group on all the dimensions of verbal and non-verbal creativity. This shows that teaching through mastery learning strategy helps in improving the different dimensions of verbal and non-verbal creativity.

The Indian Model of Mastery Learning (IMML) was applied by Jangira and Yadav (1984) to one group of IX class students. The other group was taught through conventional method. The two groups were matched on previous knowledge in mathematics, intelligence and socio-economic status. The result showed that pupils taught through IMML (mastery group) scored significantly higher on mathematics achievement test. It also revealed that different percentile
achievement scores in mastery group were consistently higher than the conventional group. Yadav (1984) investigated into the effects of mastery learning strategy in teaching mathematics. The sample consisted of six rural government high schools. Three schools were assigned to the experimental group and three schools to the control group. It was found that the groups of pupils taught mathematics through mastery learning strategy showed significantly higher gain scores on criterion achievement test than the groups of pupils taught through the conventional approach. Further it was reported that 80 per cent of the cases in experimental group scored higher than 72.89 per cent of total achievement score, while 20 per cent of the cases in the control group scored than 21.09 per cent of the total scores.

Chand (1984) studied the effects of personalized system of instruction and Bloom’s mastery learning strategy on the retention of high school students in a segment of science. Three groups randomized matched subjects design was used in this study. A sample of about 160 students was selected from the Government Higher Secondary School, Galore and three equivalent groups were formed. One of the groups was taught through conventional method of teaching and the second was taught by PSI method. The third group followed Bloom’s mastery
learning strategy. The study evinced that PSI and Bloom’s MLS have equal effects on immediate and delayed retention. Both of these methods of teaching proved superior to conventional method in their effects on immediate and delayed retention.

Patadia (1987) worked with fifth grade students with the objective of developing a strategy for mastery learning in geometry and to validate the effectiveness of developed strategy. The strategy she developed consisted of:

1) Introduction
2) Structured lecture
3) Discussion Session
4) Individualized Tutorials
5) Mathematical models
6) Problem solving
7) PLM
8) Text books and workbooks
9) Small group study sessions
10) Mathematical games
11) Review and practices
12) Assignments
13) Feedback sessions
14) Formative and Summative test

Sample consisted of 94 pupils, 51 in the experimental group and 43 in the control group. Result showed that the achievement of the experimental group was significantly higher than that of control group. It also revealed that dependence of the achievement of pupils on their IQ could be reduced considerably by using the strategy for mastery learning developed by the investigator.

It was revealed by Vaidya (1989) that the mastery learning strategy raises the achievement of the learners irrespective of the entry equipment, aptitude and intelligence of the pupils. The study indicated that MLS can be used to reduce the number of under-achievers, dropouts and failures, as it ensures almost equal attainment on the part of the learners irrespective of their entry behaviour and intelligence. Koul and Chand (1989) compared the effects of PSI and conventional method of teaching on the retention of material in science. Their study revealed that the students taught science through PSI show better retention scores than the students taught through the conventional method of teaching. These results were found to be valid in case of immediate, two weeks and six weeks retention.
Sangwan (1992) in her study on VI class students revealed that at the end of experimental treatment the group of pupils taught science through mastery learning strategy have significantly higher gain score on the criterion test in science than the group of pupils taught through conventional method. Similarly, experimental group achieved significantly higher mean score on the test of self-concept than the group of pupils taught through conventional method. Again experimental group scored significantly lower on the test of adjustment than the group taught by conventional method and hence the adjustment level of experimental group was better and higher than the control group.

Objectives of Kumar (1995) study were to compare the effectiveness of Bloom’s and Keller’s mastery learning of concepts in Economics to study the sex differences, cognitive style differences in learning of concepts in Economics, to study the interaction between mastery learning strategies and sex, cognitive style and self-concept and to know learning strategies and sex, self-concept and cognitive styles. In this style $2\times2\times2\times2$ factorial design was employed. Mastery learning strategy was an independent variable. Classifying variables were sex, self-concept and cognitive styles. Achievement in Economics
was dependent variable. Two groups of 100 male and 100 females were taught. Bloom’s mastery learning strategy was applied on Group I and Keller’s mastery learning strategy on Group II.

It was found that students taught through Keller’s mastery learning strategy displayed better results than those taught through Bloom’s mastery learning strategy. Male students were found superior to female students on achievement in Economics. Result found no significant differences between the mean post achievement test of female with high and low self-concept.

Mahajan (1996) conducted his research study with the objective to compare the mean achievement of the students taught through Computer Assisted Linear programming (CALP) with the mean achievement of the students taught through traditional method. It was found that computer assisted linear programming on geometry was effective in terms of achievement of students belonging to experimental group than that of control group at 0.05 level.

Bajpai (2000) in his study on 100 commerce student of class XII of tribal district of Jhabua in Western Madhya
Pradesh revealed that inductive programmed learning method is significantly better than lecture method.

In an experimental study on a sample of 60 students of 10+1 class, Gulati (2001) revealed that significant difference exits in the pre-test, and post-test, mean achievement scores of group of students taught by mastery learning model students scored higher on post-test as compared to pre-test on the achievement test in accountancy. Results also revealed significant difference in the gain mean achievement scores of two groups of students, taught by mastery learning model and conventional method of teaching after the experimental treatment. Gain mean achievement score of group taught by mastery learning model was higher as compared to group taught by conventional method of teaching.

2.3 STUDENTS AFFECTIVE OUTCOMES OF MASTERY LEARNING

The changes in student’s perception or view of himself and the outer world, brought about by learning conditions and the evidences he gets of his adequacy or inadequacy in his school learning are termed as affective
outcomes. Success or lack of success in school learning is a major factor in determining how the student feels about himself as a learner, about his school and school learning and his desire for further learning. Most of the researches conducted to examine the effects of mastery learning strategy have something to say about pupils' self-concept or attitude towards the subject etc. The studies reviewed here are the studies by Sears (1963), Torshen (1969), Kifer (1973), Burkman and Brezin (1981), Russock (1982), Pratt (1983), Soto (1983), Schielack (1983), Holden (1983), Kuhn (1985), Lovullo (1986), Anuforo (1987), Guskey and Pigott (1988) and Kulik, et al. (1990). Studies by Indian researchers such as Mathur (1983), Singh (1983), Hooda (1983), Yadav (1984), Koul (1986) and Vaidya (1989) have also been included in this review.

Important studies aimed at investigating students' self concept made during the sixties and early seventies by scholars such as Sears (1963), Torshen (1969) and Kifer (1973) have been discussed and analysed by Bloom (1976).

Bloom (1976) finds in the work of Sears (1963) a number of areas in which an individual may appraise himself. Some of them may be classified as academic self-
concept, such as learning, school subjects, work habits, and relations with the teacher. There are others which may be classified as non-academic self-concept. They have to do with self-appraisals with regard to athletics, relations with boys and girls, relations with others, and appearance (Torshen, 1969). There is low but positive relation between these two large categories of self-concept. Kifer (1973) noticed in his quasi-longitudinal study of successful and unsuccessful students that the general self-esteem of the successful students remained relatively high over the eight years of school, while the general self-esteem of the unsuccessful students dropped significantly from grade 4 to grade 6 and was still low by the end of grade 8. It has been found that individuals who are low in academic self-concept may be high, average or low in non-academic self-concept. However, the role of academic self-concept is important in determining whether or not the individual will voluntarily engage in school-related learning when he is free to do.

While attempting to assess mastery learning strategy on achievement with focus on students’ aptitude variables of academic ability, study orientation and locus of control. Burkman and Brezin (1981) suggested that academic
ability and study orientation were associated positively with achievement regardless of the difficulty of the content studied.

A modified PSI treatment to experimental group was applied by Russock (1982). Results were compared to a teacher directed control group. Dependent variables included measures of self-concept of science ability, positive and negative attitude towards science, attitude towards science class, and understanding about science. Locus of control internal orientation was imposed as a second independent variable. Analysis of co-variance between instructional groups yielded significant differences, favouring the experimental group, on understanding about science and retention of self-concept. Analysis of co-variance between loci of control group indicated significant differences in post-test measure of self-concept and negative attitude towards science favouring the positive internal group. Pratt (1983) studied the effects of the application of the concepts of sequencing, mastery and reinforcement and found that it led to higher achievement which in turn resulted in their developing a more positive attitude towards English classes and towards school in general. Soto (1983) also found that learning conditions strongly determine the achievement attained and attitudes acquired toward themselves as learners, including relations
between prior and subsequent achievement. The findings of Schielack (1983) also indicate that post-course attitude towards mathematics can be more positive for PSI than for lecture treatment.

The validity of the assumption that the more the students succeed in mastering their learning task, the more they wish to continue was examined by Holden (1983). She experimented with third-semester college level French class and found that mastery learning proved effective in helping students with different learning rates to master material and to feel positive towards learning French. The attitude of the learners towards grammar also improved significantly over the course of the semester. But Kuhn (1985) in his study on high school students enrolled in the second year of French observed that there was no significant difference between the experimental and control group towards learning French.

An attempt was made to determine the influence of mastery learning strategy on attitudes and achievement of sixth grade students by Lovullo (1986). His purpose was to find answers to the following questions:
a. What specific students’ attitudes towards school is a result of differences in schooling (i.e. mastery versus non-mastery approaches)?

b. To what extent did programme utilizing mastery learning/outcome-based strategies enhance more positive attitudes in Sixth-grade students?

c. Which specific components in a mastery learning/outcome-based-environment played a role in creating more positive attitudes?

The results of the study revealed that attitudes are not significantly enhanced as a result of differences in schooling (i.e. mastery vs. non-mastery). The data were insufficient to determine specific attitude related to success or failure. Anuforo (1987) studying the effects of mastery learning strategy on pupils’ attitude towards the study of English language syntax found the attitude gain score mean of the experimental group significantly higher than that of control group.

Guskey and Pigott (1988) explored a wide range of student affective variables in their collection of group-
based mastery learning studies, including affect towards the subject (Anderson, 1976; Block, 1974), academic self concept (Anderson, 1976; Yildiran, 1977). Results from these studies, according to Guskey and Pigott (1988) indicate that mastery learning procedures have an overall positive effect on effective outcomes, though typically not as large an effect as what they have on cognitive outcomes. Results show that students who learned under mastery learning generally liked the subject they were studying more, were confident of their abilities in that subject, felt the subject was more important, and accepted greater responsibility for their learning than students who learned under non-mastery conditions.

Kulik, et al. (1990) made a meta-analysis of 108 studies. 72 out of these were based on Keller’s PSI approach and the remaining 36 studies were based on Bloom’s mastery learning approach. The outcome variables measured in the studies included attitude towards instruction and attitude towards the subject matter being taught. Eighteen studies examined student ratings of the quality of the instructional method used in the course. Sixteen of the 18 studies found more positive attitude and two studies found more negative attitude in the mastery learning class.
Fourteen studies examined the effects of mastery programmes on student attitudes towards the subject matter that they were being taught. Twelve of these fourteen studies indicated that student attitudes were more positive in mastery classes than in conventional classes; two studies found negative effect.

In India many studies tried to examine the effects of mastery learning on pupils have also tried to investigate the effective outcome of the approach. Singh (1983) focused on effects of mastery learning strategy on certain non-cognitive variables of high school students. The main purpose of the study was to compare the effects of programmed instruction, Bloom’s mastery learning strategy and the conventional method of teaching of self-concept, achievement motivation and test anxiety of students after taking instruction in social studies. He found that:

a) Programmed instruction, Bloom’s mastery learning strategy and the conventional method of teaching did not significantly affect the self-concept of high school students.
b) There was significant increase in the achievement motivation of high school students after receiving instructions through Bloom’s MLS in comparison with those students who were imparted instruction through programmed instruction. However, there was no significant difference in achievement motivation of the groups of students which took instruction through Bloom’s MLS and the conventional method of teaching.

c) PI, Bloom’s MLS and the conventional method of teaching did not significantly affect the test anxiety of high school students.

Hooda (1983) reported that students instructed through mastery learning strategy exhibited improvement in their self-concept and attitude towards mathematics but he found that the improvement was not significant. Yadav (1984) also attempted to examine the effects of mastery learning strategy on students’ attitude towards mathematics and their self-concept. After receiving instructions through mastery learning strategy, the experimental group students’ attitude towards mathematics was found to be positively influenced. Improvement in self-concept of the experimental
The effects of mastery learning strategy on achievement motivation and test anxiety of socially disadvantaged group in Himachal Pradesh was examined by Koul (1986). The results of the study revealed that the achievement motivation of the students taught science through mastery learning strategy was significantly higher than that of the group taught through conventional method of teaching. It was also found that there was a decrease in magnitude of the test anxiety of students imparted instruction through mastery learning strategy. Vaidya (1989) reports mastery learning strategy has been found to facilitate improvement in achievement, self-concept and attitude of learners towards the subject of study, i.e. Hindi.

Study on effectiveness of the mastery learning programme was conducted by Mathur (1988), to investigate the effect on the achievement, self concept and attitude of students towards statistics. He found mastery learning strategy as an effective strategy in terms of achievement, self-concept and attitude towards statistics for both undergraduate and post graduate students. Mathur (1988) also established the
effectiveness of mastery learning strategy in reducing the gap between repeaters and non-repeaters.

Sharma (1998) studied the effectiveness of mastery learning strategies in comparison to conventional strategy in respect of performance and also studied the relative effectiveness of mastery learning in relation to stress level of students and three learning types in concept learning, rule learning and problem solving. It employed two $3 \times 3 \times 3$ factorial design – one for achievement scores and other for retention scores. The research investigation was carried out on the students of class IX of age range 13 to 15 years. The final sample comprised of 227 students, 103 students from Bloom’s Mastery Learning strategy, 97 students from Keller’s Personalized System on instruction and 77 students from the control group were selected for the final sample. Findings were three stress level groups showed comparable achievement gain scores, no interaction was found between treatment and stress levels for the achievement gain scores, Bloom’s mastery learning strategy yielded higher achievement gain scores than conventional instruction, Keller’s personalized system of instruction yielded higher achievement gain scores.
Gulati (2001) in his experimental study on the adolescence of XI class concluded that significant difference exits in the pre-test and post-test mean self-concept scores of group of students taught by mastery learning model. Students scored higher on post-test as compared to pre-test on the self-concept questionnaire. It was further concluded that there is no significant difference in the pre-test-post test self concept scores of students taught by conventional method of teaching.

This review of the literature available on mastery learning strategy reveals that the range of researches conducted on various aspects of its effects is quite considerable. Although there is no complete unanimity of opinion, a vast majority of researchers agree that mastery learning strategy can provide answers to many of the questions faced by educators, parents, students and planners today if it is used systematically and sensitively. Results of most of the studies provide evidences of the effectiveness of this approach in raising the achievement level of the learners. The claims of the advocates of mastery learning strategy that 90-95% students can master 90-95% of the content if they follow education through mastery learning procedure seem to stand vindicated by a large number of the researches. Improvement in cognitive outcomes shows its
consequences in the form of improved self-concept of the students. The evidences, both objective and subjective, of their achievement change their view of themselves and the people and things around them. The history of success builds in pupils a sense of self-confidence, a desire to learn more and to work systematically in order to achieve the goal of mastery. The development of positive self-concept in turn leads to higher motivation, deeper interest in the subject of study and a more positive attitude towards the teacher and the school. The information provided in several of the researches indicates that mastery learning strategy is more useful specially in improving the cognitive and affective outcomes of the relatively weaker students. It suggests that the use of mastery learning strategy can go a long way in helping to tackle the problems such as under-achievement, stagnation and drop-outs. It also emerges from this brief survey that the number and range of studies conducted to examine the effectiveness of mastery learning strategy in Indian situations are very limited and leaving an ample scope of research in this area.
2.4 HYPOTHESES

In order to attain the objectives of the study, following hypotheses have been formulated:

1. 
   a. At the end of experimental treatment, the group of students taught environmental science through mastery learning model will score significantly higher on the criterion achievement test than the group of students taught through conventional method.

   b. At the end of experimental treatment, the group of students taught environmental science through mastery learning model will show a significantly higher gain score on the criterion achievement test than the group of students taught through conventional method.

2. 
   a. At the end of experimental treatment the group of students taught environmental science through mastery learning model will attain a significantly higher mean score on the self-concept questionnaire than the group of students taught through the conventional method.
b. At the end of experimental treatment, the group of students taught environmental science through mastery learning model will attain significantly higher mean gain score on the self-concept questionnaire than the group of students taught through conventional method.

3.

a. At the end of experimental treatment the group of students taught environmental science through mastery learning will attain a significantly higher mean score on the classroom trust behaviour scale than the group of students taught through the conventional method.

b. At the end of experimental treatment the group of students taught environmental science through mastery learning will attain significantly higher mean gain score on the classroom trust behaviour scale than the group of students taught through the conventional method.