CHAPTER 8: MASTERY LEARNING MODEL

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INTRODUCTION

The models of Tyler, Bloom and Carroll that made an echo in the world of education from 1949 to 1964[1] heavily influenced mastery learning model. Naming this theory as "school learning", Benjamin Bloom investigated the reasons of individual differences that were seen in the schools where mass learning took place and tried to explain the necessary measures needed to be taken in order to minimize these individual differences for the benefit of student, school and society [2],[3]. In other words, school learning or mastery learning theory claims that when all the students are provided with additional time and learning opportunities, they can get the new behaviors that are desired to be taught at schools[4]. According to Bloom, there are hereditary crucial differences in terms of mental capacities among people. However, these differences remain as a tiny detail besides the inequalities and injustices that emerged during the education process. The quality of the teaching activities that take place at schools is among the most important variables that determine the level of learning. Bloom's model depends on the assumption that "if they are provided with an equal, fair and adequate learning opportunity, all of the students can learn". Bloom's views focuses on the quality of teaching activities at schools, the reasons of the individual differences among the students, and how to iron these reasons out through effective teaching methods[5].

Although there are crucial factors like other students, printed materials[6], the physical features of the classes, family, counseling, peer groups, the features of teachers and the education opportunities[7] provided by the teacher besides "inner conditions" like the general health status of the individuals, prior knowledge, level of intelligence, motivation and self-confidence while implementing the basic objective of education, that is, acquiring behavior, it is possible to see the varieties of mastery learning in the existing applications. The same ideas underlies at the bottom of all of these applications: These ideas are: to help those who are suffering from learning difficulties by providing a sensitive and planned teaching service, to determine a "mastery learning" criteria for them and to be able to develop a high level learning power,[8],[9].

Walberg and his friends[10], in general, investigated the eight-instruction model, which they described as "school learning models", in terms of variables that are forming these models. These models spring from the theories in the learning psychology[11],[12].

School learning model has been highly affected by the ideas lying underneath the mastery learning approach, which is widely implemented in many ways in many schools. According to this model, if positive learning conditions are provided, everyone can learn everything. Although there are some exceptions, this model offers an optimistic view about what education can provide people with. Briefly this model asserts that whatever the purpose is, the schools can give an effective education service anytime and anywhere. About his model, Bloom speaks out the following statements:

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There are many evidences proving the learning differences among the individuals. In spite of the evidences proving that there are differences among students in terms of school learning and these differences are permanent, he believes that the major part of this variable that is springing from these differences can be linked with the conditions of home and school environment. Most of the differences seen in school learning are innate and cannot be changed and these can be seen as man-made differences[13],[14].

There are two independent variables that are affecting the level of students' learning, in other words, learning outcomes. The first of these two variables is the student's entry characteristics at the very beginning of teaching-learning process; the other one is the quality of instruction. During the implementation of the teaching activities, if these two variables are taken into control, planned and implemented properly, "mastery learning" can be achieved among students. As stated above, it is expressed that the social factors like home and school environments play an effective role on the level of learning differences among people.

Many factors affect school learning. Some of these factors like intelligence (general ability), the characteristic features of the teacher, the socio-economic status of the family cannot be directly changed via teaching-learning process. On the other hand, the factors like the prior knowledge of the students, their interests, attitudes, belief in success and the quality of instruction can be changed via teaching-learning process[15].

The main function of the schools is to popularize the school, to complete students' lack of learning, draw their attention to the topics, to increase their belief in success, to improve the quality of instruction etc. If schools can make positive changes in the changeable characteristics that affect the learning process of the students and in the teaching-learning environment, then they can make contributions to students' self-realization.

Carroll's "School learning model" is based on the view that 'there are fast and slow learners". According to Carroll, when the appropriate time and learning opportunities are provided, all of the students can reach the desired learning objectives. Learning level is the function of the ratio between elapsed time in active learning and the time needed for learning. Time is the most important variable while explaining the "School learning" model. The other components of the model are: ability, ability of benefiting from teaching, patience/diligence, opportunity, and the quality of teaching[16].

Ability
Carroll explains ability as the time needed for mastery learning. When appropriate time is provided, students can learn a specific subject at desired level. Students can need more or less time for learning due to their abilities. Carroll argues that 90% of students have medium level ability and with %5 of students who have high-level ability, %95 of the group can learn at high level. As for the %5 of students are lack of ability on certain subjects. Instructional design should separate the differences between the abilities and should be organized without constituting ability categories[17].

Ability of Benefiting From Instruction
In order to learn a subject, it is necessary for students to have the adequate ability and do the essential things for learning. Not only prerequisite conditions but also general abilities (e.g. reading comprehension, logical thinking abilities etc.) acquired beforehand are more crucial. It shows the level of having the facilitating prerequisite learning conditions needed for learning new knowledge units[18].

Patience/Diligence
The time spent for learning by the willing/motivated student.

Opportunity
It includes the arrangement of self-learning time instead of a stabilized, standard time at schools.

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The Quality of Instruction

It means: teaching without need for additional time. It can be thought that let alone ability, if teaching requires additional time, it is unqualified but if it doesn't, then it is qualified. Although teachers are pretty sure of them, some of the students will learn slower and some of them will learn faster, because they are lacking in some qualifications that couldn't be acquired due to inadequate time.

For example, teachers can give appropriate materials to the students according to their personal needs or they can let them study at their own level.

According to Bloom, it is necessary to prepare reinforces, cues, student participation, feedback and correction activities in accordance with characteristics (cognitive and affective) of the students and aims of the learning unit. No matter what method or technique is used, all of these four variables should be implemented effectively.

PROCESS OF LEARNING AT SCHOOL

In teaching-learning process, students are divided into specific age groups and level of classes. The idea of what to teach and how to learn should be in accordance with the age and level group. This process depends on the assumption that teachers are more sensitive towards a specific age group and certain characteristics of students and more effective in achieving specific aims that are associated with specific subjects.

At every learning level, in order to determine the current learning level of the student and the education opportunities, some achievement indicators (learning indicators that are consistent with the objectives) are used[19]. These achievement indicators acquired in various stages of learning show that there are growing differences among individuals. It is accepted that those who are deprive of further learning opportunities, or forced to repeat specific learning experiences or those who are provided with further learning opportunities deserve to be involved in the decisions that are related with them. The differences among the students are used in explaining the individual differences and advocating different further learning opportunities concerning different people.

One of the main reasons of these individual differences in schools is that group learning has become crucial. While monotype teaching can be effective on groups, it can be ineffective on the others. Unless new ways are found out to regenerate learning defects, this will keep on creating growing individual differences.

The aim of mastery learning here is to reveal the factors that lead to defects in learning, and compose evidences that make contributions to these defects and determine the effect of change made in these factors on the outcomes. Although it is not possible to have a defect-free education at schools, theoretically or on the implementation level, it is possible to determine the amount of reduction in defects. If we can manage to establish a highly purified education system, we can expect the students to reach mostly high learning levels and reduce the amount of differences between learning levels and diminish the time needed for learning. This model is an action taken to define few factors that have the power to explain school learning. If followed carefully, it is possible to talk about three interdependent variables that are expected to create a teaching order at schools. These three variables are:

1. The extent of realized prior knowledge needed for teaching target skills/abilities.
2. The extent of student's devotion and participation to learning, or the extent of adaptation of the student to devote himself to learning or make him participate in learning process.
3. The extent of suitability of practical teaching to the needs of students.

Teachers should follow these steps in order to organize their teaching-learning process in accordance with the mastery learning[20]:

1. To determine objectives and behavioral objectives of the lesson, and to determine the units according to the desired behaviors. Two-dimensional "Table of specifications", which allows us to see clearly the relation between specific objectives and lesson units, should be prepared and used.
2. After dividing the lesson into learning units, as second step, prerequisite behaviors should be determined for each unit to be learned.
3. Before getting started to teach a new unit or lesson, cognitive entry behaviors (CEB) test should be used in order to determine whether the students have prerequisite behaviors or not.
4. According to CEB test results, compensatory teaching should be done for necessary but missing prerequisite behaviors.
5. After compensatory teaching, new teaching activities should be implemented in order to provide new behaviors.
6. After providing all the new behaviors, monitoring and evaluation should be done.
7. After monitoring and evaluation, the students who haven't been able to reach the mastery learning criteria should be leaded to supplementary teaching-learning activities in order to iron out the deficiencies or errors.
8. The students who have completed the supplementary teaching-learning process should be tested with parallel monitoring test to check if they have reached the mastery learning criteria or not
9. After the students have reached the mastery learning criteria, then teacher should pass on the new unit.

Most of the problems seen at schools derive from the lack of knowledge about prerequisite learning and not acting appropriately on the implementation level. According to the model, in a state of students' entry characteristics and the positive instruction, the learning outcomes will be maximized and the difference among students in terms of these outcomes will be minimized[21.] This model mostly deals with student qualifications, teaching and learning outcomes.

Entry Behaviors
There are two student qualifications on which Bloom lays great stress. These are cognitive entry behaviors and affective entry characteristics.

Cognitive Entry Behaviors
In Bloom's model, cognitive entry behaviors are seen as the most effective variables, which affects learning outcomes, make the unit be learned easily or make it possible. As this kind of deficiencies are easy to fulfill, Bloom regards changing the qualification of the student as a clear variable[23].

Cognitive entry behaviors includes general cognitive entry behaviors like "reading comprehension" and "language ability" which are necessary in all learning activities and all the pre-learning activities which makes learning new behaviors easy and possible. The idea that "every new learning activity should depend on the previous learnings and should be preparatory for the subsequent learnings" which has been put forward by learning-teaching theory and models requires cognitive entry behaviors to be fulfilled at the beginning of the teaching-learning process in order to achieve mastery learning.
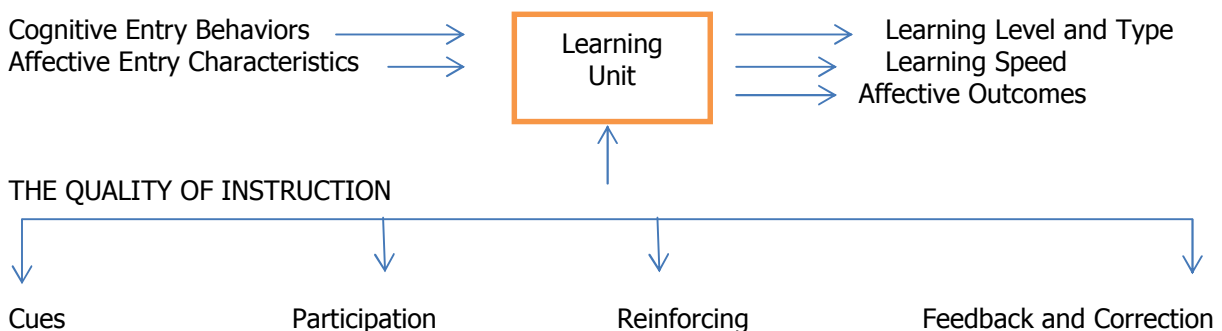

Figure 1: Mastery Learning

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The first of the students'qualifications, which play a big part in determining the learning level of the student, is cognitive entry behaviors that are necessary pre-learnings. Even the easiest learning unit depends on previous learnings. Every learning unit taking part in a gradual sequence prepares the prerequisites for the subsequent units. The presence of prerequisites provides an easy learning. According to Bloom, cognitive entry behaviors can explain 50% of the differences in learning. These are not enough for learning but have the power to diagnose the future learning. Entry behaviors can be learned, taught and improved through appropriate methods, that is, they are open to change.

In order to learn a critical behavior that is among special objectives in the program and is related with cognitive sufficiency/competence. This kind of a relation expresses the prerequisite learning concept at the beginning of the unit. The cognitive entry behaviors in a unit involve prerequisite learnings related with all of the critical behaviors that are aimed to be taught in the unit.

In educational practice mostly cognitive entry behaviors are mentioned or emphasized. In order to regulate the efficiency of teaching-learning process, benefit fully from the cognitive entry behaviors it is attempted to determine all the cognitive entry behaviors in each of the units in a course and during the process before each unit to provide learning completely all of the cognitive entry behaviors or be ready to be used.

The cognitive entry behaviors related with the units of courses in schools should be determined, and in order to check these behaviors, validity and reliability assessment instruments should be prepared and by using this kind of instruments during the teaching-learning process, it should be made sure that all the cognitive entry behaviors are learned and ready to be used when needed.

Cognitive entry behavior represents an aspect of a student's CV, which has a strong impact on his next learnings. The things happen during the learning process have positive and negative effects on the next learning stages of the student. Preschool learnings affect the student's learning in primary school. These primary school years determines cognitive entry qualifications for the next school years and these cognitive entry qualifications affect the next school years.
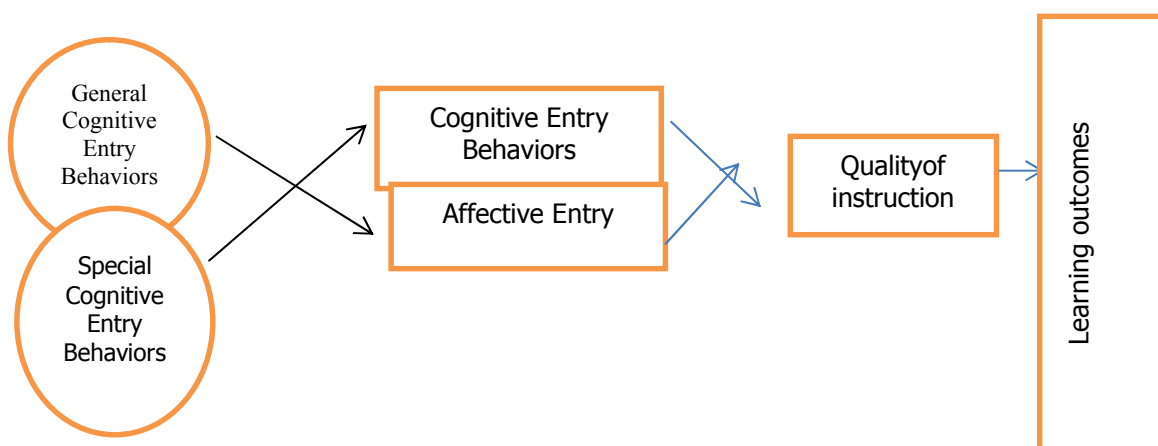
Mastery Learning Variables[24.]

Cognitive entry qualifications can be dealt with in two groups: general cognitive entry qualifications and special cognitive entry qualifications.

1. **General Cognitive Entry Behaviors:** These behaviors consist of educational aspects of cognitive entry behaviors, language ability, especially reading comprehension. Even at the beginning of lower education stages, one can acquire reading comprehension ability and in the following years, it is expected to affect most of learnings. One of the reasons of this is that most of the learning instruments at schools depend on language and need to be read. In spite of the

changes in the qualifications of teaching, the possibility of learning. That the power of reading and understanding teaching instruments allows learning to take place in spite of the changes in the nature of learning can be seen among the reasons.

Logical thinking, language improvement and writing ability need to be studied more to be   able to measure the cognitive entry behaviors by determining clearly. Once determined, it should be among the duties of the teachers to assureto have the students attained these behaviors at least to some extent in primary schools. If learning units or the general entry behavior sets about the courses can be determined, the students' learning them deeply and being ready to use whenever needed can be expected to put some teeth into their future learning.

2. **Special Cognitive Entry Behaviors:** The necessary prior knowledge needed to learn a unit is called special cognitive entry behaviors. The qualification that can be checked by the teacher during the course is special cognitive entry behavior. If there are pre-requisite relations and learning stages among the units, these behaviors turn out to be the main factor of student success in these kinds of courses. For example; in math, equation with two unknowns requires learning simple equation; in foreign language, passive sentence structures require to learn active sentence structures; in history, the comprehension of the reasons of an event requires to learn the said event and its matter of facts. Especially in math, science and foreign language courses cognitive entry behaviors are important. In these kinds of courses if the learning deficiencies are not made up at the beginning of the units, that is, the students cannot attain the necessary prior knowledge needed to learn a unit, and then the failure will increase in the following units.

Affective Entry Characteristics

Affective Entry Characteristics is the combination of student's attitudes, interests and individual's own ideas about himself. Student's background and expectations defines the affective entry characteristics about the learning unit. Bloom defines affective entry characteristics as the student's attitudes towards the course and the school, academic self-concept and the positions that are created by their interests and points the importance of these characteristics especially in terms of joining in learning event. The student's entry characteristics concerning learning, affects his school achievement and his attitudes towards future learnings. The success or failure in a course can change the qualification of the student's feeling about the course. Cumulative success and failure plays an effective role on the development of academic self-concept.

If it can be determined whether people are ready to learn affectively through examining the style of interests, attitudes and self-perceiving, then students' interest in the learning unit, then they can be provided with the belief in learning, readiness to learn. The students who are excited and interested in the learning unit can learn more easily and all the other things being equal, these students can learn quicker and at a higher level than those who are unexcited and indifferent to the unit[25.] At school learnings, the motivation of the student is very important. The power that galvanize the student into learning, no matter what the source is, is called learning motivation. Learning motivation is the student's interest in the attitude or the topic is related with the student's own attitudes towards these and his self-confidence. The interest and positive attitude and self-confidence determine the learning motivation; on the other hand, it is accepted that the results of learning event's success or failure has an effect on the student's interest, attitude and self-confidence.

The consequences obtained from the studies showing that there is a meaningful relation between affective characteristics and success put forward that affective characteristics has a great impact on success. In general, affective characteristics have the power only for explaining the one fourth of (%25) affective success variable in the field of interest. The results of the study in this field converge on the idea that: affective characteristics have the power to determine learning and predict the success in education.

Affective characteristics help students determine the extent of the effort required for the students to learn a particular learning unit. Affective characteristics also determine the student's (who are experiencing difficulty or frustration in learning initiatives) efforts to a certain extent.

Affective entry characteristics have some effects on the future learnings. However, these characteristics are not sufficient to explain them. Individuals can learn despite highly negative affective entry characteristics. At the same time, due to the lack of cognitive entry behaviors they can fail even if they have positive affective characteristics. If positive affective entry characteristics can be paired up with the necessary cognitive entry behaviors, the student can learn even in an improper instruction. In the course of learning, negative entry characteristics can create such crucial difficulties that even a high quality instruction service, which is sensible towards students', needs, can get rid of these difficulties to some extent. In many school environments there is no strong correlation between cognitive entry behaviors and affective characteristics.

Concept of Personalization and Academic Self-Concept: Concept of personalization is the expression of the person's self-perception about who he is, what/why he wants to do. It reveals the similarities and differences among people. The individual comes into the world with the capacity of perception, sensation and motion. In his relations with the environment he gets experienced about what he can do or not through using his capacity in various fields and roles. In this process, he evaluates himself with the feedbacks from the environment and decides who he is. He becomes aware of how to improve his performance on various topics.

As for academic self-concept; depending on the learning background, it is the student's self-perception style about what he can learn or not. In other words, it is the attitude of the individual towards himself. The individual's attitude and his academic self-perception depend on learning background, and judgments of teachers, parents, and friends about him and is affected by the judgments around. It is really hard to expect a student who fails at school and isn't appreciated by his teachers, friends and family to improve a positive attitude. As the school years pass by, the experiences that form the learning background increase and his self-perception about this is decisive. Hence, the more the level of education is the more the correlation between self-confidence and success is.

It has been observed that in teaching-learning process, among the students having similar entry behaviors, the unsuccessful ones' concept of personalization becomes negative and the level of cognitive success decreases; however the successful group's concept of personalization becomes positive and their cognitive level increases.

Student's academic self-concept is a variable related with his perception about his own background. The student needs to see his own success in a course or in a unit. For that purpose, the student should be allowed to learn in his own speed, to make a choice, to learn through various teaching-learning ways.

QUALITY OF INSTRUCTION

Quality of instruction is one of the main variables of the teaching-learning process and the second element of the model.

According to Bloom, in order to obtain the desired output, first of all instruction should be suitable for students' entry behaviors. If the instruction program is not suitable for students' entry behaviors and the students have prior knowledge deficiencies, no matter how good the quality of the instruction is they can't succeed.

Instruction is the management of teaching-learning process, and the interaction between student-instruction in this process. The aim of instruction is to have these interactions happen ineffectively in desired sequence and to carry on until the desired behavior modification happens. Efficiency and

sufficiency of the quality of instruction can make it easier by contributing to the pupil self-government. There have many researches about the quality of instruction which means the management of teaching-learning process, especially in group learnings concerning its components, and during the learning process how these components are used.

It will be impossible to get rid of the deficiencies in the cognitive entry behaviors of the quality of instruction unless instruction is straightly directed to eliminate the deficiencies and inadequacies of the students or the unit is changed due to the cognitive entry behaviors of the students. That is, no matter how high quality the instruction has in a specific unit, the lack of cognitive entry behaviors will make it impossible for the students to master that unit.

According to Bloom, the quality of instruction is also a controllable variable like entry behaviors. The sooner and better the instruction is provided the more the student success will increase and individual differences will reduce. It is estimated that the quality of instruction has the power to explain at least one fourth of (%25) the variability seen in the indications of cognitive success in general.

According to this model, the cues, guidelines, the open and latent participation to learning, reinforcing and feedback determine the quality of instruction. The main variables of learning at school: cognitive entry behaviors, affective entry characteristics and the quality of instruction are interrelated components. It is possible to increase the level of learning and decrease the success differences among students through external influences on these 3 variables. The effect of quality of instruction differs due to the student's possession of effective studying and learning ways, necessary cognitive strategies and affective characteristics[26].

The recent studies show that the main components of the instruction are cues, participation, reinforcing and feedback, and in the case of group learning, also corrective feedback. These components are explained as follows:

Cues

During the teaching process, what item to learn and what are expected concerning these items should be announced to the students. These can be provided through cues and guidelines. In general as the teaching methods and instructional materials become varied, the students' possibility of finding cues increases.

It shouldn't be expected the cues given to a passive student to make way for a considerable learning[28]. According to Fidan (1982) cues are "*the messages which are impellent and help the desired behaviors happen*"[29]. Cue involves the signs and explanations showing the students what to do and how to do during the teaching-learning process[30]. These messages should be clear and understandable. In order to simplify the perception of messages, benefiting from the stimulants like color, motion, light, shadow, size, which attract attention and prosper perception can make the messages gain certainity[31].

A sign includes every cue and message, which shows the students what to learn and how to learn. For that purpose, teacher can use materials like written, verbal or visual guidelines, samples, questions, source books, film, video, and recorder, CDs. However these signs should be suitable for the student's level of development and entry behaviors. In addition to this, they should not only be appropriate for students' socio-cultural background but also protect and improve their psychological, physical health.

Participation

In order to learn, the student is expected to do something and actively participate with the help of cues. Participating in learning means "the interaction of the student with the items of instruction that is offered to him and going into the effort of learning"[32]. Participation is the effort of the student for learning in accordance with cues and guidelines[33]. The appropriate signs, seasonable reinforcing and correction have an important place in participation. In teaching-learning process participation, which makes the student active, is a multi-dimensional concept. Shortly, participation, which can be

conceptualized as the experiences gained through interacting with instruction, is the most important principle of educational communication. That is why the students should be encouraged to participate in the course and their efforts should be supported and improved with experiential learning. For that purpose;

1. Students should particularly participate in activities in which they are most likely to be successful.
2. The number and content of learning experiences should be designed according to students' level of learning.
3. Students' participation behaviors should be supported with reinforcers and these reinforcers should be meaningful for the students.
4. Participation should be planned as a balanced, organized and continuous activity in all learning processes like defining behavioral objectives, organizing the content and conducting the instruction and evaluation.

The students' level of participation in teaching-learning process has the power to explain %20 of change in the level of learning. That is, when students are allowed to participate in the course at utmost level, the achievement difference among the students decreases 20%. As learning will not occur without participation, in order to increase the level of learning in the experimental group, some measures have been taken to allow students participate in the teaching-learning process. However, in his/her study, Ozcelik has founded that between the degree of student's participation and final achievement level, the correlation for advanced biology is .60 ; for algebra it is .50 [34].

Reinforcing

In schools through various reinforcing programs, it is possible to shape the student behaviors. As critical behaviors emerge in teaching-learning process, these behaviors should be reinforced because reinforcing measures has great impacts on the efficiency of the teaching-learning process. Through reinforcing measures, learning motivation is conditionally increased, attention and learning efforts are guided, expected behavior can be tried and by gaining competence, the behavior is facilitated to become permanent.

Reinforcing is the release of the stimulants that increase the possibility of forming a behavior. The stimulants used in this process are called "reinforcers". Giving positive reinforcers to the student and withdrawing the negative ones increases the possibility of the desired behavior. Reinforcing should be used to improve student's motivation and level of learning. Education is the process of terminal and permanent behavioral change. According to this, negative reinforcers (punishment) that will increase the student's fear of failure should be avoided; because it is the reinforcer not the punishment that will wipe out the behavior at that time or later on.

Most of learning theoreticians have stated that reinforcers have a great impact on learning. The findings in recent studies have put forward that there is a meaningful relation between qualities of reinforcers and the final achievement levels of the students. Walberg (1984) in his study found out that the efficient use of reinforcers in learning-teaching process increased the level of learning at average 1,2 standard deviation.

Feedback and Correction

Feedback is the announcement of whether the students' attainments are suitable for educational objectives or student's behaviors are suitable for educational objectives. Correction activities are the correction of the errors or fulfillment of the learning deficiencies. Feedback is the set of messages about the accuracy or falsity/inaccuracy of the students' learnings. Feedback and correction are among the most important activities that define the quality of instruction and level of learning[37].

In educational process there should be feedback and correction. Feedback and correction activities aim at teaching excellently and feedback obtained through formative tests is used to inform students about their deficiencies and enlighten teachers about the efficiency of their teaching.

Feedback can be altogether used with cues, correctives and reinforcers. According to Fidan (1985) all the messages delivered to the students are feedbacks in a way because feedbacks have 3 services: directive, motivating and reinforcing. Answering the questions of the students with the words like "true, okay, false, imperfect" is directive feedback and out of these words "true, okay" play a motivating role on reinforcing the learned items. At the end of evaluation, high marks are also reinforcers[39].

Feedback and correction activities should be presented in order to inform the students about the level of attaining objectives and show them what to do for this purpose. On the other hand, feedback and correction should be in coherence in any case. Accordingly, it should be known that a feedback that doesn't give the student an opportunity to correct the errors or iron out the deficiencies couldn't serve a purpose. Hence, during the flow of the course, oral and written tests can be applied or at the end of each course, monitoring and evaluating activities can be included. However, monitoring and evaluating tests should objectively measure learning outcomes, which are aimed to be taught via life experiences. Objective monitoring and evaluating activities depict learning deficiencies and the reasons of these deficiencies along with the learning levels of the students. Depending on these activities, when needed, the teaching experiences should be individualized and complementary learning opportunities like additional home works and practices should be provided in order to make up the deficiencies.

In terms of content, the units of the lesson or course should be gradually organized. Unless each of these gradually organized units is mastered, the new unit shouldn't be taught. Sonmez (2004) states that .81 of variance monitored in achievement can be explained when cognitive and affective entry behaviors and the quality of teaching are pressed into service together. It can be thought that these activities intended to increase the quality of teaching can be taught as the variables, which enable learning.

As a result of the evaluations, in order to teach the unlearned topics, make up the deficiencies and correct the errors, various means can be used. Giving the most appropriate cues to the student through correction and helping the student actively participate in the learning activity is to create the reinforcing order, which is useful for the student.
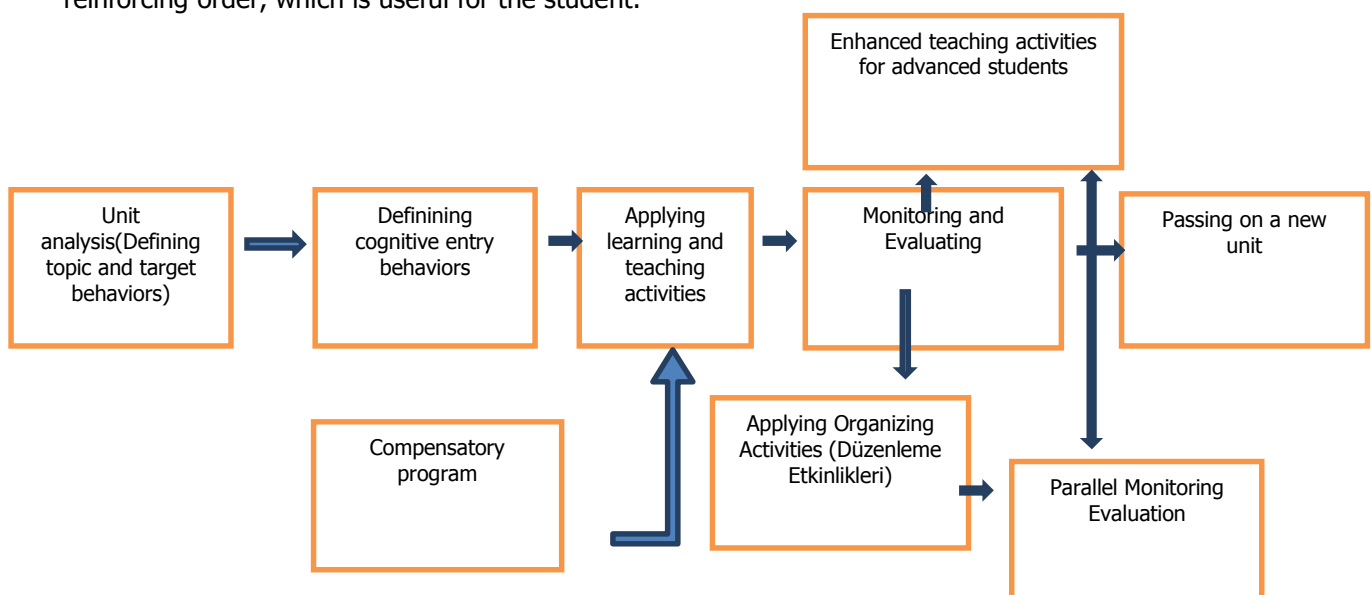

Figure 3: Teaching Process in Mastery Learning[40]

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In summary, the information obtained through learning outcomes leads the work of making up deficient behaviors and correcting errors. At the end of this, after all the behaviors in the unit are obtained, new unit can be taught. As far as feedback-correction is a part of teaching, then it is possible to individualize teaching in-group and reach mastery learning.

In Bloom's "mastery learning model" explained above, the qualities of all of the main variables that are defining the learning outcomes are open to change. In that case, changing the quality of learning outcomes and increasing their level through teaching and learning process seems possible. Then, the variables explained above can be actively pressed into service and hence the efficiency and prolificacy of schools can be increased and help self-realization. According to Bloom, the quality of teaching is also a controllable variable like entry behaviors. The earlier and better teaching can be provided, the more successful the students and the less the individual differences will be. It is estimated that the quality of teaching has the power to explain at least one fourth of variability that is observed in the measurement of cognitive achivement[41].

LEARNING OUTCOMES

Learning outcome is formed of learning level, learning type, learning speed and affective outcomes. According to Bloom, the entry behaviors of the newly schoolers at the beginning of a learning unit show a normal distribution. The individual differences in distribution increases in the lessons depending on gradual learning as years pass by, but in lesson that doesn't have pre-requisite relation, normal distribution goes on. If a teacher equals the entry behaviors at the very beginning of the learning and make up the deficiencies after each learning unit, the individual differences decrease. The teacher should present a qualified teaching by taking into account their learning deficiencies after each unit.

Cognitive achievement, learning level, changing affective characteristics and obtaining psychomotor skills are defined through students' achievements in the class. That is, the increase in the learning level at the end of the teaching forms the cognitive achievement learning outcomes and learning outcome shows whether mastery learning took place or not[42,43]. At the root of this model lies the idea of " fast learner students and slow learner students".

The outcomes that emerged after learning has taken place can be sorted as: learning level, learning speed and affective outcomes.

Learning Level and Learning Speed

Learning level can be defined as the difference between the learning level at the beginning and at the end of mastery learning. The learning level at the end of the mastery learning is higher than the initial learning level; this means that it shows a positive momentum. In order to define the learning level, at the end of each unit exams are applied. At the end of these exams, by bringing out the deficiencies and learning difficulties of the students, individual support is provided.

On the other hand, as in the learning level, learning speed can be defined as the difference between the learning speed at the beginning and at the end of mastery learning. The learning speed at the end of the mastery learning shows a positive development when compared with the initial learning.

At the end of the remedial teaching applications at the beginning of teaching process, learning speed and learning level differences among the students should be ironed out. Remedial teaching applications are carried out through defining the level of students at the end of exams after each unit. With the results of the exams, the deficiencies and learning difficulties of the students are brought out and necessary support is given. The differences among the students in terms of learning speed and level are ironed out with the help of these applications. In order to iron out these differences, remedial teaching should be included.

In order to examine the effect of independent variables on learning outcomes in mastery learning approach and iron out the deficiencies in learning outcomes without banking up, an identification of learning unit which will allow group teaching as well as individual teaching is needed. This unit should be able to form a convenient, meaningful and adequate learning outcome, which is suitable for assessment and evaluation. In other words, this learning unit should involve an adequate quantity of learning outcomes that can be assessed and evaluated and should be big enough to iron out the deficiencies and learning difficulties without banking up. This kind of a unit should compose a learning unit in which 15-30 behaviors are taught in 1-10 hours[44].

Affective Outcomes

It is accepted that the affective characteristics of a student about school learning affect his subsequent affective characteristics. Increasing the number of learning attempts that resulted in success and hence increasing the percentage of the student's learning trials that resulted in success is the most reliable, healthy and practical way to develop a learning motivation, more importantly, a healthy, balanced and coherent character, a positive self-perception and self-confidence through interests, attitudes. Especially right from the beginning of school learnings, when the student is provided with a background full of success in his own sight, then this student becomes more willing to learn and gets immunized against the manipulating effects of negative conditions. In addition to the increase in learning speed and as a result of this, the increase in learning level with the help of mastery learning feedback and corrections, the decrease in the differences of learning speed and levels among the students during the learning units show that under these conditions, the students can be "self-sufficient/autonomous[45]".

In sum, the learning level is defined by the student achievement. That is, at the end of teaching the increase in the learning speed, progressing affective characteristics and skills compose the cognitive achievement learning outcomes and learning outcome is the indicator of mastery learning.

POSITIVE SIDES OF MASTERY LEARNING

1. In this model, as the pre-requisite behaviors about the learning unit are defined beforehand, the teaching-learning process can be arranged according to the students' level.
2. Mastery learning allows each student learn in his own capacity and speed.
3. As the desired target-behaviors are defined beforehand, it enables a planned and programmed flow of the lesson.
4. The learning outcomes regarding the whole process are evaluated constantly. So, the learning difficulties and deficiencies of the students can be ironed out in time. As the learning deficiencies are ironed out in time, all of the students reach at learning targets at desired levels.
5. By giving adequate time for the teaching process until they are successful, students' self-confidence and respect can be increased.
6. In mastery learning the findings obtained through feedback-correction activities lead the way to make up the deficiencies and correct the errors
7. In the model, after all the behaviors in a unit are obtained, the new unit is getting started and the entry behaviors of the gradually arranged units can be mastered and hence every gradual learning unit has the opportunity to be learned in a shorter time than the previous one.
8. One of the responsibilities of the mastery learning is to allow the low-skilled students to learn "learning".
9. In most of the studies, it has been found out that the use of mastery learning increases the achievements on affective and cognitive level and hence leads to a positive increase in the motivation for achievement, and performing the necessities of the lesson.

RESTRICTIONS OF MASTERY LEARNING

In the studies concerning mastery learning, there are some unanswered questions and criticisms, in other words, in addition to its aforementioned positive sides, mastery learning has some restrictions. The restrictions mentioned in the studies can be summed up as follows:

1. As mastery learning tries to enable all of the students to learn at the same level, it takes time. Teachers cannot make time for teaching units, and fulfilling the deficiencies and slow learners can obstruct the fast learners' learning process.
2. In mastery learning model, the enriched teaching activities for successful students, cognitive entry behaviors, preparing monitoring tests and the difficulty of applying these tests, need for expertise can be accepted as a restriction.
3. Concerning the thinking skills, the thinking skills and the students' knowledge will increase through teachers' focusing on high-level mental processes (solving problems, applying the principles, thinking skills and creativity).
4. Mastery learning is not easy to apply and takes time. The responsibilities of the teacher increase, as he needs to customize the teaching for each student. In crowded classes, it is really hard for a teacher to monitor the work of each student regularly, to define the fully learned skills and tasks of each student, to give immediate feedbacks.
5. Mastery learning model asserts that the learning speed of the fast learners and slow learners will converge in an environment where mastery learning takes place. However mastery learning is worth the expense of time, effort and problems, many more students can learn better and enjoy school, improve a positive attitude towards learning and increase their self-confidence. On the other hand, some students can be disappointed and although the teachers do their best in order to make the system fairer, more productive and more sensitive, they can be fed up.

SOME STUDIES CONCERNING MASTERY LEARNING

There have been many scientific researches that are intended to demonstrate the effectiveness of mastery learning both abroad and in our country. Some of these researches are given below:

In the research concerning mastery learning, by combining mastery learning with student team learning method, student team mastery learning was formed and the effects of this model on achievement in math was researched. While student team learning increased the achievement level of high-skilled students, it was understood that mastery learning strategy increases the achievement levels of low, mid-level and highly skilled students[46].

In the research that was intended to demonstrate the effectiveness of mastery learning, in educational environments where mastery learning and cooperative learning methods were pressed into service together or separately, it was searched whether there was a meaningful difference among the achievement levels of the students. Once again, there was meaningful difference between the achievements of high, mid and low-skilled students[47].

Another research searched the application of mastery learning in 5th grade social studies lesson in terms of the knowledge, comprehension, and application and total achievement levels of the students. It came to the conclusion that holding the course according to mastery learning increased the students' knowledge, comprehension, and application and total achievement levels[48].

In the next research, the aim was to define the effects of mastery learning on the achievement levels of the students studying "basic IT". In accordance with this purpose among the outcomes of the research:
1. It was found out that at the end of first unit, the monitoring test showed that the group was successful but they couldn't achieve mastery. After the correction, the group achieved mastery. In the second unit, they achieved mastery without any need for correction. This case could be regarded as a sign of students' coherence with mastery learning after a while.
2. There was no meaningful difference between achievement test points that were applied to the experimental and control groups as pretests and post tests
3. Mastery learning model was applied to experimental group and a meaningful difference in favor of post-test was found between pre -test and post-test points of this group.

4. A meaningful difference in favor of the experimental group was found between the achievements of experimental and control groups. According to these outcomes, it was found that mastery learning affected the student achievement positively in basic IT lesson[49].

In another research concerning mastery learning, the effects of compensatory cognitive entry behaviors education at the beginning of units regarding 6th grade science, social studies and math on the achievement level of students. In the research, the compensatory cognitive entry behaviors education increased the achievement level of students in science and math; but had no effect in social studies in comparison with the traditional teaching[50].

In one of the researches, the effectiveness of mastery learning on undergraduate education course was tried to be determined. The final exam marks, course completing degrees, motivation for learning in the mastery learning application classes including monitoring tests and correction activities were higher than the control group. Also it was observed that women's final test points, course completing degrees, academic self-concept, and positive attitudes towards education are higher than men[51].

In the next research, the effectiveness of mastery learning methods on the achievement and permanence level of 6th grade math classes was searched. According to the outcomes of the research, there was a meaningful difference between the mastery learning experimental group and traditional teaching control group in terms of pre-test and post-test achievement results, according to t test findings, there was a meaningful difference in favor of experimental group[52].

In the other research, the effect of cooperative learning, mastery learning, and traditional teaching methods on student achievement in Biology was searched. According to the research findings, in biology course, in terms of student achievement, for an attempted unit, the experimental methods were more effective in improving the achievement than traditional teaching methods. Also, it could be asserted that in different levels of grades, different units and on bigger samples, healthier results could be obtained with these attempted methods[53].

In the last research, mastery-learning model was used to develop an E-learning method in Science. It was observed that in E-learning groups which were supported with mastery learning, both understanding and interpretation skills increased[54].

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