LEARNING AND TEACHING
Theories, Approaches and Models

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LEARNING AND TEACHING : THEORIES, APPROACHES AND MODELS

FOREWORD

Learning is one of the most long-running, undeniably important actions of human being. In addition to his innate behaviours, acquiring new knowledge, skills and attitudes through the experiences over various processes, human being directs his life in accordance with his learning. The acquirements have an efficient role on all his decisions during the lifetime.

The meaning of learning, the processes through which it occurs, the factors affecting it in negative and positive ways are among primary questions to be answered for those scientists studying in the field. Solving the mysteries of all these questions may result in using the sources in the right way as well as contributing to the discovery of expected results. On the other hand, the answers to these questions have crucial role for also the concept of teaching, which can also be named as the direction of learning process enabling the realization of learning goals. Success of a teaching activity is primarily possible if it includes activities suitable for the basics and nature of learning process. In the historical course, the answer given to abovementioned questions caused the appearance of theoretical structures such as various philosophies, theories, approaches and models. As consistent lodestars such as principles, methods, techniques, tactics, styles and strategies, the findings obtained from the scientific studies in the field have been presented to the use of learners and teaching professionals with the purpose of guiding the practitioners.

New editions of this book are expected to develop in accordance with suggestions of its readers and our colleagues.

Prof. Dr. Zeki Kaya
Co- Editor
FOREWORD FOR ENGLISH EDITION

"Learning is expensive, yet ignorance costs more."

Learning and teaching, two most arduous experiences of human being, are considered to have exceptional natures as well. Many scholars have tried long to explain the phenomena during which we ‘learn’ and ‘teach’.

This book is a great contribution to its field in that it gives the basics in context with typical processes of learning and teaching. Dr. Kaya and his colleagues have their challenge of taking the reader of this book to a journey in the glamorous world of the most basic human experiences.

It is our own challenge to achieve the task of preparing this edition of the book without changing its authenticity. In this sense we expect the authors’ and reader’s courtesy for probable errors. I am indebted to our translators who created this edition with their responsibility and hardworking.

Assist. Prof. Dr. Ahmet Selçuk Akdemir
Co-Editor
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CHAPTER 1: DEVELOPMENT AND LEARNING

Prof. Dr. Zeki Kaya
Gazi University, Gazi Faculty of Education
(Translated by Sakine Koca Sincer)

**The Meaning of Development**
In a general sense, psychology is a science that studies human and animal behaviours, and the reasons of these behaviours.

The symbolic foundation date of psychology is 1879. In this year, Wilheml Wundt (1832-1920) established a psychology laboratory in Leipzig. Psychology is accepted to have started as a science with the establishment of this psychology laboratory. From the point that started with Wilhelm Wundt and his colleagues on, the period of consciousness has mostly been investigated through the method of introspection and the conscious of human has been tried to be analyzed.¹

Psychology is a branch of science that aims at examining the interaction between environment, human being and behaviour. This branch of science is divided into sub-fields such as experimental psychology, social psychology, psychometric psychology and applied psychology.

**Fields of Psychology**

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<tr>
<th>Experimental psy</th>
<th>Social psy</th>
<th>Psychometric psy</th>
<th>Applied psy</th>
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There are a lot of sub-branches under applied psychology. One of them is educational psychology. Educational psychology is about implementing the findings of psychology in the field of education. Educational psychology mainly composes two sub-fields. These are developmental psychology and psychology of learning.

Developmental psychology is a field of psychology that examines the physical, psychological, cognitive and behavioral changes of a person from the birth to the death. Developmental psychology is one of the basic fields from which educational psychology benefits; because being aware of the developmental features of students’ ages ensures an increase in the efficiency of educational period.

**Some Theories and Approaches about Development**
The concept of theory can be defined as the group of predications that brings forward proposals in order to find the reasons why events take place. In a sense, theory is a plan that helps to realize some certain ideas in line with previously designed plans. At the same time, theory is a path that is taken as a basis to move and that is followed accordingly.

**Behaviorist Theories**
First of all, behaviour is reaction and movements displayed by any organism in a certain situation. The concept of behaviour is mostly used for movements that can be observed from outside. The behavioral learning theories focus on how behaviours are gained. Behaviorist theories accept the idea that learning takes place by establishing a connection between the stimulant and the behaviour and that changing behaviour is possible through reinforcement.²

Behaviorists handle learning as a mechanical process and gives priority to objectivity. According to the behaviorists, human beings are not good or bad from birth. The experiences and environment shape a
person's personality. According to them, human brain can be compared to a black box. It is neither possible nor necessary to know what is going on in this black box. What goes into (input) and what comes out of (output) this black box is important rather than what is happening in it. Outputs are objective, can be observed and measured. Inputs and outputs can be adjusted, arranged and controlled. The senses of a person are not important, what is important is their feature reflecting to outside. The pioneers of behaviorist theories are I. Pavlov, J.B. Watson, E.L. Thorndike, E.R. Guthrie and B.F. Skinner.

**Cognitive Theories**

Cognition is the sum total of processes carried out by human mind in order to understand the events and situations going on around. Cognition is a very comprehensive concept. Some of the activities related to mental processes that are included in the scope of cognition perceive the stimulants coming from outside, comparing these stimulants to previous information, forming new information, memorizing and remembering the gained information, evaluating the mental products in terms of logic and quality.

Effective use of cognitive theories in the field of education has been increasing regularly in recent years. Cognitive theories focus on attention, perception, memory, forgetting and retrieval. Thus, the focus is on internal stimulants instead of external stimulants in learning.

According to cognitive theories, mental processes are important rather than stimulant-reaction connection in learning. The purpose of cognitive theories is to explain how mental processes are organized and how they work.

**Some Approaches**

Apart from behaviorist and cognitive theories, there are a lot more learning theories that come out also influenced by these two theories. Some of these theories are constructivism, psychoanalytical approach and humanist approach.

**Constructivist Approach:** Constructivism is a theory that explains how an individual understands and explains what she/he has learnt and that is about the nature of knowledge. Constructivism is a theory of learning that is about how people start to learn and about explaining the nature of knowledge. This theory claims that people can create new understandings or they can combine things, ideas, events and activities they already know and believe in a manner of mutual interaction. Knowledge is gained in line with the will of a person instead of imitation and repetition. Philosophical explanations of this theory are based on J.Bruner, W. James, J. Dewey, J. Piaget and L.S. Vygotsky.

**Psychoanalytical Approach:** Sigmund Freud put this approach, also known as psychodynamic approach, forth. Some other pioneers of this approach besides Freud are Alfred Adler, Carl Jung. Unconscious and intrinsic motivators are the most basic concepts that are used to explain human behaviours. The most well known elements of this approach are hypnosis, structures of conscious (unconscious, preconscious, conscious); psychic elements of personality (id, ego, superego) and psychosexual developmental periods.

**Humanist Approach:** Gestalt school and existentialism have influenced the leaders of this approach. The pioneers of this approach are Rogers, Maslow, Sartre, Charolette Bühler, Frankl and Binswagner. They have got ideas against behaviorist and psychoanalytical approaches. The way humanist approach handles human being differentiates this approach from other theoretical explanations. A person is a value in him/her, he/she should not be turned into a tool of a certain social or labour organization. A person is responsible for himself/herself, his/her behaviours, his/her identity that he/she will shape. It is up to that person to make life worth living and meaningful. None of the people, who are all mortal, will repeat their lives. Not past or future but present is important. Science is not a goal but a tool for people. More freedom should be ensured instead of controlling people's behaviours.
Basic Concepts About Development
It is necessary to know basic concepts and principles about development in order to explain the development and developmental features of human being. There are some basic concepts about development. These concepts are human, development, period of development, critical period of development, developing, phase, time effect, growth, maturation, readiness, heredity, age, experience and learning.

Human: We can define human as a bio-cultural and social entity. Within the framework of this definition, the first human nature is about biological dimension, the second nature is about cultural dimension and the third nature is social dimension. The biological dimension is accepted to be the basis or must for a human to be human. It is emphasized that human is a living entity that is composed of 46 chromosomes, 23 of which come from mother while the other 23 come from father and that the most important feature of human from other living entities is that human is a living creature who can think. Cultural dimension is also accepted to be sufficient for a human to be human. Human can develop his/her cultural dimension at the end of an interaction with nature. Human that is born as a biological entity grows and develops with the cultural values of the society in which he/she is raised up. The social dimension of human gets started with socialization at the end of an interaction with other humans.

Development: It is a process that starts with conception and ends with death and during which an organism experiences changes at the end of learning, growth and maturation.

Developing: It is the regular and continual change of organism by means of the interaction between growth, maturation and learning.

Development Period: There are some steps where certain features come into prominence. Each of these steps is accepted as a period. These periods are respectively infancy, early childhood, childhood, adolescence, early adulthood and senility.

Critical Development Period: A person can be more appropriate to have certain learning experiences and to gain certain skills at certain periods of age. This is a period when a person is more ready to learn than the previous period, when some of his/her features are at the forefront and which can cause continuous and irrevocable results.

For example; prenatal period is important for physical development. If a mother is subject to a bad environment or takes drug, alcohol, etc., physical development can be influenced badly.

Phase: The term of phase is used to emphasize the discontinuity of an organism’s development and to show the features about age and interests in developmental psychology. Each phase is experienced between certain time intervals, a phase cannot be omitted to pass directly to the next one, a certain phase is experienced between the time intervals that are a must, it is impossible to experience a phase in another time interval of another phase.

Time Effect: This effect is called as historical time effect. Historical time effect is the effect of events and phenomena that affect the society in which individuals live in terms of individuals’ development. This also means the effect of present time on an individual’s development.

For example; it is historical time effect that nowadays children learn how to use mobile phones and computers, how to play computer games and how to use the Internet.

Growth: It is the physical changes in an organism that can be observed quantitatively. Growth is about the body of an individual. It means the increase in the body’s height, weight and volume. Growth can take place at different rates of speed at different organs. Growth goes on healthily towards maturity by means of proper nutrition and protection from bad effects.
Maturation: It is the biological change that helps the organism that grows physically to carry out physical functions depending on age. In a general sense, we can call the completion of a body's developmental processes as maturation. Maturation is under the effect of both heredity and environmental factors. It is a biological change experienced by the organism depending on heredity regardless of learning experiences in order for the organism to carry out the expected functions. In other words, maturation is the process of biological growth that is species-specific regardless of environmental effects.

Readiness: We can say that the term, readiness comprises maturation. Readiness comes out depending on maturing, namely, previous experiences and maturation. We can define readiness as the state of having the necessary sufficiency for learning to take place and for learning experience to be effective. In short, readiness is a term that comprises not only the level of maturation possessed by an individual but also an individual's previous learnings, interests, attitudes, level of motivation, skills and general health condition.

It is the readiness of the individual in terms of physical, biological and psychological factors. Age, motivation and past experiences of an individual are factors that affect the readiness for a new learning.

Heredity: This term is used as "inheritance" or "genetic." The terms of inheritance and genetic state that living beings are still under the influence, even under the control of the materials they receive from their ancestors. In other words, heredity means that each living being possesses the same qualities as their ancestors.

For example; millions of living beings are born on earth every day. Some of them resemble their parents from the moment that are born. Hence, a butterfly looks like a larva when it is born, or comes to the world. On the other hand, a newborn human is a baby. However, it is still just a small example of its parents who cause its birth. The resemblance mentioned here takes place when the characteristics of general structure and special behaviours possessed by each living being pass from parents to the born baby, from one generation to the next one. The state of new offspring's resemblance to the old one and the factors that ensure these features to pass the newborn can be defined as "heredity-inheritance-genetic."

Age: The progress of a person's development is expressed in ages. Age is the criterion to determine the features, differences, progress and changes about developmental areas and periods. Age is the most important factor that determines the formation of a person's decisiveness about his/her interests and knowledge. Age includes some progress and some experience.

For example; with aging, people's interests and knowledge can gain certainty and decisiveness. In the first years of a human life, interests and knowledge are different and short-term. In the following time, a person concentrates on certain areas. Thus, interests and knowledge of person become definite in a sense.

Experience: Experience is defined as the impression of the interaction between the individual and other individuals or environment on the individual. Experience is divided into two categories as experience in terms of education and experience in terms of living. Gained experience comprises all the activities at the end of the interaction between individuals. Lived experience, on the other hand, comprises just the activities that leave their marks on the individual and that cause a change in individual's behaviour.

Behaviour: In a general sense, behaviour is composed of all the movements of an organism. According to the behaviorist psychologists, behaviour is the reaction of an organism to an action or the action to a reaction.
Learning: It can be defined as all types of changes that are permanent and that come out as a result of repetition and experiences of an individual.

Basic Principles about Development
There are some universal principles about development. Development of all people follows these principles:

1. Development occurs as a result of the interaction between heredity and environment: The hereditary features of a person influence his/her physical, cognitive and many other features. However, hereditary features take shape as a result of a person's interaction with the environment and thus development occurs.
2. Development is continuous and occurs through certain phases: Development is a process that continues all throughout life from conception to death and it occurs through phases. Each phase becomes the basis of the next phase and each phase is fulfilled depending on the accumulations of the previous phases.
3. Development occurs by turns: During the critical periods of development, a field of development specific to that period comes to the forefront and accelerates while other development areas experience a lag.
4. Development follows a predictable line: Development can be guessed in advance, in other words, development follows a predictable line. This line is as stated below:
   a. Development occurs from the head to the foot: The development of an organism starts with the development of head and then it is completed by the development of body, stomach, legs and feet respectively. Apart from this, after the development of internal organs is completed, the development of body is completed.
   b. Development occurs from inside to outside: Development follows a direction from the center to outside. For example; first of all, internal organs develop and then skin develops.
   c. Development occurs from the general to the specific: Minor muscular movements of an organism develop after major muscular movements develop. After a baby can hold an object with its arms with the development of major muscular movements, it can hold an object with its hands and fingers with the development of major muscular movements.
5. Development occurs as a whole: Zones of development are not independent from each other; they are in an interaction. A positive or negative feature in a developmental zone also influences another developmental zone.
6. There are some different people about development: Each person has got his/her own specific hereditary features, experiences, interaction with environment and personal qualities; because of this reason, the speed of development may also change from person to person.
7. There are critical periods in development: An organism can be more sensitive to certain learning experiences and environmental factors at certain times. According to psychosexual and psychosocial approaches, those certain needs are not met at certain times cause the individual to stick to that period. Such individuals cannot display proficiency specific to the next developmental period and so they cannot develop sufficiently in terms of emotional and mental qualities.

Developmental Periods and Tasks
The term of developmental task was defined and studied by Havighurst (1900-1991). Developmental tasks are developmental responsibilities that come out at a certain period of life and that bring an individual to the following level of behaviour. If a person does not fulfill developmental tasks specific to a phase, he/she cannot fulfill developmental tasks of the following phases in time and healthily and there will also be some problems and defects in the general personality development because of this reason.

Babyhood (0-2 years)
Developmental tasks of babyhood are of vital and critical importance, because these developmental tasks constitute the core of almost all the following development processes.
Child starts to talk towards the end of this period. Together with the start of talking, child starts to gain some qualities such as expressing himself/herself, perceiving what is said to him/her and establishing social relations depending on this. Likewise, the organism gains physical balance with the start of walking. Depending on this, infrastructure for a lot of psycho-motor activities are gained and developed.

The most important developmental tasks of this period are:
- Eating solid food
- Learning how to walk
- Establishing relations with the individuals around

**Developmental Tasks of Early Childhood – Period of Games (2-6 years)**
The most important developmental tasks of this period which is also called preschool period are:
- Improving walking and speaking depending on maturation
- Gaining self-care skills such as having meal, getting dressed on his/her own, washing face
- Establishing eye hand coordination
- Learning sexual differences, starting to gain sexual identity
- Learning how to communicate with different age groups by means of taking parents as model and starting to be aware of his/her own feelings
- Starting to learn social rules and roles

**Middle childhood (6-12 years)**
The most important developmental tasks of this period, which is also called as school period, are:
- Establishing attitudes for himself/herself
- Establishing groups with peers, enriching communication and interpersonal relations
- Developing three basic skills about reading, writing and maths
- Developing the appropriate role for his/her sex by means of finding a suitable model
- Starting to develop a system of conscience and values
- Personal independence, making decision alone, taking responsibility

**Developmental tasks of adolescence (12-18 years)**
The most important developmental tasks of this period are:
- Accepting physical features, experiencing bodily and physical changes, making peace with the new bodily image
- Being independent and different in the family, taking and applying decisions about himself/herself
- Adopting social roles suitable for his/her sex
- Establishing mature relationships with peers of the same and opposite sex
- Getting prepared to choose a profession
- Developing the system of values and moral
- Wishing to take responsibility for and interest in social problems

**Developmental Tasks of Young Adulthood (18-30 years)**
The most important developmental tasks of this period are:
- Choosing a suitable spouse
- Learning how to live with wife/husband
- Learning how to be a family and how to keep a house
- Finding a job related to his/her profession
- Fulfilling social responsibilities as a citizen
- Joining a friends-group

**Developmental Tasks of Middle Adulthood (30-65 years)**
The most important developmental tasks of this period are:
- Accepting that social responsibilities increase
- Continuing life standard and income-generating financial conditions
- Continuing relationship with children and aged generation, and helping and guiding them
LEARNING AND TEACHING: THEORIES, APPROACHES AND MODELS

- Spending spare time
- Continuing life as a person integrated to the partner
- Adapting to physiological changes and aging

**Developmental Tasks of Late Adulthood (65+ years)**
The most important developmental tasks of this period which is also called as the period of senility are:

- Understanding and adapting to the decreased cognitive and physical power
- Adapting to retirement and decreased income
- Accepting and adapting to the loss in the family
- Adopting and implementing social roles appropriate for his/her own age
- Arranging physical and social environments where he/she feels comfortable

**Main Factors That Affect Development**
It has been discussed whether heredity or environment is influential on human development. Both hereditary and environmental factors influence human development.

![Developmental Tasks Diagram]

**Heredity**
The genes coming from his/her mother and father together with conception determine heredity of a person. **Zygote** that is composed of 46 chromosomes 23 of which come from father comes into existence after mother’s egg unites with father’s sperm. Various combinations of genes determining the features that will pass to to-be-born baby by heredity are lined in the molecule of deoxyribonucleic acid (DNA). All the hereditary features of the baby, the core of life are coded in DNA molecules. Genes coming from mother and father can be *recessive* or *dominant*; if genes are dominant, they will ensure that their features will pass to the baby whatever other parent’s feature is. It is necessary that both parents possess genes having the same features for the features of recessive genes to pass to the baby. Moreover, the features received from mother and father by heredity are different from the features observed in the individual. All the qualities received from mother and father by heredity are called **genotype** (colour of eyes and hair, etc.) while observed qualities are called **phenotype** (features such as intelligence that comes from birth are shaped by the influence of environment and can be conserved from outside). Genes received from mother and father, are the factors that determine the capacity of intelligence that an individual can possess. Studies that investigate the influence of heredity and environment on intelligence show that intelligence is determined by the common effect of hereditary and environmental factors.

**Environment**
Factors that arise in the prenatal birth, at the moment of birth and in the postnatal period are influential in shaping features that come with heredity. The illnesses that mother suffers, the drugs she takes, the polluted environment in which she lives, bad eating habits and having stress in the prenatal period influence the development of the fetus in a negative way. Apart from this, if the baby cannot take oxygen or has brain trauma at the moment of birth, these factors also affect the development of the baby badly. What is going on within the family, the attitude of the family, family relations, and family’s socio-economical-cultural condition also affect a person’s development in the postnatal period.
Parents’ attitude towards the child is influential in the child’s development to a great extent. Parents’ past experiences, their own parents’ attitude towards them play an important role in bringing up a child. If parents are strict, tyrannizer, restrictive to the child, this can hinder child to gain self-confidence and self-control. Excessive tolerance and allowance to the child can also affect the development of the child in a negative way. If a healthy relationship is established between the parents and the child, and if parents display a consistent attitude and show that they trust their child; the child can improve his/her self-confidence, self-respect and thus he/she can individualize.

Apart from all these factors, there are a lot of factors that affect a person’s development such as the culture in which he/she lives, environment, relatives, school, teachers, friends, the moment of birth, divorce of parents.  

**Meaning of Learning**

The term of learning is mostly misused conceptually. When one mentions learning, first of all, studying the information related to a curriculum or a programmed education come to everyone’s mind. Thus, just the term of learning that means gaining knowledge comes to the foreground. However, we also learn an example of our experiences, feelings, verbal and non-verbal communication with other people. For example, we learn our style of perceiving ourselves, method of perceiving our self and ourselves. Even, daily habits such as having meal three or four times a day, which is a habit determined by culture, are also learnt. Almost all the things about educational interaction go under the title of learning, which is a basic concept of education.

For example; developing one’s productivity, skills, habits and supporting attitudes are dealt with under the heading of learning concept.

The term of learning is mostly used in a narrow sense. In a general sense, learning is a method of adapting to current social condition, rules and cultural needs. A person who is open to adaptation by nature is born in a social environment. Also, parents know a lot of things, rights and wrongs, and they reflect what they have learnt, in other words, the factors that have determined their personalities and their entities to the child. However, parents are not only an individual entity. Parents also symbolize current traditions, value judgements, prejudices and social musts. They also symbolize conflicts that they could not cope with or perhaps that they have suppressed. The child confronts and identifies with all these starting from the moment she/he is born. Psychoanalysis puts forth that first learning takes place by means of identifying with parents. Continually repeated rules and prohibitions are internalized in time and after a certain period, warning and punishing parents continue their functions although they are not there. The first learning of a child is in the form of submitting to the wishes of parents and to what they symbolize. Most of what parents want is the needs of society as a whole, in other words, the needs of the class where the parents are. It should be kept in mind that the child is in the hands of parents that does not allow opposing from the moment of birth in order to understand that learning means the same as submitting at first. However, with learning, dependence on parents diminishes step by step in the long term. Parents and other educators should allow and support this independence.

Many learning psychologists have offered to define learning as a more or less permanent change of behaviour and that occurs at the end of experience. The changes mentioned here do not comprise types of reaction coming from birth, maturation events or tiredness, drunkenness and other temporary states.  

The fact that learning psychologists define learning as a change about behaviours is not based on relation with children at first hand; this definition is rather based on experiments done with animals. In short, defining learning as a change in behaviour is, first and foremost, helps revealing exactly measurable learnings.
Basic Concepts about Learning

It is necessary to know basic concepts in order to understand how learning occurs. The leading ones of them are act, reflex, instinct, experience, behaviour, sense, perception, attention and memory. It is useful to explain what act is at first.

**Act**

This term means performance. What a person does constitutes his/her performance. A goalkeeper can be mentioned to have a high or low performance in a football match. We can define performance as a high or low level of performance.\(^{25}\)

We can say that a person's performance is influenced directly by heredity and environment. Heredity comprises a person's behaviours from birth while environment comprises behaviours learnt later. We can say that inborn behaviours are divided into two. These are reflex and instinct.

**Reflex**

This term is mostly used for behaviours that are displayed suddenly and immediately. We can say that a driver who can easily adapt to new and sudden circumstances has got good reflex. However, it is not enough to explain reflex in that way.

Reflex is an inborn, quite immediate, consistent and simple behaviour displayed to a certain stimulus.\(^{26}\) According to this definition, behaviour must be inborn, quite immediate, consistent and simple and there must be a stimulus if we call this behaviour a reflex.

*For example, we lift our leg when we hit our knee.*

**Instinct**

Instinct means a behaviour that is seen in all the members of a species and that develops not as a result of learning but as a result of maturity. This kind of behaviours is not displayed intentionally. Behaviour should have these features to be called an instinct:
- It must be inborn.
- It must be seen in all the members of a species.
- It must not be seen in other species.
- It must be a complex pattern of behaviour.

We can say that humans do not have instinct. However, humans are also known to have some instinctive behaviour. Perhaps, maternal behaviour of a woman can be thought to be an instinct at first. We can say that maternal behaviour is not an instinct, but an instinctive behaviour. Because, it has been proved by studies that the reason why women display maternal behaviour is about biochemical substances.

*For example, a research has proved that women who stay with newborn babies for three weeks release prolactin. When prolactin was injected to a man, the man was also observed to display maternal behaviour.*\(^{27}\)

**Behaviour**

We can call all types of behaviours of a person as behaviour. Behaviour cannot always be observed. In other words, behaviour can be explicit or implicit.

*For example; a person’s talking, writing, blinking, waving, thinking, saddening, heart beating are all behaviours.*

Human behaviours are divided into three groups such as inborn behaviours, temporary behaviours and acquired behaviours.

**Inborn behaviours** are behaviours that cannot be changed with learning.
Temporary behaviours are the ones that come out as a result of some factors such as alcohol, drug, narcotic drug, illness and that disappear after these factors disappear.

For example, that a human talks because of high fever and alcohol can be as an example of this behaviour.

Acquired behaviours are the ones that are not inborn and that are a product of learning. Behaviours that are a product of learning are generally acquired through a planned education or random domestication.

Behaviours acquired through a planned education are terminal and qualified behaviours that tried to be gained or changed at schools or institutions by means of applying a plan.

For example; telling the definition of learning, keeping the environment clean, keeping healthy, playing a musical instrument are behaviours acquired through a planned education.

Behaviours acquired through random domestication are behaviours acquired spontaneously without implementing a certain plan.

For example; these are the behaviours acquired as a result of interaction at a certain level at school, at home, at the cinema.

Acquired behaviours are expected to be terminal. However, acquired behaviours may not be terminal all the time. Behaviours that are not terminal can be acquired even through a planned education.

Sense
A person generally processes a piece of information at two levels, which are sense and perception. Sense is a general concept that shows the sensitivity of organism to internal and external stimulant events.

For example; experiences such as brightness of light, warmth of tea, the pain of pinprick are included in sense.

We can say that the raw material of experience is sense. However, we should also keep in mind that experience is not just composed of a series of sense. We always process our senses by means of interpreting them in our daily lives.

For example; we interpret series of tones as melody, a big and red cubic shape as a red house, cold and wet sense as rain.

Perception
The process of interpreting and making senses meaningful is called perception. People perceive the world with their sense organs. So, there are perceptions related to all of the senses as visual perception or audio perception. In general, visual perception is the most dominant one in a human life. Objects come to mind when visual perceptions are in question. Perception of objects is partly based on learning. It is possible for a person to name objects and define their functions by learning. However, the basic tendency to organize stimuli into objects is the result of an inborn feature of human's organs and nerve system as well as learning. This natural ability including the perception of objects is called organizer tendencies. The most important organizer tendencies are related to separation of shape and ground, grouping and completing.
**Attention**

One of the most leading features of perception is that it is selective. Sense organs of a person meet a lot of stimuli at a certain time. However, we perceive just a few of these stimuli more specifically in this period of time. In other words, people pay attention to just a few of events happening at a certain time. Then, we can say that attention plays an important role in terms of what people perceive. Attention is defined as focusing on some aspects of an experience at a certain time while ignoring the others. Attention has got a focus and a boundary area. Events are perceived specifically at the focus of attention. On the other hand, events are perceived to a lesser degree in the boundary area of attention.

*For example:* you are watching a national football match on TV. While watching the match, you focus on the Turkish footballer that is taking the ball to the net of the opposing team. There may also be a lot of other footballers that try to prevent the Turkish footballer to score a goal. The footballers that try to prevent a goal are within the boundary area of your attention.

**Factors That Affect Learning**

We can divide the factors that affect learning into three groups. These are factors about learner, learning methods and to-be-learnt matter. There are also other factors that affect learning while they can be divided into different groups. The major ones of them are teacher and the learning or teaching environments. However, teacher and the learning or teaching environment do not affect learning directly. So, we can look at the factors that affect learning under three groups, which are about learner, learning methods and to-be-learnt matter.

**Factors About Learner**

The factors related to the learner comprise the necessary qualities of a person needed to realize learning. These qualities of a person are species-specific readiness, maturation, level of general motivation and anxiety, transferring previous information, motivation and attention.

**Species-specific readiness:** Human can learn to the extent his/her genetic structure allows. In other words, a person is prepared to do some actions while not to do some other actions.

*For example:* a person or a dog cannot learn how to fly, because both people and dogs do not have the necessary structure and qualities to fly.

Species-specific readiness means that a person has got the necessary biological qualities to acquire the expected behaviours. A person can learn just what his/her own species can learn.

**Maturation:** In general, maturation refers to biological development that takes place under the influence of heredity. The most important signal of a person’s development and learning is maturation. Maturation is the product of the internal strengths that affect both the structure and functions of a person. A person should be mature at a certain level to realize learning. We can say that there are two kinds of maturation. One of them is maturation in terms of age and the other is maturation in terms of intelligence.

A person should be at a certain age to realize a good learning. In other words, a person should have a maturation of a certain age in order to learn.

*For example:* a person should be about 9 months old to learn how to walk and about 2 years old to learn how to speak.

Some people may not learn even if they reach the maturation of a certain age necessary for learning since they may not reach the necessary maturation in terms of mental processes. Maturation in terms of intelligence is generally handled together with the term of intelligence. Some psychologists accept intelligence as the criteria for learning ability.
For example; children’s speed in learning how to read is about intelligence.

**Level of general motivation and anxiety:** A person should be motivated at a certain level to learn. The level of motivation means the degree of a person’s accepting the stimuli coming from outside. The level of general motivation is very important in learning situations that necessitate complex mental processes.

For example; we can say that a student who studies on bed has got a low level of motivation since the students tends to relax about studying.

We can say that a very high level of motivation also prevents learning. For example; a highly motivated student can panic and so cannot learn.

Both low and high levels of motivation make learning difficult. The level of motivation should be at a medium level for a good learning.

Anxiety is also important in learning just like the level of motivation. The effect of anxiety, which means a mild fear possessed without knowing what the problem is, is similar to the level of general motivation. A very high or low level of anxiety makes it difficult to learn. Although the effect of anxiety on learning depends on people, we can say that a medium level of anxiety is necessary for a good learning.

**Past experiences:** The preliminary information to be learnt also plays an important role in a person’s learning. Especially adults do not start learning at a zero level since adults have a lot of past experiences in and out of school. They generally build each new learning on their previous knowledge. This phenomenon which is called passing or transferring learning may have positive or negative effects.

For example; acquiring the skill of four operations in math can make it easier to learn how to solve problem or to do shopping in daily life. Learning the word order of **subject, verb, and object** in Turkish can make it more difficult to learn the word order of **subject, verb, and object** in English.

**Motivation:** In general, motivation means the impetus that starts, directs and continues the action of a person. Motivation makes learning easier by means of effects such as lengthening the duration of participation in a certain activity, directing behaviours towards a certain purpose. So, a person should be motivated to learn more easily. Motivation is the state of gaining power to achieve certain goals. In other words, motivation is the state of gaining strength that has physiological, cognitive and affective dimensions in a person and that directs a person to do certain activities and that gives energy to a person. We can say that motivation is an important factor that makes learning easier.

For example; there has been a study about students who have same levels of intelligence but different levels of success. In this study, it has come out that those students who have higher levels of success also have got a higher level of motivation than those who have lower level of motivation.

**Attention:** Attention plays an important role in a person’s learning. We can say that learning process starts with the process of attention. Although there are a lot of stimuli around us, we just learn the information to which we pay attention. We cannot process a piece of information without being aware of or perceiving that information. The level of motivation can affect attention. A high level of motivation can increase attention.

**Factors About Learning Methods**

Another group of factors that affect learning are learning methods. The major factors about learning methods are organizing the time and duration of learning, the structure of the subject to be learnt, participation and feedback.
Organizing the time and duration of learning: It is a well-known fact that people differentiate in organizing the time and duration of learning. While some people spend an hour a day on the subject or subjects to be learnt while others can learn if they spend two hours on certain days of the week. Such kind of learning is called learning by intermittent study. And there are some other people who learn a subject not by studying intermittently but by studying intensely. Learning by studying intensely is called overall learning. We can say that both types of these learnings are useful for people.

Those students who learn in an overall manner by means of studying intensely just before an exam are more successful at the exams. We can say that this is good for students in terms of exam point. However, overall learning may fade away after a short time. Even, it can be forgotten if the exam is delayed. We can say that learning by intermittent study is more efficient for those who want to achieve a permanent learning. Intermittent learning is more efficient especially in achieving psychomotor behaviours. Intermittent learning can be said to be more useful than overall learning when the learnt subject thought to be used all throughout life. In short, intermittent learning can be preferable for subjects thought to be used later while overall learning is preferable for subjects, which are not thought to be useful some time in life later.

The structure of the subject to be learnt: The structure of the subject to be learnt also plays an important role in learning. People learn something as a whole or by means of dividing it into parts. Many studies have been carried out to find out if learning as a whole or by dividing into parts is more efficient. Most of these studies have proved that learning, as a whole is superior to learning by parts. However, the subject to be learnt should have some qualities to say that learning, as a whole is more efficient than learning by parts. These qualities are that the subject should be short, meaningful and easily connectable to each other and it should be suitable for students’ abilities.

There are also cases where learning by parts is certainly superior to learning as a whole. The subject to be learnt should have some qualities to say that learning by parts is more efficient. One of these qualities is that the subject should be easily divided into parts. The other quality is that the subject should be too long as a whole.

Participation: Studies that have been carried out in the field of learning prove that learning is an individual activity. No one can learn on behalf of any other person. So, a person should take the responsibility for his/her own learning. And this means that a person should participate in learning process efficiently. Participation means that a person interacts with the subject to be learnt and is involved in learning. Participation may not be observed directly. Quiet and passive participation may also be as effective as a clear participation in some cases. Participation is directed and affected by internal and external conditions of a person. The internal factors affecting and directing a person’s participation are attention, motivation and readiness. The elements and activities in the learning environment are external factors.

Feedback: Feedback or the information about the results means acquiring information about an action that has been carried out. A person who gets information about how right or wrong what he/she does and says can learn more easily. A person can learn slowly if he/she does not know how much she/he proceeds during the learning process. Even he/she can learn the wrong as the right, his/her learning may be interrupted or she/he can never learn. We can say that success is the starter of new learnings.

For example; a student who solves a problem and learns that the result is true goes on solving problems. Another student who cannot solve the same problem tries to solve the problem again if she/he sees why and where she/he makes a mistake.

Information about the results makes a person aware of his/her mistakes, deficiencies and level of success. Being successful makes a person happy and increases the wish to learn. The information
about results is useful or not depends on a person’s covering up his/her deficiencies and correcting his/her mistakes. So, correction should follow the information about the results.

Factors About the Subject to Be Learnt
Another important group of factors that affect learning includes factors about the subject to be learnt. The subject to be learnt may be easy or difficult. That a subject is easy or difficult for a person may be related to the qualities of the subject to be learnt. The major ones of these qualities are perceptual distinguishability, meaningfulness and conceptual grouping.

Perceptual distinguishability: We can say that those things that are easily distinguishable from the objects and written or oral information around can be learnt more easily. It is about perception to see the thing to be learnt different.

For example; while watching the sea, not whitish bubbles on blue water but a white sailing boat in a further distance attracts our attention. This is also true for verbal learnings. A number in digits attracts our attention more among a few meaningless words.

We can say that a number in digits is more distinguishable perceptually than a few meaningless words. Information that is distinguished perceptually attracts a person’s attention and what is going to be learnt is learnt more easily.

Semantic association: We can say that meaningfulness is one of the most important variables in learning verbal knowledge. The more meaningful a subject is, the easier it is to learn this subject.

For example; the sound *grş* that associates with “giriş, görüş, güreş” is more meaningful than the sound *gsr*. Semantic association refers to what comes to mind while learning. If there are a lot of associations about what is going to be learnt, it can be said to be very meaningful. Semantic association of what is going to be learnt affects learning in a positive or negative way. When a word is uttered, some other words related to the uttered word should come to our mind. If not, the uttered word cannot be learnt easily and can be forgotten easily. Indeed, this can be accepted as transferring previous knowledge to new learnings.

Conceptual grouping: It makes learning easier to group and integrate what is going to be learnt since grouping what is going to be learnt activates a person’s sense of exploring. If grouping cannot be achieved, what is going to be learnt is perceived as too much and this makes learning more difficult. Conceptual grouping can be accepted as a class comprising a lot of members.

For example; metals, animals and jobs are each a conceptual group since each has got a lot of members. For instance, the group of metals can be divided into sub-groups such as rare metals, common metals and alloys. And each of these sub-groups can be handled separately.

It may be easy to learn something when conceptual grouping is done and the groups are divided into sub-groups.

SUMMARY

- The symbolic foundation date of psychology is 1879.
- Psychology studies human and animal behaviours and the reasons of these behaviours.
- All kinds of activities of an organism that can be observed directly or indirectly are called behaviour.
- Educational Psychology is mainly composed of two domains called development and learning.
- The major theories about developmental psychology are behaviorist and cognitive theories.
- Behaviorist theories claim that learning improves by means of establishing a connection between stimulus and behaviour and that change of behaviour can be realized through reinforcement.
According to cognitive theories, mental processes are more important than the connection of stimulus-reaction in learning.

There are a lot more learning approaches that come out also by the influence of behaviorist and cognitive theories. Some of them are constructivism, psychoanalytical and humanist approaches.

There are some basic concepts about development. These are human, development, developing, developmental period, critical developmental period, phase, effect of time, growth, maturation, readiness, heredity, age, experience and learning.

Each person's development takes place with certain principles.

Development takes place as a result of heredity and environment.

Development is continuous and takes place through certain steps.

Development takes place alternately.

Development follows a predictable line.

Development takes place as a whole.

There are individual differences about development.

There are some critical periods in development.

There are some periods in a human's development.

Babyhood comprises 0-2 years.

Early childhood – period of games comprises 2-6 years.

Middle childhood comprises 6-12 years.

Adolescence comprises 12-18 years.

Young adulthood comprises 18-30 years.

Middle adulthood comprises 30-65 years.

Late adulthood comprises over than 65 years.

There are both genetic and environmental factors in a person's development.

A change in behaviour takes place by learning. This change doesn't have to be positive; it may be positive (reading and writing) or negative (smoking and drinking alcohol).

Learning comes out as a result of a person's own experiences, activities or reactions (repetition or experience).

All changes of behaviour cannot be accepted as learning.

Behaviour should be displayed through a certain period of time to be accepted as learning (it should have continuity).

The change of behaviour should not come out as a result of factors such as illness, drug, tiredness, etc. Behaviours that are observed under the influence of a temporary factor are not learnt (for example, a drunken person's specific actions).

Instinctive behaviours and reflexes are not evaluated as the product of learning.

If learning takes place, it is possible to transfer the learnt behaviour to be used in other situations.

It is not possible to observe learning itself directly. The observable quality is the performance.

If an organism reacts to a certain stimulus differently from the previous encounter, this is learning.

Learning is the success of a person. A person learns the necessities of life, whether they are right or wrong, through success. During the period of learning, a person learns by means of attending different establishments from birth to death on one side while he/she learns in the environment where she/he lives on the other side. What a person learns in the environment she/he lives in is as important as what she/he lives in the establishments.

We can group the factors that affect learning under three headings. These are factors about learner, learning methods and the subject to be learnt. There are also some other factors that affect learning. The major ones of them are teacher and the environment of learning or teaching. However, teacher and the environment of learning or teaching do not affect learning directly.
REFERENCES

15. Otrar, M., Eminoğlu Küçüktepe, S., Küçüktepe, C., Mentioned Source
16. Demirel and Ün., Mentioned Source
17. http://www.bilgininadresi.net/Madde/39669/Kal%C4%B1t%C4%B1m-Nedir
18. Ertürk, S., Mentioned Source
20. Otrar, M., Eminoğlu Küçüktepe, S., Küçüktepe, C., Mentioned Source
27. Bacanlı, Hasan. Mentioned Source
32. Erden, Münire and Yasemin Akman(1997), Mentioned Source
33. Selçuk, Ziya (2001), Mentioned Source
34. Senemoğlu, Nuray. Mentioned Source
35. Bacanlı, Hasan. Mentioned Source
36. Morgan, Cliff ford T. Mentioned Source
38. Bacanlı, Hasan. Mentioned Source
40. Senemoğlu, Nuray. Mentioned Source
CHAPTER 2: BEHAVIORIST APPROACH

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Behaviorist Approach

First of all, behaviour is composed of reactions and movements that an organism gives and does in a certain situation. The term, behaviour is mostly used for actions that can be observed from outside. Behaviorist learning approach mostly focuses on how behaviours are acquired. Behaviorist approach claims that learning can develop by means of establishing a connection between stimulus and behaviour, and that any behaviour can be changed through reinforcement.

Behaviorists address learning as a mechanic process and give particular importance to objectivity. According to behaviorists, people are not good or bad from birth. Experiences and environment constitute a human’s personality. According to them, human brain can be compared to a black box. Neither can we know what is going on in this black box nor do we need to know it. What is important is not what is happening in this black box, but what is important is what goes in this black box (input) and what comes out of it (output). Outputs are objective, observable and measurable. Inputs and outputs can be adjusted, arranged and controlled. What is important is not the senses of a person, but the reflection of them. The pioneers of behaviorist approach are I. Pavlov, J.B. Watson, E.L. Thorndike, E.R. Guthrie and B.F. Skinner.

History of Behaviorist Approach

By the early 20th century, the science of psychology has had important turnouts, 20-30 years after Wundt established the first psychology laboratory. Of all these turnouts, the method of introspection is the leading one. Wundt and his followers thought that the subjects such as conscious and feelings expected to be studied by psychology, could be studied just by introspection and they didn’t consider it risky to use introspection as a scientific method. Psychology can use introspection as a scientific method since it deals with inner lives of people just as sciences about outer world use external observation as a scientific method. However, many have considered objectivity and reliability of introspection as a real problem.

Another development in those years occurred in the world of science. Physical sciences made a great progress in those years and especially physics changed the world of science fully. Moreover, the philosophical tradition behind physics constituted the base of people’s questioning most of the things. Another development in the early 20th century was that functionalism was on the rise within the scope of psychology. Some phenomena such as conscious, which were accepted to be a structure before started to be accepted as a process helping to adapt to the environment. Doubtless to say, Darwin’s evolutionary theory also influenced this idea. Darwin’s ideas about living beings that had to adapt to the environment in which they were living also made tremendous impact on psychology. Another development that can be evaluated in this context is the study of animal psychology. Animals’ psychological situations turned into a research subject under the influence of Darwin. It was thought that animals had some qualities such as conscious as well as perception, distinguishing.

An article (psychology through the eyes of behaviorist) written by John Broadus Watson in 1913 in such a positivist environment was revolutionary. In his article, which changed both the methods and subjects of psychology, Watson stated that it was not scientific for psychologists to deal with unobservable phenomena such as conscious or thought, and that science had to deal with observable behaviours. Doubtless to say, Watson’s these ideas have a background, in other words, Watson did not suddenly felt it necessary to boom like this. Watson could evaluate the spirit of time well and could read the developments well. Although some other important names of behaviorist approach
such as Thorndike and Pavlov displayed some manners that could be included in behaviorist approaches before, Watson’s article is accepted as the birth of behaviorist approach.

The period that started with Watson’s article is called as Watson’s behaviorism and it is accepted to last until 1930. The second phase, which comprises the studies of Edward Tolman, Edwin Guthrie, Clark Hull and B.F. Skinner, is called as new-behaviorism and it lasted until 1960s. In this period, behaviorists claimed that (a) the base of psychology was composed of studies about learning, (b) behaviours could be explained by principles of conditioning and (c) psychology had to comply with the principle of functionalism and that a concept that could not be defined functionally could not studied, either.

The third phase is the period that has been lasting since 1960 and it is called as new-new-behaviorism or social behaviorism. The pioneers of this phase are Albert Bandura and Julian Rotter. Cognitive elements were added to behaviorism in this period. Behaviorists of this period think that it is not true for behaviorism to deny mental and cognitive processes. Even Bandura named his theory social-behaviorism first and then replaced this name with social-cognitive theory while Rotter called his theory social learning theory.

To have a general look at behaviorists, there are two kinds of behaviorists: methodological behaviorist and radical behaviorist. While Bandura and Rotter are included in the group of methodological behaviorist, Watson and Skinner are included in the group of radical behaviorist. While radical behaviorists believe that psychology should study just the observable behaviours and environmental processes, methodological behaviorists think that cognitive processes can also be studied, but methods of behaviorist approach should be used. (Schultz and Schultz, 2007). According to another classification, there are three types of behaviorism: methodological behaviorism claiming that psychology is the science of behaviour, not mind; psychological behaviorism claiming that the reason of behaviour is not internal (such as mental processes) but external and analytical (philosophical or logical) behaviorism claiming that mental concepts and processes can be defined in terms of behaviorism. This variety also signifies that behaviorist approach includes different ideas.

On the other hand, when we come to today, behaviorism not only has lost strength but also seems to be defeated by cognitive revolution. Put strict behaviorists such as Watson, Pavlov and Skinner aside, new-new behaviorists state that they are cognitive-behaviorists. Even, according to a research, two thirds of the members of American Behaviour Analysis Association established depending on behaviorist approach define themselves as cognitive-behaviorist.

Fundamentals of Behaviorist Approach

As is mentioned above, behaviorism has passed through three phases. It is clear that different ideas have been accepted in each of these phases. However, behaviorism is basically an approach founded by Watson and it is doubtless that it has got some fundamental qualities. These fundamental qualities have been influenced by the conditions of that day. The first behaviorists who tried to gain scientific qualities to psychology were influenced by physics to a great extent and even they “imitated” them (Ormrod, 1990):

1. A person’s learning is similar to other living things’ learnings. The same principles are valid about a person’s learning in the same way a dog learns. So, behaviorists use the term, organism in their definitions and the term, organism comprises both people and animals.
2. Depending on the first principle, behaviorists try to explain human behaviour by means of the studies carried out with animals. Of course, there are a lot of reasons (such as being reinforced and raised easily), but the most important reason is explained by Tolman in that way: “Let’s watch what mice live in cages, these animals cannot go out at night while a researcher plans to carry out an experiment. ... They also don’t have a conflict of class or race and they avoid politics, economics and psychological notices.”

In short, it seems quite possible to isolate variables well while doing experiment with animals. Even Pavlov built a special building in which he thought he could control all kinds of physical stimuli.
3. Like John Locke’s understanding of human mind, human is like a blank sheet from birth. The environment shapes it. (Mind is not a term used by most of the behaviorists.)

4. Learning can be examined by means of focusing on measurable and observable events such as physical subjects.

5. Most behaviorists believe that people’s qualities such as feeling, idea, motivation cannot be observed or measured directly and so they cannot be handled and studied scientifically. Organism is a “black box.” What goes in (stimulus) and what comes from (reaction) the box is measurable and observable. However, what is going on in the box cannot be understood. So, it is not included in the subjects of psychology.

6. Principles of learning are based on the connection between stimulus and reaction.

7. Behaviorists use the term of conditioning rather than learning. According to this, organism is conditioned (to give a certain reaction) by environmental stimuli in learning. So, such kind of learning takes place out of the control of the organism.

8. Learning is said to take place only when there is a change in one of the observable behaviours of the organism. If there is no change in the behaviour, it is clear that learning doesn’t take place.

9. Learning can be stated and expressed in a short and brief manner. All learnings can be explained through the same simple rules whether they are simple or complex.

**Basic Concepts of Behaviorist Approach**

While behaviorist approach claims that the research subject of psychology should be observable behaviours, this approach also claims that all behaviours have learning as its base and that learning is conditioning. According to behaviorist approach, there are conditionings at the base of human behaviours. Behaviorist approach came out against concepts that express mental processes such as mind and conscious. The basic concepts of behaviorist approach are:

**Conditioning**

Behaviorist approach claims that learning takes place through conditioning. Conditioning occurs in a way that an organism matches a certain stimulus around with a certain reaction. When a reaction is associated with a stimulus apart from a stimulus that naturally moves itself, it is said to be conditioned. Conditioning can be divided into two such as classical and operant. Classical conditioning states that a neutral stimulus is matched with an unconditioned reaction while operant conditioning states that the possibility of an organism to display a certain behaviour again through reinforcement.

**Organism**

Behaviorist approach prefers using a more general term, organism instead of human or individual. The term, organism included both people and animals.

**Reaction**

Behaviorist psychologists are also called S-R theorists. In this relationship, reaction is a behaviour displayed by the organism to a stimulus.

**Stimulus**

Stimulus is composed of changes in the internal and external states that move the organism. For a great part of behaviorist approach, this change of state is mostly external. They may not deal with internal changes of state.

**Reinforcement and punishment**

Reinforcement is the process of increasing the possibility of an organism to display behaviour to a certain stimulus once more. The stimulus used in this process is called reinforcer. Reinforcers help a motivation of the organism to be satisfied at least to some extent. The responses to an organism’s behaviour may be three kinds: (a) reinforcement, (b) punishment and (c) not reinforcing. While reinforcement increases the possibility of behaviour to be displayed once more, punishment is used to increase the possibility of not displaying a certain behaviour. On the other hand, not reinforcing means not giving any response and it generally decreases the possibility of behaviour to be repeated.
In general, behaviorists are against punishment. Because punishment does not give any clue to the organism about which behaviour it should display as well as causing some negative feelings. Or, in more familiar words, punishment teaches what should not be done rather than teaching what should be done. Such a case is not included in definitions of learning and education. Because education tries to teach a student what she/he should do rather than what she/he shouldn’t do. If we come to think from the point of organism, reinforcement guides organism about what it should do while punishment does not include a guide about what to do. Moreover, the studies have shown that reinforcement is more efficient than punishment.

Reinforcement, which can be understood as rewarding in daily language, is divided into two as positive and negative. While positive reinforcement means adding a nice stimulus to the situation in which the organism lives, negative reinforcement means eliminating a bad stimulus from the situation. From the point of student, giving chocolate to a student who displays a good behaviour is positive reinforcement. Allowing a prisoner who displays the expected behaviours in jail to go home for the weekend is negative reinforcement, because the prisoner is allowed to avoid prison or to get rid of the limitations on his/her freedom (for a certain time).

Punishment is also accepted to be in two types. In the first type of punishment, an unpleasant stimulus is added to the situation in which an organism lives while in the second type of punishment, a pleasant stimulus is eliminated from the environment. It is the first type of punishment if a student who doesn’t do his/her homework suffers from physical violence while it is the second type of punishment if his/her toys are grabbed.

**Extinction**
“Repetitions that are not reinforced tend to fade away.” Conditioning should be reinforced at least from time to time in order to continue after it is established. When behaviour is not reinforced, it tends to disappear after a time.

**Generalization**
Generalization is called an organism’s displaying the same conditioned reaction to a stimulus similar to the one to which the organism naturally responds.

**Discrimination**
It expresses organism’s ability to differentiate two separate stimuli. The process of discrimination should be processed especially when stimuli are given the same reactions. Otherwise, the organism will tend to give the same reactions to both of the stimuli even if they are different.

**Reinforcement ratio**
Another concept of behaviorism is reinforcement ratio. Skinner defined different applications of rewarding an organism depending on time and behaviour. Carrying out reinforcement with variable and steady intervals and ratio is called application of reinforcement ratio.

**Spontaneous return**
A forgotten behaviour starts to be displayed again after a certain time. Behaviour fades away when it is not reinforced, but it has also been observed that after a certain time, a learnt behaviour starts to be displayed again. This is called spontaneous return.

**High-level conditioning**
Conditioning is associating a stimulus with a reaction. High-level conditioning occurs when an organism is provided to give reaction to a new stimulus as a result of associating a different stimulus with the related stimulus.

A. **Pavlov – Classical Conditioning**
Ivan Petrovich Pavlov (1849-1936) is one of the most well known people of psychology. Pavlov, who was considerably responsible and ambitious in terms of sense of responsibility and ambition and
decisiveness to work, sacrificed a lot of things apart from scientific research for science. Pavlov was also a careful scientist. For example, he built a mechanism for dogs’ mouth in order to measure the juice they secrete for the sake of providing his studies with scientific validity. Then, he designed three-storey Tower of Silence, whose rooms were isolated from each other, which was sunk in sand, which was surrounded by a ditch filled with straw, that did not let air in when closed in order to prevent dogs from being influenced by any external stimuli. Here, the purpose is to maintain that reaction comes from just the stimulus.

Pavlov was a Russian physiologist who carried out studies on the functions of heart nerves, primary digestive glands and conditioned responses. His studies on primary digestive glands gained him Nobel Prize in 1904. His studies about conditioned responses are an accidental result of his studies about digestive glands. While Pavlov was trying to do a research about the function of juice secreted by a dog when it was given food, he noticed after some time that dogs began to secrete juice without waiting for food. Dogs, which saw their keepers or even heard their keepers’ footstep started to secrete juice. Thus, Pavlov found out that dogs’ reflexes were moved by other events happening at the same time with the real stimulus. Pavlov, who committed rest of his life to do research on this subject, carried out a lot of studies with a big group of researchers and investigated this subject associating it with many concepts used by behaviorist approach today.

Pavlov was interested in reflexes. The term, reflex means behaviour that an organism brings from birth and that is displayed to a certain stimulus in daily life. Dog’s secreting juice for the given food is a natural reflex. First of all, it is important to clarify some basic concepts used by Pavlov in his studies. Unconditioned stimulus is the stimulus that causes an organism to display a certain reaction without learning having been occurred yet. In an ordinary experiment, food is an unconditioned stimulus because it causes the dog to secrete juice before learning occurs. Unconditioned response is the reaction that the organism displays to this stimulus. The juice secreted by the dog to the food is unconditioned response. On the other hand, conditioned response appears when the dog gives reaction to a stimulus to which it should not react normally. The response of juice displayed by the dog to the picture of food or to researcher shows that the researcher or the picture of the food has gained the quality of conditioned stimulus. The response of juice in this case is also conditioned response. And this process is called classical conditioning. We can say that classical conditioning is a process in which a response displayed by an organism to a stimulus under natural conditions is also displayed to another stimulus. The dog starts to display the response of juice, which it gives to food in an ordinary experiment to researcher, or the picture of food.

Behaviorism expresses shaping behaviour. In classical conditioning, shaping a dog’s behaviour is possible through reinforcement. Reinforcement means giving unconditioned stimulus again in classical conditioning. In the experiment carried out by Pavlov, the food given to the dog is reinforcer and the dog continues to secrete as long as it is given food. In relation to this, when the food is not given for a certain period of time, extinction occurs and the dog stops to give the response of secretion after a time. If the dog is expected to continue to give the response of secretion, it is necessary to do reinforcement and to go on giving food.

Pavlov did not make any reference to high-level mental processes in the animals used in the experiments in those years. At the time Pavlov carried out his studies, animal researches were potently being carried out and animals were accepted to possess high-level mental qualities such as conscious and intelligence. Pavlov described his studies, which he carried out quite tangibly and functionally, and he contributed to the development of a neutral methodology in psychology. Joseph Wolpe, who developed the approach of behaviour therapy, took Pavlov’s studies as the basis of his studies.

According to Pavlov, both human and animal, each is a machine. They are complex machines, but in the end, they are just machines.
Classical conditioning can be used for shaping many behaviours of human and animals. Since it is about natural and inborn behaviours, it is an effective technique to shape animals’ behaviours. Likewise, it can also be used to shape the behaviours of children who are thought to continue naturally to a great extent. How unconditioned stimulus should be is clear; it should not be conditioned and it should have a direct relationship with response. On the other hand, unconditioned response should be an inborn response that is given to an unconditioned stimulus under natural conditions. Although it is very easy to prepare these conditions for animals, it is more complex for these conditions to take form in humans.

Classical conditioning is true for humans especially about feelings since people’s feelings are inborn and natural to a great extent. For example; fear is one of the feelings used by the organism to protect it. When an organism comes across a danger about continuing its life, it feels fearful. Fear is inborn, but it is shaped by classical conditioning that why and how fear is felt. Fears in daily life and also love and like are all results of classical conditioning. A child matches doctor and painful experiences during a doctor treatment and starts to be afraid of doctors. Likewise, people like other people with whom they enjoy themselves.

People tend to generalize conditionings that are powerful for an organism such as fear since this is an important situation for people. When people start to be afraid of a stimulus, they tend to generalize it. A child who is afraid of doctors will probably generalize white coat and start to be afraid of everyone with white coat. Another example, which shows classical conditioning in humans, is reflex. Reflexes are people’s inborn behaviours. So, they can be easily shaped by classical conditioning. When a person has his/her mouth water when someone says “lemon”, this becomes a good example. The person matches the word, lemon and lemon, itself. Thus, the response of having his/her mouth water given to lemon is also moved when he/she hears the word, lemon. People’s reflexive behaviours can be shaped by classical conditioning since start of a reflex depends on an external stimulus, not on the organism. In classical conditioning, the organism is passive receiver of and reactor to environmental conditions.

B. F. Skinner – Operant Conditioning

Burrhus Frederick Skinner (1904-1990) is one of the most important and effective people in the history of psychology. Skinner, who had a wide range of interest areas, also wrote novels as well as making some devices such as Skinner box, crib and teaching machines.

One of the most important features of Skinner that differentiates him from other behaviorists is that he avoided theories. Being a very strict positivist, Skinner attributed great importance to experimental data. As a result of having an idea of mechanic human, he claimed that person was a blank organism (reminds the view of tabula rasa), that an organism had nothing in itself that would help to explain a behaviour, that human behaviour was determined by external powers and that people displayed behaviours that could be predictable within the framework of certain laws. However, it is necessary to underline the fact that Skinner did not deny mental events, but the claimed that mental events were not useful in explaining human behaviour and that these mental events were not suitable to use in scientific researches.

While Pavlov was interested in organism’s behaviour displayed against a certain stimulus, Skinner got interested in behaviors that occurred without the presence of any external stimulus, which he called operant behaviour. While Pavlov was interested in conditioning in natural behaviour, Skinner got interested in conditioning in unnatural behaviours. In operant conditioning, there is no stimulus (at least, at the beginning). However, this is not because there is no stimulus, this means that stimulus is not within the border of awareness or it is not clearly apparent at the beginning. Another simple difference between classical conditioning and operant conditioning is that operant behaviour affects environment although reactionary behaviour has no effect on the environment. In other words, in classical conditioning, the dog’s behaviour has no effect on the environment. The dog just reacts to the given stimuli. Even, one of the most important features of classical conditioning is that the organism should not need to do anything, and even shouldn’t do anything. Pavlov stated that it was
necessary for an organism to have no attitude towards stimulus in order conditioning to take place. Namely, a dog should not have any attitude towards a bell; in other words, the dog should not have a quality such as liking or avoiding bell, in order to be conditioned. On the other hand, in operant conditioning, everything depends on organism’s behaviour. If the organism does not display the related behaviour, conditioning does not occur while the organism changes the environment in which it lives; at least, it puts a reinforcer in the environment, which is a nice stimulus. This is what is stated in general, that’s to say, although reinforcement comes before behaviour in classical conditioning, it comes after behaviour in operant conditioning. Skinner believed that most of human behaviours were operant behaviours and he claimed that the best thing to do for behavioral science was to find out how an operant behaviour could be conditioned and faded away.

Skinner studied on mice in the fundamental experiment of operant conditioning. The mouse, which was put in operant box (or Skinner box) developed by Skinner, himself, displayed very different behaviours at first. What is aimed at in operant conditioning was having the mouse press lever in the box. While the mouse was doing different things, it accidentally pressed the lever. Once it pressed the lever, food dropped in the box. Although the mouse did not establish a relationship between food and pressing the lever at first, it started to establish a connection between them after some repetitions. Although it was slow at first, the mouse’s behaviour to press the lever increased in a short time. Skinner used the term o of response rate in order to determine mouse’s behaviour operationally. According to the law that he called law of acquisition, the power of a performance increases when reinforcer follows it. The power of the behaviour to press the lever increases as long as it is followed by the food. The reinforcer here is to give food after behaviour and food turns out to be a reinforcer. The behaviour of an animal, which is always reinforced, continues as long as reinforcement goes on. Extinction occurs when reinforcement disappears. But there is a problem at this point: does it need to be reinforced all the time? This case was handled on a day when Skinner could not find money for reinforcer. When Skinner could not find a financial support for the food to be given to mice, he started to do experiments with this question in mind: “What happens if I rarely reinforce instead of reinforcing all the time?” The way to be followed in these experiments, namely, when the reinforcement would be given and would not be given, was conceptualized as schedule of reinforcement. Therefore, the rules that regulate when reinforcement will be done constitutes schedule of reinforcement.

When studies about reinforcement schedules got started, Skinner preferred to reinforce at regular intervals at first. When reinforcement is given every three minutes, fixed interval reinforcement schedule is used. Studies have shown that the less time there is between reinforcements, the more efficient reinforcement is. Giving salary to the workers at the turn of each month is an example of this. Payment is done according to the time spent on that job, not according to the job done. In such cases, when the time between reinforcements increases, the rate of reacting decreases. In the case of extinction, behaviours that are reinforced at fixed intervals are more resistant. Namely, a behaviour reinforced at fixed interval is extincted more difficultly when compared to a behaviour reinforced all the time.

Skinner used reinforcement schedules considering behaviour after reinforcement considering time. Reinforcing every three actions of an organism instead of reinforcing every three minutes is fixed ratio reinforcement schedule. This kind of reinforcement schedule, which is also used in daily life, is suitable for work at piece rates used especially in industry. A worker who gets payment after each ten pieces of work gets reinforcement according to this schedule. Animals of fixed ratio reinforcement schedule give response more than animals of fixed interval reinforcement schedule. This is accepted to be the evidence of the fact that ratio schedules are more effective than interval schedules.

There are also variable reinforcement schedules apart from fixed reinforcement schedules. They are called variable interval ad variable ratio reinforcement schedule since they can consider time and behaviour. According to variable interval reinforcement schedule, behaviour of an organism is reinforced at variable intervals. Reinforcement is done sometimes every three, every five or every four minutes. Similarly, cases in which sometimes four and sometimes five behaviours are reinforced are
called variable ratio reinforcement. The last type of reinforcement schedule is random reinforcement.
The most effective reinforcement schedule is random reinforcement, because it is not certain when
reinforcement will occur. And this makes the organism alert and careful all the time.

It is necessary to state that timing is very important in relation to the schedule, which is more efficient
when reinforcement occurs with short intervals. According to behaviorist approach, timing is very
important, because the earlier it is, the more effective it is. The time between the bell ring and meat
in classical conditioning and the time between pressing the lever and food dropping down in operant
conditioning should be very short. The longer this time is, the longer it takes for conditioning to occur.
In other words, the animal has difficulty in establishing a relation between two stimuli or between
behaviour and reinforcement.

Skinner thought that verbal behaviours of people were different from animals. Although people are
different from animals in terms of verbal behaviours, acquiring verbal behaviours depend on the same
rules as other types of behaviours. As is the case with other behaviours, a person acquires language
through a system of reinforcing correct use of language and not reinforcing incorrect use of language.
This idea also lies behind children’s repeating their mistakes. If adults meet incorrect pronunciation of
a child with pleasure, the child will tend to repeat this mistake.

One of the contributions of Skinner to behaviorism is the concept of behavior modification. This
approach expresses changing human behaviours through developed rules and principles, and it
especially uses positive reinforcement. A very common example of this is the case of a child who cried
to get what she/he wants. If what the child wants is bought, the possibility of the child to cry in order
to get what she/he wants at a later time. Because what he/she wants is bought when she/he cries.
However, it is a more preferable case to reward the child when she/he doesn't cry.

Another application of Skinner’s ideas is about IQ Zoo programmes. In these programmes, there are
animals that dance with music, that pull a paper of luck and gives it to a person, that get on some
kinds of vehicles that roll a Wheel. 6000 animals have been trained and used in different sectors in
USA at some time.

Another contribution of Skinner to education is programmed instruction. Programmed instruction
means directing a student by means of reinforcing his/her responses given to teaching materials in a
manner of small progresses. Although it was not successful in early 1960s when it was first
developed, it is used in a very effective way with the development of computers today.

The student is exposed some questions and he/she is allowed to go on only if she/he gives the correct
answer. Thus, the student can pass to higher levels as he/she learns. Programmed instruction, which
can be defined as reinforcing the suitable behaviour of a student, is one of the most important
contributions of Skinner to education.

Other Important Behaviorists
When someone says behaviorism, it is doubtless that first of all, Pavlov and Skinner come to mind.
However, there are also some other behaviorists who were also quite effective within this field.
Watson, Thorndike, Tollman and Guthrie are among them.

John B. Watson (1878-1958)
Although behaviorism is closely related to Pavlov’s experiments in early 1900s, it was Watson who
established behaviorism in 1913 with his article. Watson, who claimed that human behaviours and
animal behaviours did not have certain lines, stated that psychology had to take behaviour as its basis
and it had to aim at guessing and controlling behaviour in order to be a real science. According to
Watson, psychology should investigate why certain behaviour comes out and should find out ways
and methods to control behaviour. Watson suggested to eliminate mind, conscious, what is going on
in brain from psychology and introspection as the method.
According to Watson, behaviours can be simple just like reflexes while they can also be very complex. Complex behaviours are called action. Actions such as eating, reading, building are complex. However, no matter how much complex an action is, they can also be handled in terms of simple actions. Responses can also be divided into implicit/explicit or learnt/unlearnt. Responses that psychology will investigate should be somehow observable. Watson claimed that observable behaviours had to be investigated by means of separating them into the smallest unit, to the responses of muscles and nerves. According to Watson’s behaviorism, behaviour is separated to the smallest unit.

Although Watson did not establish his own theory, he was quite efficient in establishing and popularizing behaviorism. Watson’s another contribution to the world of science is Little Albert experiment. In this experiment, an eleven-month-old baby called Albert was used. Albert was shown a white mouse and a loud noise was given (hammering grate) after that. In a short time, Albert began to be afraid of Mouse. Later, Albert began to give the same response to other stimuli such as rabbit, fur coat, Santa Claus. This is an example of stimulus generalization research in this field. Depending on such researches, Watson claimed that people’s fears, anxieties and such feelings result from conditioning in early childhood.

E. L. Thorndike
Edward Lee Thorndike (1874-1949) is said to be the greatest learning theorists of all time in some by some sources (Hergenhahn, 1982). Thorndike was a psychologist who carried out studies not only in the field of learning but also in other fields of education. He claimed that stimulus and response are connected to each other about learning. According to him, a neural connection is established in the organism when learning takes place. He called his theory as connectionism.

According to Thorndike, the basic way of learning is trial and error. In the puzzle box that he developed for his experiments, the animal has to display a series of complex behaviours in order to get out. The cat, which displays various behaviours at first, can display the proper behaviour after many trials. At this phase, a connection is established between the stimulus (box) and the cat’s response to pull the clip to open the door. While a certain period of time passes for the cat to display behaviour at first, it can display the behaviour of opening the door immediately in time. Learning occurs gradually while is it not related to mental processes such as thinking and comparison. These ideas have made Thorndike one of the pioneers of behaviorism.

Thorndike thought that all mammals including human beings were subject to the same learning principles. He asserted three laws about learning process before 1930s: law of exercise, law of effect and law of readiness. Law of exercise is composed of two components. The first component is the rule of usage, which states that a response is strengthened as it is given to a stimulus. The second component is, on the contrary, the rule of not using and according to this rule, when a response is not given to that stimulus, the power of the connection decreases. The rule of timing is also true here and the more time there is between stimulus and response, the less powerful the connection is.

The second law is law of effect. This law states that a response will be learnt when a response given to a stimulus is satisfactory, and the response will not be learnt when a stimulus is not satisfactory or it is disturbing. The behaviour of the cat is learnt, because this response causes a satisfactory result of opening the door and getting out. Thus, the possibility of the cat to give the same response at a later time increases.

The third law is the law of readiness and it claims that when a person is ready for an action, he/she will get satisfied with learning and the connection will be powerful, but carrying out actions for which a person is not ready will be just like a punishment. So, if a person has to display certain behaviour when she/he is tired, this will be disturbing for him/her.

Thorndike reviewed his theory and made some changes and amendments after 1930. The change about the law of effect is about the role of punishment. According to this, while reward makes connection more powerful, punishment makes this connection weaker. As an organism established
new connections, older ones seem to weaken. According to Thorndike, punishment does not have one forget a behaviour, but just suppress it.

**Tolman**

Edward Chace Tolman (1886-1959) is one of the first defenders of behaviorism. Although he received lectures about Gestalt psychology at first, he adopted Watson’s view of behaviorism after he got aware of them. As distinct from other behaviorists, he developed the idea of intention in behaviour. His concept of intentional behaviour is quite different from the ideas of other behaviorists. Other behaviorists do not have the concept of intention, in other words, the organism do not have any intention while displaying behaviour. Although it seems that the concept of intention refers to a mental intention, Tolman did not use this concept in terms of mind. However, intentional behaviour puts him somewhere between behaviorist approach and Gestalt psychology.

In terms of Watson’s ideas, Tolman was not interested in singular behaviours and stimulus-response connections, but in general level of response, which he called molar behaviour. While Watson claimed that behaviours should be handled and examined through separating them into the smallest units as much as possible, Tolman thought that it was necessary to deal with total response, not with muscle and nerve movements. Tolman stated that all behaviours occurred in line with a purpose.

Another contribution of Tolman is the concept of intervening variable. He claimed that behaviours got started by intervening variables. These intervening variables are internal motivations, heredity, past experiences as much as external stimuli. When an organism displays behaviour, she/he behaves under the influence of motivations about an external stimulus, inborn genetic features, past experiences and age factor. This idea shows that Tolman is not a S-R theorist, but S-O-R theorist in that S-O-R stands for Stimulus-Organism-Response. Tolman called his idea as functional behaviorism. Tolman reviewed his theory after 1950 and added some concepts to his theory such as needs, motivation and behavioral area.

One of the contributions of Tolman to learning psychology is the concept of cognitive map. Living beings shape a map of their environment in their minds. Tolman’s experiments with the rats in the maze showed that without any punishment or reward, rats could easily find the hidden food by the help of cognitive maps of the mice, which only walked through the maze. Cognitive map is a concept that is part of maze learning which is another concept introduced by Tolman. Maze learning is a kind of learning that an organism does unconsciously. Rats walking through maze do not do this in order to make the cognitive map of the maze but they make up the map while walking around and this is latent learning.

As a result, Tolman gained some concepts such as intentional behaviour, molar behaviour, internal variable, cognitive map and latent learning to the field of learning psychology. Although he is a behaviorist, he is a behaviorist who is near Gestalt about learning psychology.

**E.R. Guthrie**

Edwin Ray Guthrie (1886-1959) developed behaviorist approach within evocative approach. According to the law which he called law of contiguity, if an action with a contingent stimulus is repeated, the stimulus tends to be followed by that action. This law can be accepted as another expression of behaviorist opinion. Guthrie contributed to learning psychology in two important ways. His first contribution is the idea that learning occurs at first trial. According to Guthrie, learning occurs at last and one time in real life. According to him, rewarding or repetition are not important for learning. The organism tends to repeat what it does for the last time.

Guthrie’s second contribution is about the methods of having something forgotten. According to Guthrie, there are three ways to have a behaviour forgotten:

1. **Method of threshold:** It means differentiating a stimulus gradually and slowly by means of giving this stimulus within the borders of perception difference threshold. The person thinks that she/he comes across the same stimulus, but the difference is not noticed because the stimulus is within
the borders of stimulus difference threshold. This technique is used in order to get on a horse by means of starting the job with a light blanket at first and then adding to the weight of the blanket and getting on the horse at the end.

2. Method of saturating: It is elimination an undesirable behaviour by means of giving a stimulus too much and often. A person who wants to stop smoking achieves his/her goal by means of smoking too much or when a horse is too tired to throw the person from his back, one can get on the horse.

3. Method of reaction formation: It means exposing the organism to an opposite stimulus to which the organism cannot display the unexpected behaviour. In order to get on a horse which throws the person from its back, the horse is tied tightly and thus its movements are limited.

As a result, Guthrie contributed to learning psychology with his theory of contiguity, learning at first trial and having something forgotten. Especially his ideas about the methods of having something forgotten are still valid today and it is used for cases such as smoking.

Evaluation and the Current State
Behaviorist approach is a movement, which came out in early 1990s both to establish psychology as a science and to adapt to the spirit of the time. In those days, many people humiliated psychology since it as a new branch of science. Even Pavlov did not take psychology seriously when he first started his studies, but he changed his mind later. What is more interesting is that his greatest contribution has been to psychology. Pavlov was not alone, psychology was a new science in those years and what and how it would research was a controversial subject. Behaviorism is an answer to the question of what and how psychology will research. In those years also, there were some other factors such as positivism being prevalent, theory of evolution and Darwin's ideas being accepted commonly, amazing developments in physics that accelerated the coming out of psychology.

Behaviorism has witnessed a great progress especially through the ideas of Pavlov and Skinner and it contributed to the research and understanding of learning to a great extent. Although experiments with animals were very common at the beginning, it is real truth that it also enlightened human learning.

Although behaviorism complied with the spirit of the time at the beginning, the spirit of time passed to the cognitive side and so behaviorism was defeated by cognitive revolution. Nowadays, cognitive approach is commonly accepted. Even behaviorists call themselves as cognitive-behaviorist rather than just behaviorist. Therefore, behaviorism got defenseless especially after the death of Skinner. Albert Bandura and Julian Rotter, who started the path with behaviorism, define themselves as cognitive behaviorist, not just behaviorist. As a result, behaviorism has completed its mission after contributing to the learning psychology to a great extent, and today it is accepted to be a theory whose deficiencies and mistakes are understood. However, this does not mean that it is not a great and efficient theory.

SUMMARY
Behaviorism is an approach, which was moved by Pavlov's studies in 1900s and established by Watson's article in 1913. Behaviorism, which basically claims that examining animal behaviours can enlighten human learning, also claims that the research subject of psychology is not mind, but behaviour and that observable and measurable behaviours can be researched. Pavlov's classical conditioning and Skinner's operant conditioning processes could explain most of human learning. Behaviorist approach, which does not consider humans' internal and mental processes, has lost its effect since 1950s when cognitive revolution got started to progress day by day. Especially after Skinner's death, there is no one left to defend behaviorist approach today. Despite of this fact, it is an undeniable fact that behaviorist approach is one of the most important and efficient theories of learning psychology.
REFERENCES

Cognitive Approach in the Process of Learning

Studies related to how a person learns and how learning can be efficient have a long history. Various theories and approaches have been developed in this field and they have had important impact on endeavors for learning. Pedagogues make a classification based on three basic approaches while dealing with learning theories. These are behaviorist approach, cognitive approach and constructivism. It will be a mistake to see these three approaches as alternative to each one or to evaluate them independently while making a classification. Behaviorist, cognitive and constructivist ideas and principles overlap in many fields. It is difficult to classify these theories in this context. Some theories can be involved in more than one class in different ways. For example; in some resources, Bruner's theory of Discovery Learning is accepted to be cognitive rather than developmental. In some other resources, Bruner is mostly included in developmental or constructivist class. On the other hand, while Albert Bandura is mostly classified as behaviorist, Bandura himself opposes to behaviorism. This difficulty in classification is natural. Because it is impossible to make a statement independent of behaviorist approach while dealing with cognitive approach or to make a statement independent of cognitive approach while handling constructivist approach. In other words, behaviorist approach provided a basis passing to cognitive approach while cognitive approach provided a basis passing to constructivist approach. According to this, cognitive approach does not deny behaviorism, it claims that cognitive process is seen in behaviorist learning. Moreover, constructivist approach established its principles on the basis of the principles of cognitive approach. According to behaviorist approach, learning depends on stimulus and response to a stimulus, and the resulting behaviour should be observable and measurable. While passing from behaviorist approach to cognitive approach, the question if cognitive process is present or not in acquiring behaviour started to be asked. We cannot say that cognitive psychologists completely exclude the findings of behaviorists. Cognitive processes and activities such as processing information, mental representations, guesses and expectations are accepted to be a basis in the interpretation of learning. What cognitive theorists do in addition to behaviorists' findings is that they claim cognitive processes are also present in the events of an organism's learning.

In this chapter, cognitive approach is explained while the theories below are also included considering learning theories, which are explained, in separate chapters in the book.

Latent Learning – Place Learning

The theory of latent learning was developed by Edward Chance Tolman (1886-1959). Tolman, who made great contributions to the fields of learning and motivation, presented his theory of cognitive learning while working in California University, Berkeley. Tolman, who is accepted to be a cognitive behaviorist today, developed his own sense of behaviorism in a period when ideas related to learning psychology claimed by J.B. Watson (1878-1958) were dominant. According to Watson, behaviours are accepted to be a movement by various muscles. Human behaviours such as speaking, walking, thinking, feeling and such are all composed of movements of nerve system and muscles. According to Watson, concepts such as instinct, motive, conscious, subconscious presented by other theories in order to explain human behaviours are uncertain expressions trying to explain muscular movements and neural activities. He said that learning occured related to how an organism establishes a connection between his/her information and cognition about the environment and himself/herself.
This idea does not comply with the ideas of Thorndike and Hull, who thought that learning as a strict connection of stimulus-response.\textsuperscript{2}

Tolman claimed that learning was related to complex mental processes, not simple mechanic conditioning processes. He did a lot of classical experiments with mice in order to prove his idea. One of his most well known studies involves maze running. Moreover, he also put emphasis on the role of reinforcer in mice's learning their ways in complex mazes. These experiments caused the birth of “The Theory of Latent Learning” expresses as the learning occurring in situations where there is no certain reward\textsuperscript{3}. Hugh Blodgett did the first experiment making use of the paradigm of learning without reinforcer in 1929 and he was the first academician who used the term of latent learning. He announced this concept, which he put forth as a result of the experiments he carried out with mice in 1929, in “university of California publications in psychology” through an article, which he published with the name of “the effect of the introduction of reward upon the maze performance of rats” in the same year. Then, Tolman also did equaling experiments and developed studies in this field and mentioned Blodgett as the creator of the term “latent learning.” Tolman also stated in his article named “cognitive maps in rats and men” published in “The Psychological Review” that it was again Blodgett who did the first experiment in this field. Tolman called the first learning occurring when trials without a reinforcer were done as “latent learning.” People apply this kind of learning every day while driving car, walking through the same path daily, and they learn the places of various buildings and places. However, learning appears when we need to find out an object or building.\textsuperscript{4}

\textbf{Cognitive Maps}

Tolman’s term of “cognitive maps” which he used to explain the learning behaviour of an animal in a maze states that the animal develops a schema of spatial relations, a cognitive map related to the places of objects rather than a simple chain of stimulus-response. That a monkey, which is not hungry, can easily find out the places of the food when it gets hungry after discovery behaviours in test environment, even long after that and other similar experimental observations support the presence of such a cognitive map.

Living organisms constitute a map in their mind about their physical environment. Information such as where and how to go is acquired through these maps. These maps are called cognitive maps and they are constituted unwittingly to a great extent.\textsuperscript{5}

\textbf{Purposive Behaviorism}

Tolman called his own specific behaviorism as “purposive behaviorism.”\textsuperscript{6} According to Tolman, one of the most important features of human and animal behaviours is that behaviour is goal-oriented.\textsuperscript{7} Tolman used the terms of purposive or molar behaviour in his book, Purposive Behaviour in Animals and Men (1932). He claimed that studies should focus on molar behaviours, not on small units of behaviours or actions as claimed by behaviorists. According to Tolman, behaviour is purposive; behaviour has a quality to be able to be changed and adapted in line with environmental conditions for the purpose. When behaviour is purposive, the purpose can be to avoid something or to gain some other thing. For example; while a bird in a cage tries to flee away from the cage, a seller tries to gain profit through a sale of his/her goods. Tolman called his theory purposive behaviorism since he organized behaviour around a purpose.

Tolman’s learning theory is one that unites behaviorism and Gestalt. Tolman tried to explain how a human or animal behaviour is related to their purposes, intentions, information, thinking, plans, making sense.\textsuperscript{8}

\textbf{Molar Behaviorism}

Tolman defended molar behaviorism contrary to Watson’s molecular behaviorism. Tolman stated that behaviorists overlooked the whole while they were analyzing behaviour as very small units. He used the term of molar to mean a kind of global behaviour that could be observable in daily life every day. For example; cooking, washing up, and writing the answers in an exam are some examples. According
to Tolman, studying behaviour by means of dividing it into small parts and elements cause the loss of behaviour’s meaning. Therefore, purposive behaviours that have unity in meaning should be studied.

**Extinction**

According to Tolman’s theory, extinction comes out because of changes in the expectations to a great extent. If an organism is certainly aware of the fact that a sign will not guide a reinforcer anymore, extinction occurs and the reason of this extinction is that the organism does not need it anymore.

**Variables of Learning**

Tolman addresses the variables of learning in two groups such as environmental and individual differences.

**Environmental variables:** The behaviours to be displayed differ according to environmental qualities. Different ways are tried in order to achieve a certain goal. What is important is to achieve a goal in the shortest and easiest way. A person who prefers to use public transportation to go to work when it is snowy while he/she goes to work by his own car when it is not snowy is an example. Some of the environmental variables are:

- **Nutrition program:** This concept refers to schedule of depriving an animal. For example; the duration of time since an animal’s eating.
- **Coherence of purpose object:** It is the coherence of reinforcer stimulus with the instinctive situation of the animal. For example; food cannot be a reinforcer for a thirsty animal.
- **Type and Suitability of Stimuli:** It is the suitability of signs and clues given to the animal.
- **Type of Motor Responses Necessary in the Case of Learning:** Running and sharp turns are examples.
- **Type of Running in a Maze and Being Successful:** The form of way turn necessary for analyzing a maze determined by the experimenter.
- **Number of Trials and Accumulative Nature of These Trials**

**Individual Variables:** There are some qualities that differentiate individuals from each other. According to Tolman, these are heredity, age, and previous education, organism’s condition about hormone, drug and vitamin. These qualities are shaped according to the qualities of environment. For example, teaching reading and writing is more common in the first grade primary education. While some of first grade students learn how to read and write earlier, some others learn later than them. The most important factor here is individual differences.

**Intervening Variables:** The term of intervening variable describe psychological processes that intermediate between the environmental stimulus directing the behaviour and observable responses. Tolman tried to explain the causes of the variety of complex and molar behaviours. Tolman answered this question making use of the term of intervening variable. Intervening variable is a structure built to help to explain the relation between independent variable and dependent variable. Tolman accepts cognition to be intervening variable. Cognition is an element that intervenes both stimulus and response.

**Discovery Learning**

In today’s world, the demands of business world from education have changed in parallel to the global economical competition. Business world primarily wants its workers to have problem solving skills. Business world calls its workers to find new ways by means of thinking over what they can do and how they can do what they do more easily and more competitively. As economic competition increases at global level, business world starts to need individuals who can be more successful through a small training after being recruited. Our society now needs graduates who can cooperate, work in teams, teach others and negotiate with others. Both business world and society expect graduates who can collect data in order to reason and solve a problem, and who can interpret and evaluate the data. Individuals graduating from schools that give education through traditional methods do not possess these skills. In this context, discovery learning is accepted to be a new
approach to raise up future graduates having all the skills mentioned above. In this approach, special learning methods and learning strategies based on guidance play an important role.

Discovery learning is accepted to be natural part of human beings. People are born with an innate curiosity and this curiosity causes them to learn. Babies learn how to talk through discovery learning. They listen to what is spoken around them, imitate sounds and try to unite speaking parts they have explored. Although discovery learning is generally said to be represented by Bruner in the books and articles, there are some ideas developed by John Dewey, Jean Piaget and Lev Vygotsky at the base of this theory.

Dewey, in his book *Democracy and Education*, describes learning as an action which requires learners to be in a society, to put the ideas and information together when they communicate with others, and also which requires these individuals to constitute their information by means of implementing the results of their meaningful and important past experiences. According to Dewey, children naturally possess active learning motivation and education just helps to make it possible to learn more. According to Dewey, mental development starts with social interaction. Namely, children are not receivers but participators of learning.

On the other hand, Jean Piaget, in his book *Understand is to Invent*, states that understanding results from discovery, that productivity and creativity will be lost, and an individual will be got stuck in repetition without understanding. According to Piaget, children cannot think in the same way with adults. It is Piaget who first claimed that children were not empty containers that need to be filled with information, that they were individuals who could actively constitute information. According to Piaget, children are individuals who continually create and test their senses of the world. In other words, they are active and participating students.

Lev Vygotsky puts special emphasis on the importance of cultural and social effects, and children’s interaction with others in cognitive development. In the term of “Zone of Proximal Development” put forward by Vygotsky, there is a difference between what a child can succeed alone and what a child can succeed with help. In other words, if his/her peers, teachers or parents who can help to constitute the necessary experiences, accompany the child this child can solve more complex problems in a certain mental period. According to Vygotsky, determining a student’s place while developing and structuring childhood experiences for richer inventions will strengthen education in class.

The Features of Discovery Learning

Traditional learning comprises teaching activities and explanations in class under the leadership of the teacher. On the other hand, basic foundations of discovery learning are learning occurring in the individual, teaching and learning strategies designed by the teacher, and the atmosphere created by using these strategies. Indeed, discovery learning is not a new theory. Principally, teaching models and strategies focusing on active and applicable learning opportunities for students aim at learning through discovery learning. Bicknell-Holmes and Hoffman lay stress on three features of discovery learning:

1. **Exploring and problem solving in order to create, integrate and generalize information**: The most important feature of discovery learning is this first one. Students can take on active roles in order to create, integrate and generalize information through exploring and problem solving. Students can constitute more comprehensive implementations for their skills through activities that encourage taking risks, problem solving and testing their unique experiences instead of receiving information passively through presentation, explanation or exercise. Because of this feature of discovery learning, students carry out the deed of learning instead of teachers. Thus, the roles of teachers and students change completely, and most of the teachers have difficulty in accepting this radical change in the roles.

2. **Activities whose sequence and frequency are determined and carried out by students, and which depend on students’ interests**: The second feature of discovery learning is that it encourages students to learn at their own speed. There may be a flexibility about the sequence and frequency of learning activities through discovery learning. Learning is not the static progress...
of lessons and activities. This feature of discovery learning contributes much to students’ motivation and their taking responsibility of their own learning.

3. **Encouraging to integrate new information to the current information of students:** The third feature of discovery learning is the use of the current information as a basis in order to structure the new information. Scenarios familiar to students help students to extend their current information and find new information on this current information. Papert’s discussion on the case when nursery school students come across LOGO computer program is one of the most important examples of this case. Papert changed the speed regulation of the program and thus maintained the real meaning of zero to be found. Student explored that steady objects moved at zero speed. Papert achieved to create a new understanding of concepts about zero and other numbers by means of changing something familiar to student.

Comparison of traditional approaches and principles of discovery learning:

**Learning is not passive, it is active:** Students are active in discovery learning. Learning is not just receiving what is read or said, but it is following the new information actively. Students are involved in applied activities composed of real problems waiting for a solution. The real goal is to find the answers and learn more.

**Learning is process-oriented rather than content-oriented:** In discovery learning, focus has shifted from final product, namely, from content to process, namely, to how content is learnt. Analysis and interpretation are present in order to understand what is learnt instead of giving the correct answer directly. Discovery learning helps students to go into a deeper level of understanding. It focuses on having important skills and implementing these skills.

**Failure is important:** In discovery learning, failure is accepted to be a positive situation. Thomas Edison, who tried 1200 designs until he found out the working bulb, is a good example of this feature. When Edison was asked if so much failure discouraged him or not, he replied that he was never discouraged because he learnt thousands of useless designs. So, learning can occur even through failure. Discovery learning does not focus on finding the correct answer. Cognitive psychologists have shown that failure is in the center of learning. What is essential is learning and a lot can be learnt through failure, as well. If a student never fails while learning, this probably means that she/he does not learn a new thing.

**Feedback is necessary:** An important portion of discovery learning is that there are opportunities of feedback in learning process. Student’s learning is strengthened, deepened and maintained to be more permanent by means of discussing a topic with other learners. Discovery learning provides opportunities of deeper understanding by means of putting all these differences together. Students make a natural progress and internalize concepts.

Dr. Roger Schank and Chip Cleary constituted five categories about implementing discovery-learning theory in class:
1. Case-based learning
2. Incidental learning
3. Learning by exploring/conversing
4. Learning by reflection
5. Simulation-based learning

**Meaningful Verbal Learning**

David Ausubel (1918-2008), founder of Meaningful Verbal Learning, was an American psychologist who completed his PhD education in Developmental Psychology in Columbia University. He was influenced by studies carried out by Piaget, and he published many books on developmental and educational psychology. He is accepted to be a neuro-behaviorist because of his studies in the field of educational psychology. Although Ausubel recognized other forms of learning, his studies focused on verbal learning.
Ausubel, who dealt with the structure of meaning, believed that external world could make sense only when it could be transformed into learner’s conscious content. Meaning is created through equality of representation between language, namely, symbols and mental context. Here are two processes:

1. Perception: present in meaningful verbal learning
2. Discovery: present in concept formation and problem solving.

Ausubel’s studies can mostly be compared to Bruner’s studies. Both psychologists researched the structure of information, but Bruner focused on discovery processes while Ausubel focused on verbal learning methods such as speaking, reading and writing. According to Ausubel, people primarily learn a piece of new information by means of being directly exposed to information rather than discovery. According to Ausubel, student does not need to make a discovery for a meaningful learning to take place; students receive information readily rather than through exploring. Because of this reason, students should be prepared to receive the information organized by the teacher. In meaningful learning, lesson goes on in the direction from whole to piece, in other words, with deduction. It is important to associate and re-organize what is learnt at each phase. If the whole is not presented and preliminary learnings are not reminded, students will tend to memorize. Ausubel believes that concepts, principles and ideas are gained through deductive reasoning. According to Ausubel, learning should be meaningful. Verbal learning can be meaningful if it is carried out efficiently, but discovery learning may not be meaningful every time. Moreover, verbal learning is more advantageous than discovery learning because a lot of information can be transferred to the student in a short time if verbal learning is carried out efficiently. Ausubel, who believed in the idea of meaningful learning as opposed to rote memorization, says in the preface of his book called “Educational Psychology: A Cognitive View”: “If [he] had to reduce all of educational psychology to just one principle, [he] would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.” In other words, the most important factor that affects learning is the current fund of knowledge. This fund should be revealed and teaching should be planned accordingly.

In Ausubel’s approach of meaningful learning, organizer information plays an important role. These are starter expressions constituted by high-level concepts. An organizer can be a concept, a principle, a generalization and a rule. It is an advance organizer, a piece of information presented by the teacher, which helps student to organize the new information. Advance organizers help the process of learning when difficult and complex materials are presented. There are two conditions for this:

1. Student should process and understand the information given as advance organizer. This increases the effect of organizer.
2. Relations between basic concepts and term should be shown making use of organizer.

**Types of Organizers**

Ausubel’s theory of advance organizer is dealt with in two categories. These are comparative and expository organizers. The main goal of comparative organizers is to activate existing schemas. Similarly, they act as reminders to bring into the working memory of what you may not realize is relevant. By acting as reminders, the organizer points out explicitly “whether already established anchoring ideas are nonspecifically or specifically relevant to the learning material.” Similarly, a comparative organizer is used both to integrate as well as discriminate. It integrates new ideas with basically similar concepts in cognitive structure, as well as increases discriminability between new and existing ideas, which are essentially different, but confusably similar. An example of a comparative organizer would be one used for a history lesson on revolutions. This organizer might be a statement that contrasts military uprisings with the physical and social changes involved in the Industrial Revolution. On the other hand, expository organizers are often used when the new learning material is unfamiliar to the learner. An example, which Ausubel and Robinson provide in their book School Learning: An Introduction To Educational Psychology, is the concept of the Darwinian theory of evolution. To make the Darwinian theory of evolution more plausible, an expository organizer is used as combination of relatedness to general relevant knowledge that is already present, as well as relevance for the more detailed Darwinian theory. Another example would be the concept of a right angle in a
A teacher could ask students to point out examples of right angles that they can find in the classroom. By asking students to do this, it helps relate the students’ present knowledge of familiar classroom objects with the unfamiliar concept of a 90-degree right angle.

The steps stated below are used while implementing meaningful verbal learning in class:

1. **Presenting advance organizers:** Organizers such as explanation, schema, model that draw the outline of the lesson and make a structure for the new information are presented. These organizers constitute the skeleton for new information, attract attention to important points and relate current information to the to-be-presented learning material.

2. **Presenting the new information:** New information is introduced from the general to the specific making use of deduction. Discussions and conversations contribute to student’s learning process. Teaching goes from general information to concrete examples. Previous and new pieces of information are compared and the differences and similarities between them are discussed.

3. **Reinforcing cognitive organization:** In this step, given information is tried to be fully integrated into the structure presented at the beginning. It is important to determine whether the student makes sense of what is learnt or not. Activities such as exercises and problem cases are used to have students transfer information to new situations.

**Gestalt Theory**

Wolfgang Köhler (1887-1967) is one of German Gestalt psychologists. He is one of the founders of psychology school called Gestalt during the period when behaviorism was dominant in psychology in the USA. He studied physics and psychology by the guidance of Max Planck and Karl Stumpf. It is possible to see how Köhler, whose PhD thesis was on psychoacoustics, transferred the field of physics to psychology.

Gestalt psychology, founded by Wertheimer, Koffka and Köhler, is a reaction to behaviorism, which reduced experiences to simple stimulus-response reflections, and a reaction to constructivist perception theories, and reduced experiences to pieces, which were defended by Wundt and Titchener. Gestalt psychology, which has its root at Husserl’s phenomenology and Kant’s philosophy, accepted perceptual process as a synergic cooperation, which united perceptual elements and constituted a holistic interpretation of a stimulus, and where parts are much less important than the whole. This theory states that an individual evaluates stimuli coming from outer world as a gestalt rather than receiving them by means of isolating: “The whole is greater than the sum of the parts.” When one looks at a portrait, she/he sees a portrait, not parts such as nose, eyes, lips, hair separately. The music composed of the contributions by all the musicians is listened rather than the single contribution of each musician at a concert.

Köhler’s experiments with animals are accepted to be one of his most important contributions to the field of psychology. His studies, which he carried with the name of “The Mentality of Apes”, were published in 1917. In this study, Köhler almost spent all his time on a group composed of nine monkeys kept in a cage for the purpose of research. A monkey called Sultan made a great progress in terms of intelligence and turned out to be Köhler’s favourite experimental object. Köhler used food as a means of motivation and firstly tested chimpanzees’ ability to solve problem. He observed Sultan, his smartest ape, to unite branches of bamboo and use it as a means to reach the food located in a long distance away from the cage. In another case, he observed that one of the apes solved the problem of reaching the bananas hanging on the ceiling by means of putting boxes as a pile and climbing on this pile to get the bananas. Based on his observations, Kohler concluded that apes did not carry out these missions through trial and error or luck, but they used “introspection” and he explained the behaviour of apes’ problem solving in terms of cognitive processes. According to Kohler, these animals can learn how to solve problem just like humans. These behaviours of apes are carried out through a mental process. One of the most important contributions of Gestalt theory to education is the application of introspective problem solving and productive thinking. Student should be exposed to all elements of a problem in order to acquire introspective problem solving behaviour. Namely, the problem and the elements necessary for the solution should be presented to the student. The appropriate atmosphere should be prepared for the student to understand the nature of the
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problem, explore the relations between its elements and organize the possible ways of solution, in other words, to make an invention. For this purpose, curiosity of the student is moved\textsuperscript{62}.

According to Gestalt theorists, an individual perceives the whole as a meaningful and organized whole, not through separating the whole into parts. Then, he/she discovers the relations between parts and the whole. Moreover, relations of simplicity, similarity, proximity, and continuity, shape-base are important in perception. In this case, the teacher should give the basic framework of the lesson as an organized and meaningful whole to the students at the beginning of the term, and then should go into details. Thus, the teacher can help students to understand the function of the lesson and relations between the units as a whole\textsuperscript{63}.

Theory of Data Processing

Theory of data processing is a theory that has been put forth by George A. Miller (1920-) grounding on Edward C. Tolman's (1886-1959) sign and latent learning theories, that claims that learning is a complex and internal process occurring with some mental processes, and that is based on cognitive approach. Theory of data processing accepts information as the basic means of learning and explains learning in terms of memory system. It focuses on how information goes into the memory, how it is stored there and how it is retrieved in case of need. In the theory of data processing, the process starts with receiving the stimulus coming from outside through sense organs, and goes on with describing and storing of these stimuli. This stored information can be retrieved and used when necessary. This system is compared to computer systems and it is shown with a model expressed as the model of data processing (Schema 1).

Model of data processing is composed of three main elements such as (1) information stores, (2) cognitive processes and (3) executive cognition. Information stores is the first element of data processing model and refers to the places where information is stored. It is composed of three different types of memory such as (1) sensory record, (2) short-term memory (processor) and (3) long term memory. These are the steps of data processing at the same time. The stimuli received from around firstly go into sensory memory through sensory organs. Then, the raw information here is transferred to processor memory with the help of attention and perception. In the processor memory, raw information is made sense by means of thinking over them and uniting them with the information in the long-term memory. Here, information is turned into behaviour or transferred to long-term memory in order to keep by means of meaningful coding. Long-term memory is the data store where information is continually stored. It has got three different parts where different types of information are kept such as (1) semantic memory, (2) recollectional memory and (3) operational memory. Semantic memory mostly stores verbal information (concepts, principles, generalizations) while recollectional memory records events, phenomenon, time and places that have a shocking or deep effect. Operational memory is part of the memory, which stores types of skills, ordinal, applied, and methodological information. The second element of data processing model is Cognitive Processes. Cognitive processes are mental activities that help information to transfer from one memory to another. These are composed of processes such as attention, perception, repetition, coding and retrieving. In the cognitive process, the information, which is wished to be learnt, is chosen by means of attention as stimulus or raw information among other information, and it is turned into meaningful information through perception. Those pieces of information that are wished to kept forever are transferred from processor memory to long term memory by means of repetition. Through coding which means formation of mental symbols of information, information is transferred to long-term memory and stored there. When information is wished to be used again, process of retrieving (remembering) comes foreground, and the wanted information is looked for and found among the information stored in the long term memory and then it is transferred to processor memory for use. Learning individual does this sometimes intentionally and sometimes automatically. Forgetting as opposed to retrieving or remembering means eliminating information from the memory or not being able to retrieve it. The third element of data processing model is composed of executive processes called cognition information or executive cognition. Executive cognition maintains that information stores and cognitive processes to operate in harmony in data processing. Executive cognition has an individual quality, and the learning individual controls and directs cognitive processes.
called as attention, perception, and repetition coding and retrieving with his/her own cognition information.

Graph 1: Information Processing Model

**Information Stores**

**Sensory Record**
The first step of gaining information and the first unit of memory system is sensory record. An individual is always under the effect of stimuli coming from around. An individual is exposed to a lot of information at one time by means of seeing, hearing, touching, tasting and smelling. For example, a student in class is under the effect of thousands of stimuli such as the sunlight coming through the window, the teacher’s voice, reflection of data show, colour of the wall, the hardness of the desk she/he is sitting on, whispers of friends, hunger, etc. However, among the endless stimuli coming into sensory record, a few ones, which attract attention, which comply with the expectations and aims of the student, are chosen and sent to short term memory; others are lost. Although the capacity of sensory record is limitless, the stimuli coming here can stay here only for a few seconds (0.5-3 sec.). For example, when an picture is passed in front of the eyes quickly, its sign stays in the eyes for a second, or when a fly touches on cheek, it is felt at the very moment. These examples show that stimuli go into sensory record and the process takes place for half of a second. The presence of sensory record is of critical importance for human life. If a person forgot the first words of a sentence she/he was reading or hearing before it is completed, it would not be possible to make sense of this sentence. The information included in sensory record is exactly the same as the stimulus going into the record. Visual senses are coded as photograph and audio senses are coded as voice just for a few seconds. Stimuli need to be transferred to short term memory by means of the processes of attention and perception in order to be conscious and meaningful pieces.

**Short Term Memory**
The information chosen through the processes of attention and perception among the sensory record goes into the short memory, which is the second element of the system. Short-term memory, which is also called as processor memory or active memory, is the memory where limited amount of
information is stored temporarily for a limited time. Both the duration of time and capacity to keep information are limited. Short-term memory can keep about 7(+/−2) units of information (letter, number, shape, sentence, photograph, etc.) for about 20-30 seconds. Short-term memory is in contact both with sensory record and long-term memory. The information coming to short-term memory is either filtered, organized and turned into behaviour to be used or is stored in the long-term memory by means of relating to the current information and coding. Information should be repeated to stay in the processor memory for a while. Moreover, it is important to use some strategies such as repetition, memorization, making sense, associating and grouping to increase the capacity of short-term memory.

Long Term Memory
Long-term memory is the place where new information coming from short-term memory is united with the previous information and stored. Abbot defines long term memory as a more permanent store where information can stay asleep, out of conscious and without being used until it is called back to the conscious. The information processed in short-term memory is sent here to be kept for a long time. So, this can be compared to a library. The limits of long-term memory are not certain. The duration of time when information is kept here is very long. Information, which is active, in short term memory stay passively in long term memory and a certain time should pass for this information to be remembered. Information is retrieved from long-term memory sometimes intentionally and sometimes automatically when necessary. However, the problem here is to use the correct information when necessary. If information is not coded and located appropriately, there may arise difficulties in retrieving.

Tulving (1993) divides long term memory into three: these are (1) Semantic memory (2) Episodic memory and (3) Procedural memory. Tulving is the one who first pointed the difference between episodic memory and semantic memory while all the discussions about the topic consider these two different types. Today, many researchers unite them in a more comprehensive category and call it as declarative memory. Some other researchers have defined extra memory types. For example, Abbot uses declarative and procedural memories. Huitt adds imaginary memory to this list. However, Pylyshyn states that imaginary memory does not have a different structure of organization, but it is subject to the rules applied to semantic and episodic memories.

Semantic Memory: It is the place where information gained through experience is stored. Concepts, phenomena, rules and generalizations of subject areas are stored here. In semantic memory, pieces of information are connected to each other as verbal and visual networks. A pattern is formed for each concept and process, and a relation is established with current patterns. The ways included in the mind map are followed in order to reach the information in semantic memory and any of the many ways can be chosen to reach the same information. According to Anderson (1985), the more connections there are among the concepts in a concept network, the easier it is to reach the related information since if one cannot reach the information through a way, another way can be used. Thus, it gets more understandable that not information but the ways to reach this information are stored in long-term memory. The better a mind map is organized and the more meaningfully it is built, the stonger memory gets.

Episodic Memory: Episodic memory is composed of memories that give the sense of remembering real situations and events. It is the place where personal experiences are stored. Information in the episodic memory is stored as images organized according to when they were formed and where they occurred. According to Paivio, image is defined as structure of memory that collects and store information about pictures. It catches information just like a photograph and it can also be very useful in terms of visual presentation and context of the information. Important events such as festivals, military service days, the day when one hears the news that she/he passes university entrance exam, the first day at work, marriage, etc. are remembered easily while it is difficult to remember ordinary events that are repeated continually since new events can spoil the previous ones.
Procedural Memory: It is the memory where information and processes about how a job can be done are stored. Formation of procedural memory takes a long time, but once it is formed, its quality of being permanent and remembered is very likely to be seen. For example, learning how to drive a car takes a long time, it requires many steps of processes, but it is almost impossible to forget it. The more a process is repeated, the more likely it is to turn into a natural reaction.

Cognitive Processes

Attention: It is the power to focus on a certain stimulus and it constitutes the focal point of conscious. In other words, it is a kind of heading in order to response to stimuli. Suthers defines attention as the limitations about perceptual process and producing answers. Data processing starts with attention. Stimuli coming from outside come into sensory record first of all and here the stimulus is sent to short term memory and kept without making any changes, as it is taken from outside. Stimuli towards which attention does not head are lost. Namely, attention determines which information will pass to short time memory and which will not. Individuals have the capacity of directing their cognitive strengths towards certain resources of information in the environment. In other words, selective attention is under the control of the individual and efficient learning depends on the selective ability of the individual.

Perception: It can be defined as the process of describing the stimuli received through sensory organs or the process of turning sensory signals into meaningful experiences. In the process of perception, what stimulus is decided? As each individual has his/her own way of organizing the received signals, their perception of the signals also differs. An individual can pass just the information she/he can perceive among the environmental stimuli coming into sensory memory.

Repetition: Information is stored through repetition in order to stay in short term memory longer. The reason why duration of keeping is longer is that coding is carried out and information is not lost before being sent to long-term memory. Stimulus or stimuli should head towards reaction. Perception has an active and selective quality, and an individual’s perception of a certain stimulus or stimuli’s situations is based on efficient preparation and directions.

Coding: Most of the information coming from around is stored temporarily without coding. Coding is the transfer of information by means of relating the information in long-term memory to the information in short-term memory. The individual to be sent to long-term memory should code information meaningfully. Each individual carries out coding in the most meaningful way according to him or her. There are four basic elements in enriching the process of coding by means of increasing the meaningfulness of information: Efficiency, organization, articulation, and memory supporting clues.

Storing: Anderson and Bower suggested an important model in order to explain how accumulated information is stored. This model is based on the idea that information is established on verbal units including structures of subject and verb rather than perceptions. Information is stored in long-term memory. However, during the process of storing, information is stored in the appropriate part among episodic, semantic and procedural memories. Thus, the process of retrieving is carried out correctly.

Retrieving: It is looking for, finding and activating the information stored in the long-term memory. What is important is to find out the clues that will retrieve the stored information in this process. According to Ashcraft, there is no real forgetting in long term memory. Forgetting is failure in retrieving.

Executive Cognition

Executive cognition is the information about cognition. Executive cognition is about learners’ skills to use learning strategies and handling the thinking types. In other words, it means that an individual is aware of the fact that his/her own cognition structure and learning qualities are different. A student with executive cognition is aware of his/her own way of thinking, she/he does not focus on just learning the material while deciding how to study, she/he is also aware of his/her cognitive
weaknesses and strengths. The process of executive control explains the answers of the questions why some individuals learn and remember what they have learnt more than others. Executive control is the name of the system that controls all the cognition processes of an individual. This system controls two basic aspects of learning. The first one is about motivational processes. Motivational processes are composed of situations that can be controlled by the individual consciously such as intending to get or aiming at getting something. The second one is composed of all the processes about data processing. It is claimed that executive cognition has two functions. One is implementing conditional information. For example, what is learnt at school is implemented at home. The next one is about evaluating and executing the process of thinking. Individuals differ in terms of executive cognition and this difference is about developmental process (biological differences and differences of experiences). Executive cognitive abilities start to develop at 5-7 years and continue to develop in school years. In this process, teaching is more efficient than maturation. These are the important points in terms of data processing:

1. Changes of brain occur by means of biological maturation or experience;
2. Increasing process capacity, speed and efficiency are each a result of maturation and information development;
3. Changes of connection occur in nerve networks;
4. Concepts that come out without organizing itself and repeated are a result of the adaption to changing environment;
5. Problem solving and metacognitive capacities increase.

SUMMARY

- Pedagogues mostly classify three basic approaches while dealing with learning theories. These are Behaviorist Approach, Cognitive Approach and Constructivism.
- It is impossible to make an explanation independently from behaviorist approach while dealing with cognitive approach or independently from cognitive approach while dealing with constructivist approach.
- Latent learning theory was developed by Edward Chance Tolman (1886-1959).
- Tolman claimed that learning occurred through complex mental processes, not through simple mechanistic conditioning processes.
- The term of “cognitive maps” used by Tolman in order to explain the learning behaviours of an animal in a maze expresses that the animal establishes a schema of spatial relations, a cognitive map related to objects’ places rather than chain of a simple stimulus-response.
- One of the most important features of human and animal behaviours that attract attention is that behaviour is goal-oriented.
- Tolman defended molar behaviorism as opposed to Watson’s molecular behaviorism.
- According to Tolman’s theory, extinction takes place mostly because of the changes in the expectations.
- Tolman addresses the variables of learning in two groups, which are environmental, and individual difference variables.
- Discovery learning is accepted to be a natural part of human beings. People are born with an innate curiosity and this curiosity pushes them to learn.
- The founder of The Theory of Meaningful Verbal Learning is David Ausubel (1918-2008).
- Ausubel, who dealt with the structure of meaning, believes that external world can make sense only if it is turned into learner's conscious content.
- According to Ausubel, the student does not need to discover for a meaningful learning, students receive the information as a ready from rather than discovering it. Because of this reason, students should be prepared to receive the information organized by the teacher.
- In meaningful learning, lesson plan goes from the whole to the part, namely, in a deductive way. In each step, it is essential for the student to relate and re-organize what has been learnt.
- In Ausubel’s approach of meaningful learning, organizers play an important role.
- Gestalt psychology, founded by Wertheimer, Koffka and Köhler, is a reaction to behaviorism, which reduced experiences to simple stimulus-response reflections, and a reaction to
constructivist perception theories, and reduced experiences to pieces, which were defended by Wundt and Titchener.

- Gestalt theory states that an individual evaluates stimuli coming from outer world as a gestalt rather than receiving them by means of isolating: “The whole is greater than the sum of the parts.”
- Theory of data processing is a theory that has been put forth by George A. Miller (1920-) grounding on Edward C. Tolman’s (1886-1959) sign and latent learning theories, that claims that learning is a complex and internal process occurring with some mental processes, and that is based on cognitive approach.
- Theory of data processing accepts information as the basic means of learning and explains learning in terms of memory system.
- It focuses on how information goes into the memory, how it is stored there and how it is retrieved in case of need.
- Model of data processing is composed of three main elements such as (1) information stores, (2) cognitive processes and (3) executive cognition. Information stores is the first element of data processing model and refers to the places where information is stored. It is composed of three different types of memory such as (1) sensory record, (2) short-term memory (processor) and (3) long term memory.
- Cognitive processes are mental activities that help information to transfer from one memory to another. These are composed of processes such as attention, perception, repetition, coding and retrieving.
- Executive cognition maintains that information stores and cognitive processes process holistically in data processing. Executive cognition is individual and the learner controls and directs cognitive processes such as attention, perception, repetition, coding and retrieving with his/her current cognition information.

REFERENCES

74. Ashcraft, M., (1989) Human Memory and Cognition, Glenview, IL; Scott, Foresman
CHAPTER 4: SOCIAL LEARNING THEORY (SOCIAL COGNITIVE THEORY)

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INTRODUCTION TO SOCIAL LEARNING THEORY

A lot of various theories have been suggested throughout history. Some of them are grouped under the heading of behaviorist learning theories while some others are grouped under cognitive learning theories. Social Learning Theory is accepted to be one of the Cognitive Dominant Behaviorist Theories because it has some qualities that overlap with behaviorist theories as well as some cognitive qualities.

The idea that an individual shapes his/her own behaviours by means of observing others’ behaviours dates back to Plato and Aristotle. One of the names that draws attention to this point is John Dewey. Dewey, whose school as accepted to be a small society, defended the idea that students were learning from each other while they were growing up. On the other hand, Russian theorist Lev Vygotsky was also interested in social learning and drew attention to the point through the term of “zone of proximal development” that learning could be realized under the guidance of teachers and in a social environment.

Psychologists that studied experimentally the idea that learning could be realized in a social environment are Thorndike, Miller, Dollard and Watson. Thorndike, Watson, Miller and Dollard are famous for their various experiments they carried out about the idea that learning could be realized by means of observation. Thorndike and Watson are known to fail in these studies. On the other hand, Miller and Dollard’s opinions on this subject are significant.

According to Miller and Dollard, what is necessary for observational learning is composed of observation, response based on observation and reinforcement for the said response. In short, behaviours that are displayed by means of taking someone as a model are strengthened when they are reinforced. In addition to this, although Julian Rotter also had very important studies about putting forward and developing this theory, the name that first comes to mind when Social Learning Theory is mentioned is Albert Bandura.

SOCIAL LEARNING THEORY (SOCIAL COGNITIVE THEORY)

In 1947, some concepts such as observational learning were taken one step ahead with the name of “Social Learning Theory” by Julian Rotter. Rotter objected to the strict rules of behaviorism and stated that experiences of an individual might be influential on the behaviours of another individual; however Rotter also added that external stimuli and reinforcers might also affect behaviours. Besides, Rotter stated that the direction and level of this influence could be determined just by cognitive factors. Rotter, who was interested in the reinforcement and its influence as well as its source, put emphasis on the term of focus of control and divided it into two: Internal Focus of Control and External Focus of Control. Rotter explained Internal Focus of Control with the idea that an individual would see himself/herself as the source of reinforcement and External Focus of Control with the idea that an individual would see some powers other than himself/herself as the source of reinforcement.

When some of the students who just leave the exam class say that they could not do well in the exam by means of using some expressions such as “I didn’t study, I didn’t read the questions carefully, I don’t like and understand this lesson, etc.”, the source of their reasons is themselves. They believe
that the result can change when they change something and they take the responsibility of their behaviour. On the other hand, some other students put forth some excuses such as “the questions were difficult, the teacher intentionally chose to ask questions about the points we don’t know, it was too hot/cold, it was too noisy, they prevented me to concentrate, etc.” and when the source of these excuses are studied, it is obvious that the individual talks about a factor apart from himself/herself.

These individuals who relate the reason of their behaviours to luck and who do not take responsibility of their own performance have difficulty in achieving a goal.

Bandura and Walters, who resumed on the studies of Miller and Dollard besides Rotter’s studies, also dealt with the subject of learning through observation and imitation. According to Miller and Dollard, imitations can turn into habits. On the other hand, they call the tendency to imitate others’ behaviours to be reinforced as generalized imitation. In the light of this information, we can say that Dollard and Miller tried to explain the behaviours acquired through imitation just by means of operant conditioning without considering cognitive processes.

On the other hand, Bandura defends the idea that the concepts such as “imitation, observation and taking as a model” are the fundamental concepts in learning. However, imitation is just one aspect of observational learning.

For example; if a teacher smiles at the words or behaviour of one of the students; other students in class also smile together with the teacher they even begin to laugh. Children will display the behaviour of laughing when they come across the same situation in class or anywhere else.

Everything learnt through observation do not have to be imitation. In other words, observation learning is not a simple process of imitating. What is important here is the results of the observed behaviour. Cognitive elements are also involved and an individual receive and process his/her observations as mental data. In this case, learning can also be realized without imitation.

For example; a driver who sees that another driver who does not stop at red light gets a fine may avoid the said behaviour; as is seen in this example, the observer tries to avoid the observed behaviour rather than imitating it. Another example can be a student who sees that one of his/her friends is caught while cheating in the exam. This student will try to answer the questions without teaching in order to avoid such a difficult situation. In this example, the student observes that cheating is a behaviour that will create bad results and prefers not to imitate this behaviour. Another student who sees that one of his/her friends is always rewarded for his/her academic success knows that he/she should give importance to the activities of studying in order to get such rewards, however he/she may not display any effort about this. Here, the student learns through observation but does not imitate the model.

According to Social Learning Theory, behaviours and feelings may change through observation and taking someone as a model. Most of a person’s behaviours are shaped by means of observing others, seeing about their ideas and the guidance effect of these ideas. In order to prove this, Bandura carried out experiments with three groups of children.

In an experiment, Bandura divided a group of children (half of them are girl and while the other half are boys) into three groups so that each group has the same number of children. The children in the first group watch a film in which the reinforced adult model hits and beats quite a big doll and is aggressive; the children in the second group watch a film in which the aggressive model is punished; and the children in the third group watch a film in which the aggressive model is neither reinforced nor punished. Then, the children in all three groups are given a doll similar to the one in the films and their level of aggressiveness towards the doll is measured. According to the findings, the children who watched the model whose aggressive behaviours are reinforced have the highest level of aggression; the children who watched the model whose aggressive behaviours are punished have the lowest level of aggression; the children who watched the model whose aggressive behaviours are neither reinforced nor punished have an intermediate level of aggression between the two groups. The findings of this
experiment prove the difference between learning and performance while it is also very important in that an individual’s behaviours are influenced by others’ experiences.

Through this experiment, Bandura concludes that media, especially television is very influential in learning, that a child learns behaviours such as aggressiveness, facileness and sharing. Children can take the characters they watch on TV and thus learn desirable and undesirable behaviours and transfer them into their lives. Moreover, generations and the culture of the time also influence behaviours. This experiment carried out by Bandura is very famous in the field of psychology and is given as an example many times.

Bandura states that it is very difficult to learn how to drive through Skinner’s operant conditioning model. Formation has a slow pace and the relations between the steps are established with difficulty. Bandura claims that watching and imitating an experienced driver makes it faster to learn how to drive. Bandura thinks that taking someone as a model is a more sophisticated behaviour than just simply imitating and he prefers the term of taking as model rather than imitating.

There are some similarities between behaviorism and Social Learning Theory coming to the fore with Bandura who criticized Behaviorist Theory in many ways. These similarities are as stated below:
1. Experience is important in both of these theories.
2. Reinforcement and punishment are used in the development of learning in both of these theories. Feedback is important in the development of learning in both of these theories.

On the other hand, Social Learning Theory criticizes Behaviorist Approach in terms of three main points:
1. Behaviorist approach does not represent learnings that are realized in natural environments. In other words, terminal behaviours do not need to be rewarded often.
2. Behaviorist approach cannot explain how the first reactions are acquired. In fact, much behaviour is displayed without reinforcement.
3. Behaviorist approach is interested in just direct learnings, namely, situations where results are immediately observed while it is not interested in indirect learning. In fact, it is known that a lot of learnings occur indirectly in real life.

In line with these criticisms, there are three significant differences in social learning theory:
1. A behavior is learnt, but may not be displayed immediately. A behaviour acquired through observation does not need to be displayed at once, the acquired behaviour may be displayed some time later. This situation can be explained through the terms of learning and performance.
2. Learning is not always based on the reinforcer given to the individual who takes someone as a model.
3. Human being is not a passive and simple organism that reacts to stimulus.

In this context, this theory makes use of both behaviorist logic and the concepts of cognitive theories. Because of this reason, Social Learning Theory has passed into the history of education as Cognitive Dominant Behaviorist Theory.

A substantial portion of human behaviours is learnt through observing other individuals displaying the said behaviours. Albert Bandura is the first psychologist who addressed the observational learning as a systematic whole. Bandura presented to the world of science the systematic on which he was studying with his work called Social Foundations of Thought and Action. He called this theory as Social Cognitive Theory in 1986 although he called it as Social Learning Theory (Social Behaviorism) at the very beginning.

The approach brought by Bandura to learning in early 1960s was social behaviorism. Bandura’s theory also has cognitive qualities besides being behaviorist. Although his theory is accepted to be a branch of behaviorist approach, it has a milder structure. In other words, social learning theory is some kind
of a mediating theory. There is a mediating mechanism between stimulus and response, and this mechanism is the cognitive process of an individual. Thinking processes are thought to be influential on reinforcements resulting from external reasons.

For example, according to Social Learning Theory, individuals learn gender identity roles primarily by means of observing and imitating parents; however, they evaluate these role models in line with their own values and shape them according to their own thinking processes.

Social Learning Theory, which is also called "social cognitive theory," "observational learning," and "learning through taking someone as a model", is a theory that emphasized the ability of learning through instructions or observing the behaviour(s) of a chosen model without needing the direct experience of the individual. This theory is also defined as "social learning" as it plays an important role in learning social behaviours and rules, it is also accepted to be a theory that is constituted by means of integrating cognitive learning theory and analytical behaviorist theory.

For example: a child who kisses his/her grandfather's hand at a festival gets pocket money. His/her sibling displays the same behaviour when she/he sees him/her. In this example, this behaviour, which is accepted by the society, is maintained to be repeated through observation.

According to social learning theory, individuals who observe the experiences and results of these experiences belonging to other individuals enter an emotional conditioning and they themselves display the same behaviours in similar situations. While learning through observing positive and negative results of other individuals' behaviours saves time and energy for the learner, it also protects the individual from possible threats. For example, this kind of learning protects a person who observes his/her friend driving too fast and having an accident and being injured protects this person from the risk of having an accident.

Bandura explains in this theory not only the general principles of learning and modeling but also many concepts and processes included in the psychology (development, making decision, self-sufficiency and social processes, etc.). According to Bandura, human behaviours are explained not only through forming by reinforcement but also through mutual interaction of cognitive, behavioral, and environmental factors. An individual can learn behaviour by means of taking someone who displays this behaviour as a model. This is called observational learning or imitation. Behaviour affects both the environment and mental and personal factors (individual); mental and personal factors (individual) affect environment and behaviour; environment affects the formation of behaviour through mental and personal factors (individual). Social learning theory includes values, external expectations and personal wishes.

**FUNDAMENTAL CONCEPTS IN SOCIAL LEARNING THEORY**

Learning occurs in three different ways in social learning theory, which is a theory that grounds on interpersonal social communication. These are observational learning, learning through modeling and indirect learning.

**Observational Learning**

Social Learning Theory claims that different strategies are necessary for learning. According to Bandura, an individual who observes learns five different things from the model:

1. New cognitive abilities and new psycho-motor skills
2. Strengthening or weakening previously-learnt prohibitions
3. Social motivators, new values, beliefs
4. How environment and goods will be used
5. The method of expressing feelings
These products that are learnt through observation require a certain process. Since learning does not occur suddenly, observational learning is composed of four consecutive important processes. These are processes of paying attention, retention, creating behaviour and motivation.

a. **The Process of Paying Attention**: If the individual does not pay attention to the activities she/he will take as a model and perceive correctly, observational learning does not occur. According to Social Learning Theory, three basic factors that affect learning in this process are the qualities of the observer, the qualities of the observed model and the qualities of the observed behaviour. The process of paying attention is affected by physical qualities of the perceiver (the capacity of perceiving, state of tendency, preference and emotional state), purpose of the observer, past reinforcement experiences; functional value of the model (simple, clear, interesting and functional); the qualities of the model such as age, gender, character, similarity and status. These qualities will be explained in the following pages.

*b. Process of Retention*: The process of retention is also called “the process of bearing in mind.” Making use of the information acquired through observation requires remembering this information. The observed information is symbolized and coded and then kept in memory. While coding may be limited to the observed behaviour, it may also include why, how and when behaviour is displayed. According to Bandura, most of the cognitive processes that organize behaviour are mostly verbal rather than visual. Fictitiously and verbally stored information should be repeated mentally or implemented after observation.

*c. Process of Creating Behaviour*: This step determines turning what is learnt into performance. It is necessary for the individual to have appropriate physical and psychomotor qualities and the individual should possess enough wish, belief of success and self-sufficiency capacity in order to have cognitive learning turn into behaviour. It is necessary to do the behaviour mentally at first, and mistakes should be corrected if there is any. This process should continue until behaviour gets similar to the model’s behaviour.

*d. Process of Motivation*: Motivation is a process that helps what is learnt to turn into performance. At the end of the observed behaviour, the reaction given to the individual who is taken as a model is also influential in the observing individual’s decision making about displaying the same behaviour or not. If the individual who is taken as a model is rewarded at the end of the observed behaviour, this motivates the individual who is observing. However, if the observed behaviour damages or results in punishment, observing individual avoids this behaviour. According to Bandura, reinforcement has two significant functions. These functions are:

For example, the fact that a group of people who have witnessed the same accident give different details while telling the accident later proves that how much difference there is between the details paid attention by the witnesses and how much difference there may be between the things different people pay attention to. Another example is that students may perceive an example told by the teacher in different ways and when they are asked to perceive what they have perceived through examples, the examples may be different.

For example, a group of people who have witnessed the same accident give different details while telling the accident later proves that how much difference there is between the details paid attention by the witnesses and how much difference there may be between the things different people pay attention to. Another example is that students may perceive an example told by the teacher in different ways and when they are asked to perceive what they have perceived through examples, the examples may be different.

For example, a person who witnesses a traffic accident code the information such as what the people involved in the accident say, how they behave, who caused the accident and then remember this information later. Another example is that a child who watches his/her mother cooking codes how the mother cooks and at another time, remembers how his/her mother cooks and tries to cook himself/herself.

For example, a child who does not know how to ride a bike observed the model behaviour repeats what she/he learnt through observation in line with the model and similar to it at first and then rehearses. Another example is that a student who is expected to make a presentation in a lesson plans and repeats what she/he should do in the presentation in his/her mind at first and then she/he makes the presentation.
1. Reinforcement causes the observing individual to expect that she/he will also be rewarded when she/he displays the behaviour of the model that is rewarded.

2. Reinforcement functions as an activator in turning what is learnt into performance.

There may be three different types of reinforcement and these are indirect reinforcement, external reinforcement and internal reinforcement.

**Indirect Reinforcement:** Observing results accompanied by others’ behaviours result in changes in the behaviours of the observer. The observer is both informed and motivated by the observed behaviour. If the model succeeds and is rewarded during the observed behaviour, the observing individual will imitate this behaviour more often and in a shorter time.

For example, a person who takes someone who attracts people around due to his/her perfume in a TV advert as a model would like to use the same perfume. In another example, when the teacher because of his/her positive behaviour rewards a student, other students are motivated to display the same behaviour. For example, when the younger sibling sees that his/her elder sister is rewarded with a bike because of good marks in her paper, he/she is motivated to have an expectation to have his/her wishes realized by means of having good marks as well.

**External Reinforcement:** It means that an individual displays the expected behaviour as a result of being rewarded or appreciated by people around him/her. The individual reinforces his/her behaviour through positive and negative reactions received from around as a result of his/her behaviours and she/he is motivated.

**Internal Reinforcement:** It means that an individual motivates himself/herself internally. When an individual achieves his/her goal or comes across a negative situation, he/she motivates himself/herself by means of reinforcing internally.

In social learning, internal reinforcement plays an important role. Internal reinforcers are the ones such as personal satisfaction, sense of comfortability, enjoying, liking, pride. As is mentioned in reactional conditioning; this situation can be given as an example for internal reinforcement and reinforcer.

A child who hits one of his/her friends in nursery school ignores the punishment of sitting given by the teacher, and feels relaxed by means of saying; “Ohh, I don’t regret hitting him. He made fun of me. I gave him the right punishment.” The sense of relaxation experienced by the child is internal reinforcement. Saying “Oh, I don’t regret hitting. He made fun of me.” is internal reinforcer.

Bandura believes that especially internal reinforcement through which the individual motivates himself/herself is more important in motivation. Moreover, Bandura claims that reinforcement or rewarding has two functions. These cause observing individuals to have an expectation and imitation.

**Learning Through Modeling**

Individuals take people who look like themselves as a model in order to learn behaviours and they observe how they do different behaviours. Observer’s capacity of perception, level of readiness, cognitive structure and skills, tendencies and physical capacities are important in this process. However, not everyone does the all the behaviours they observe. This is because of the interaction between the model and observer, and this interaction depends on some basic features of individuals. These are age, gender, character, similarity and status.

1. **Age:** Individuals tend to take people who are at the same age as or older than them as a model.
   - In general, younger individuals are not preferred to be taken as a model.

2. **Gender:** Another tendency of individuals is to take someone who is the same gender as themselves as a model rather than modeling people who are different gender.
3. **Character**: Individuals tend to take people who have a good position in the society or who have proved themselves in a way as a model. Skillful, successful or prestigious individuals are taken as a model more than others.

4. **Similarity**: People tend to take individuals who have similarities with themselves as a model. They find these people who have common features with themselves more suitable for themselves. Especially age and gender are related to this feature.

5. **Status**: The status of the model has a great influence on whether this person will be taken as a model or not. A person with a high status is more likely to be taken as a model than a person with a low status. In schools, it is very common that especially teachers or students who are popular and have a spirit of being a leader and who are good at sports and other activities are taken as a model.

According to the status of the model, the level of modeling the observed behaviour differs:

<table>
<thead>
<tr>
<th>Features of the model</th>
<th>Behaviour observed in the model</th>
<th>Level of being taken as a model</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>High status</td>
<td>Results of the behaviour are not known clearly</td>
<td>High</td>
<td>Famous people</td>
</tr>
<tr>
<td>Equal status</td>
<td>Positive</td>
<td>High</td>
<td>A student who is good at sports among peers</td>
</tr>
<tr>
<td>Equal status</td>
<td>Positive</td>
<td>Low</td>
<td>A student who is punished because of being lazy among peers</td>
</tr>
<tr>
<td>Low status</td>
<td>Positive</td>
<td>Low</td>
<td>A student in the younger class who is rewarded because of being successful</td>
</tr>
<tr>
<td>Low status</td>
<td>Negative</td>
<td>Low</td>
<td>Younger sibling who is complian by the motor because of being naughty</td>
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**Types of Taking as a Model**

Individuals are influenced by various people and words, take them as a model and include them in their lives throughout their lives from childhood to old ages. In this context, there are three types of modeling:

1. **Live Models**: These are people who are around the individual. This group is composed of individuals who the individual communicates with in daily lives such as parents, siblings, relatives, neighbours and friends.

2. **Symbolic Models**: These are famous people who are known, read and seen through films, songs, television and books. This group is composed of individuals such as famous sportsmen, singers, and presenters of TV programs, artists, film or novel characters and actors.

3. **Verbal Instructions**: These are instructions often used in society and verbally common rather than another individual who can be modeled by the individual. “Girls should not look directly,” “customer is always right,” “men do not cry,” “girls should stay at home” and such other instructors are included in this group.

**Functions of Taking as a Model**

Functions of taking as a model are explained in three different ways. These are reaction facilitation, abstention/non-abstention and observational learning. Observational learning has been explained in detail in the previous pages, so in this part, reaction facilitation and abstention/non-abstention will be explained here.
**Reaction Facilitation:** It means facilitating the formation of a behaviour known by the observer previously through the behaviour of the individual who is taken as a model. Although the behaviour displayed by the person who is taken as a model ensures a new learning for the observer, if the observer repeats this behaviour, this is called reaction facilitation.

For example, if you start to look for something in the street, after a short time, you can see some others who are looking for something in the street together with you. Likewise, when a person starts to applaud in crowd, others will also start to applaud.

**Abstention/Non-abstention:** As a result of the behaviour of the person who is observed, there may arise an effect of abstention or non-abstention related to the learnt behaviour realized through observation. The effect of abstention can be defined as the fact that the observer abstains from displaying certain behaviour because there is punishment at the end of the behaviour. Non-abstention states, on the other hand, that the observer do not abstain from certain behaviour and tends to display it unless there is a negative result of this observed behaviour.

For example, when a little child goes to his mother and asks the same questions for many times, and the mother replies him with a smile all the time and explain the answer, the child will display this behaviour again later and this creates and effect of non-abstention. In his case, the child goes on asking questions and thus learning occurs. However, when the same child goes to his father and asks questions for many times and the father reprimands him, the boy will abstain from asking any more questions to his father and this results in the effect of abstention. This means that the boy will give up asking questions and so learning does not occur.

**Products Gained Through Modeling**

According to Bandura, an individual who observes gains three different products from the model:

1. He learns new cognitive and psychomotor skills.
2. He learns social norms and prohibitions.
3. He gains new values and beliefs.
4. He learns the ways to make use of the environment and goods.
5. He develops methods of expressing his feelings.

**Learning Through Indirect Ways**

Social learning comprises indirect learning, in other ways, learning through a model. That social learning is indirect means that learning processes, in other words, experiences are also indirect. In social learning theory, indirect experiences are divided into two as indirect reinforcement, indirect punishment, indirect motivation and indirect sensuality.

**Indirect Reinforcement**

Reinforcement carries a meaning not only for the organism receiving the reinforcement but also for the organisms that observe this. Individuals who observe that a certain behaviour is reinforced are more likely to display same/similar behaviours. Individuals who observe that the behaviour of taking social responsibilities are rewarded may behave in the same way.

Studies have shown that individuals who observe a model whose behaviours are reinforced imitate the model’s behaviours more often and more frequently. When teachers reward a student for a positive behaviour, they should be aware of the fact that this act of rewarding is influential not only on the behaviours of the student whose behaviour is reinforced but also on the behaviours of the other students in class.

For example, it is indirect reinforcement that “Pelin comes to school with her new beret, she attracts all the attention, everyone tells her that her beret is very beautiful and fits her so well, and Selin, who watches this situation, also decides to buy the same beret.”
**Indirect Punishment**

Punishment has a meaning not only for the organism that receives the punishment but also for the organisms who watch that this behaviour is punished. Individuals who observe that a certain behaviour is punished are more unlikely to display this behaviour. When a student is punished because of a negative behaviour, not only the behaviour of the student who is punished is prohibited, other students are also prevented from doing the same action.

*For example, when a student is influenced by his friend’s situation that is caught cheating in the exam and so suspended from school, he avoids cheating in the exam. Likewise, individuals who observe that obscene language is punished avoid obscene language.*

On the other hand, it should be kept in mind that an aggressive and emotional punishment may also cause imitation of aggressiveness. An individual who observes that his friend’s driving license is seized because of not obeying traffic rules is careful about not making the same mistakes.

**Indirect Motivation**

When behaviour observed by an individual ends up with a valuable product, the individual wishes to display this behaviour. The individual capacity of the one who observes is influential on motivation.

*For example; giving certificate of excellence to a student in front of all other students at school motivate other students to get certificate of excellence. Students who see that one of their friends in class gets scholarship can try to get scholarship as well. A student who observes one of his friends getting a reward in a knowledge contest studying hard can understand how he should study in order to be successful.*

**Indirect Sensuality**

Most of the feelings are acquired through observation. People who are afraid of mice, cats, and snakes although they do not directly injure them are examples of this situation. A child who sees that his mother is afraid of mice can also be afraid of mice. The reason of such fears is observing models having similar experiences. The voice, mimes, cries, words of models give a lot of messages and an individual who observes the model may have similar fears. Bandura states that modeling has the power to change behaviour in social environment.

*For example, a child who watches that another child playing with a dog and being bitten by the dog can get scared of dogs.*

On the other hand, Bandura also states that behaviour can be re-learnt or changed through modeling. Behaviour has a quality which ensures it to be used at school, work and hospital, etc. that are a model of education.

*For example, in the case of a child who is scared of dogs, a gradually developing program can be implemented in order to eliminate fear of dogs by means of having the child watch a peer who is playing with a dog in the first phase. A child who starts the school may come to school with one of the parents, watch other children who stay in class alone and then get rid of the fear of being left alone in class.*

Bandura claims that children or adults may acquire behaviour by means of repeating it just by observing the behaviour of a model they choose or without receiving any reinforcement. In a study conducted by Bandura at a nursery school, children who are kept in a half-dark room are ensured to watch a short film. In the film, boxers fist and kick sandbag, which they use as a tool of training, shout "şokero" and throw balls to the sandbag. After the film finishes, children are left in the game room alone one by one and what they do is observed through a blind mirror. As a result, children are observed to display the behaviours they have watched as well as other aggressive behaviours they learnt before.
BASIC PRINCIPLES OF SOCIAL LEARNING THEORY

When Social Learning Theory is studied, there are some important principles. Bandura explains these principles under six headings, which are Mutual Decisiveness, Capacity of Symbolization, Capacity of Foresight, Capacity of Indirect Learning, Capacity of Self-Regulation and Capacity of Self-Judgement.

1. Mutual Decisiveness: Behaviour comes out as a result of the interaction between environment and individual. The first basic principles of Social Learning Theory are that the displayed behaviour, personal factors and effects of environment should be handled together, and these will constitute their own system. Reinforcers and punishments are already potentially present in the environment. However, behaviours of the individual determine their coming out. In the dilemma of environment-individual, the question of which is more influential is circumstantial.

For example; when a student displays an undesirable behaviour in class and affects his friends, this is the case that individual affects environment. However, when this student is influenced by positive behaviours of his friends and corrects his behaviours, this is the case that environment affects individual.

2. Capacity of Symbolization: Capacity of symbolization is also called as the capacity of symbolization. In short, capacity of symbolization means that individuals symbolize their whole life in their minds. Through these symbols, they can carry their past in their minds as well as they can test the possible events of future. The capacity of symbolization changes from person to person. Because of this reason, individuals who observe the same event may learn different things from what they observe. Bandura states that those individuals whose capacity of symbolization is high are more successful about social learning.

For example; the expression frequently used by people, “What you say is as meaningful as what the others understand from it,” is a result of symbolization.

3. Capacity of Foresight: Capacity of thinking or symbolic capacity is used in determining the future. Social Learning Theory requires the capacity of making plan for the future as well as using symbolic capacity. People should guess how people will treat them in the future, set their goals and plan their future. In short, since thinking comes before activity, people should think of the future.

For example; by the help of this quality which is a must especially for managers, a successful manager can predict the questions to be asked before the meeting, make the necessary preparations for these questions, and conduct the meeting successfully.

4. Capacity of Indirect Learning: Individuals, especially children observe the results of others’ behaviours or the results of these behaviours, and thus they learn. A part of an individual’s learning is composed of learning through being directly involved in the process, doing and living. In indirect learning, individual does not live the said process directly, they learn by means of watching, listening to reading about the people who have gone through this process. According to
Bandura, people have different levels of indirect learning capacity. While an individual learns behaviour as a result of a single observation, another individual may learnt the same behaviour as a result of two-three observations.

For example; when a friend of Ahmet’s, who always drives fast and carelessly, drives car the same as Ahmet and has an accident, Ahmet starts to drive slowly and carefully, while another driver, Hüseyin may start to drive slowly and carefully after three of his friends have an accident.

5. Capacity of Self-Regulation: One of the basic principles of Social Learning Theory is that people have the capacity of controlling, influencing and directing their own behaviours. People, themselves organize a lot of behaviours about how much they will talk, how much and when they will eat, the obligation to do homework. Although learning may occur by means of observing others, people themselves are responsible for their own behaviours. Self-regulation maintains that people adjust their behaviours to the rules they themselves set, and after displaying the behaviour, to review the behaviour to see if it is suitable or not and then decide if they will take it as a model or not.

For example; a student with a high level of self-regulation decides to do his homework first when he comes home, and then to play computer games for a limited period of time, and really implements his decision.

6. Capacity of Self-Judgement: It defines the fact that people can make personal judgements about themselves and model behaviour. Previous experiences and observations play an important role for the behaviour to see that they think or explain. People can do self-control and test the suitability and sufficiency of their thoughts through looking at the results of their behaviours. In other words, an individual who can make self-evaluation realize a more efficient learning by means of meeting deficiencies and correcting mistakes. This capacity is called self-sufficiency.

Self-Sufficiency: It is called self-judgement of an individual about organizing activities necessary for displaying a certain performance and doing this successfully. In short, it is the perception of sufficiency constituted by an individual about carrying out a certain action. According to Bandura, performance (behaviour) requires a certain sufficiency. The perception of self-sufficiency can be compose of these four basic factors:
1. Information gained by the individual as a result of his/her behaviours directly
2. Indirect experiences (Experiences of models resembling the observer)
3. Verbal persuasion (inspiration, encouragement, advice, suggestion)
4. Psychological situation (skill, belief, stress, anxiety)

SOCIAL LEARNING THEORY IN EDUCATION

According to social learning theory, the basic factors that affect learning are qualities of observer or the one who models, qualities of the individual who is observed or taken as a model, and the qualities of the behaviour which is observed or taken as a model. Because of this reason, the points stated below should be taken into consideration in order to be more successful in education and to ensure a more efficient education:
- Individuals can also realize learning indirectly, and the models that are observed are mostly prestigious, high-status and powerful people.
- Especially children imitate individuals who they take as a model. Because of this reason, the individuals who are taken as a model (teacher, parents) should display desirable behaviours in order to have children display desirable behaviours.
- Desirable behaviours should be reinforced in class and students should be made to notice that those students who display desirable behaviours are reinforced.
- It should be kept in mind that behaviours rather than words are influential in modeling; there should be consistency between words and behaviours.
- Aggressive behaviours can be easily and quickly acquired through modeling.
Especially the social and physical atmosphere of the class should be organized in a way that desirable behaviours attract attention while undesirable behaviours are avoided.

According to social learning theory, verbal symbols are used in individuals’ keeping in mind process. Because of this reason, activities that pay attention to verbal skills should be included in the lesson.

Students should not be expected to display performance about their skills and when this occurs, it should be kept in mind that this performance is temporary since it results from obligation, coercion, etc.

According to social learning theory, internal reinforcers are more influential than external reinforcers. Because of this reason, students should be supported and maintained to motivate themselves.

Self-sufficiency plays an important role in an individual’s self-trust and displaying desirable behaviour. So, teachers are expected to increase students’ level of self-sufficiency and thus help them.

**SUMMARY**

- Social Learning Theory is accepted to be one of the Cognitive Dominant Behaviorist Theories because it has some qualities that overlap with behaviorist theories as well as some cognitive qualities.
- Although concepts such as learning through modeling and observation were first put forth by Julian Rotter with the name of “Social Learning Theory,” the name that first comes to mind when Social Learning Theory is mentioned is Albert Bandura.
- Bandura claims the idea that concepts of “imitation, observation and modeling” are basic concepts in learning. However, cognitive processes are also included in the process, and the individual receives and processes his observations as mental information. In this case, learning can also occur without imitation.
- There are some similarities between behaviorism and Social Learning Theory coming to the fore with Bandura who criticized Behaviorist Theory in many ways.
- Social Learning Theory criticizes Behaviorist Approach in terms of three main points.
- There are three significant differences in social learning theory in line with this criticism.
- According to Bandura, human behaviours are explained not only through forming by reinforcement but also through mutual interaction of cognitive, behavioral and environmental factors.
- Learning occurs in three different ways in social learning theory, which is a theory that grounds on interpersonal social communication. These are observational learning, learning through modeling and indirect learning.
- These products that are learnt through observation require a certain process. Since learning does not occur suddenly, observational learning is composed of four consecutive important processes. These are processes of paying attention, retention, creating behaviour and motivation.
- There may be three different types of reinforcement and these are indirect reinforcement, external reinforcement and internal reinforcement.
- Individuals take people who look like themselves as a model in order to learn behaviours and they observe how they do different behaviours. This interaction that takes place during this observation depends on some basic features of individuals. These are age, gender, character, similarity and status.
- Individuals are influenced by various people and words, take them as a model and include them in their lives throughout their lives from childhood to old ages. In this context, there are three types of modeling which are live models, symbolic models, and verbal instructions.
- Bandura explains functions of taking as a model in three different ways, which are reaction facilitation, abstention/non-abstention and observational learning.
- In social learning theory, indirect experiences are divided into two as indirect reinforcement, indirect punishment, indirect motivation and indirect sensuality.
- When Social Learning Theory is studied, there are some important principles. Bandura explains these principles under six headings, which are Mutual Decisiveness, Capacity of Symbolization,
LEARNING AND TEACHING : THEORIES, APPROACHES AND MODELS

Capacity of Foresight, Capacity of Indirect Learning, Capacity of Self-Regulation and Capacity of Self-Judgement.

- According to social learning theory, the basic factors that affect learning are qualities of observer or the one who models, qualities of the individual who is observed or taken as a model, and the qualities of the behaviour which is observed or taken as a model.

REFERENCES

34. Çelen, N. (1999). Mentioned Source
CHAPTER 5: ANCHOR LEARNING

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WHAT DOES ANCHOR LEARNING MEAN?

The Group of Vanderbilt Cognition and Technology (CTGV) first developed anchor learning in 1990 under the leadership of John Bransford. Although many people have been contributing to the theory and research of anchor learning, the leader of this theory is Bransford. Anchor learning, one of the application models of constructivist approach, is a learning approach, which prescribes that all learning activities should be organized around a story, problem or case that is called anchor. This approach also provides the students with the opportunity to apply the information they have gained on different real life cases and thus serves as a bridge between school life and real life. The materials within the border of programmes basing on anchor learning are generally technology-based and they contribute to students’ success in a positive manner.

ANCHOR

Lexical meaning of the word ‘anchor’ is to moor or anchor something with an anchor. Within the framework of anchor learning, it means a comprehensive knowledge base or environmental adjustment that provides students with a rich source of information. Another definition of ‘anchor’ within the framework of anchor teaching is a comprehensive case of story or problem that also includes introductory and explanatory preliminary information that students will need and that presents a rich source of information.

FEATURES OF ANCHOR

- It helps students to see the information they need and set their important goals, and to apply them in daily life.
- It is composed of stories.
- It makes students focus on the subject on a large scale.
- It presents basic preliminary information.
- It is generally composed of video materials.

Activities of anchor learning provide support of learning that will associate ideas with other content areas or that will enlarge them. On the other hand, the scope of anchor learning requires students to be placed in a story based on a problem. Anchor teaching provides students with pragmatic basics, fills in the blank between theory and practice, breaks the weakness of information (stable, lifeless, memorized information) about structuring cognitive theories and new methods of learning by means of blending both; and thus anchor teaching helps students to develop the necessary information, ability and confidence for being an individual that can think independently and a problem solver at the same time. The scope of anchor teaching necessitates students to be placed in a story that is based on a problem. While researching the problem, students define the information range and look for the information necessary for solving the problem. They play an authentic role while developing solutions for the problem. The teacher, on the other hand, facilitates students’ works and plays the role of a trainer.
Anchor educations is one of the authentic activities that secure effective organization of information and that facilitate learning by means of creating target structures accelerating the formation of cognitive products. Bransford and his friends, under the leadership of Vandebilt Cognition and Technology Group (CTGV), employed a structuralist approach while emphasizing on process/transaction within content. Anchor teaching is a learning approach that supports both formal and informal reasoning and that provides the students with the opportunity to learn when and which one to use. This approach achieves its goal by means of real and complex problems that one comes across throughout daily learning and by having students look at these problems through multi-dimensional perspectives.

Most of the educators agree that the fundamental principal of education is to teach the students how to think independently and how to cope with problems. The goal of anchor education is this: solving the problem of memorized information by means of using target structures and to accelerate thinking in conformity with the related conditions. The model of anchor education helps students to gain information that can be used on a large scale instead of memorized information, and it achieves this by the help of a guide or focus that will attract the students’ attention.

According to Bransford, this guide helps students to define the problem and to head towards their own perception and memory related to this problem. The function of this guide is the same as the target structures that facilitate a strong activation in short-term memory and that create appropriate cognitive information. If these advisors can secure students to head towards their own perception and interpretation related to the problem, teaching will be clear beyond cognitive borders and possess the features of expert behaviour. Bransford goes on as below: "Anchor education has got two basic goals. The first one is to help students to realize the the important points of the case defined as the problem. The other is to cause a change about their perception of the guide and about what they understand from the guide as they look at the case from different points of view." What is expected from the guide is to attract the attention of student and to help student to focus on the related points of the problem that is supposed to be solved. Inter-disciplinary researchers in Vanderbilt think that anchor education can be activated by the help of microcomputer technology.

**Basic Goals of Anchor Learning**

- The most basic goal of anchor learning is to help students to be a thinker that has self-confidence and to develop their information and ability by means of the method of problem solving. Computers and videodisks are used to achieve this.
- To overcome unnecessary and stable information.
- To design interesting and realistic contexts that support effective structuring of information.
- To create an atmosphere in which teachers and students can do research and share their experiences for the sake of problem solving based on real situations.
- To develop students’ abilities to achieve holistic goals in a deductive manner without disintegrating information and skills.
- To help teachers to be a guide or coach and to be a learner together with their students and thus cooperate with them.
- To create student-based classrooms by means of activating students.
- To develop students’ skills of effective communication and of independent thinking and learning.

**Techniques of Anchor Learning**

Anchor teaching focuses on the importance of learning through problem solving. Education at school generally develops the performance of the students through tests and they don’t accelerate problem solving through more realistic duties. For example, it has been previously stated that daily problem solvers cannot transfer the mathematical processes they have learnt at school to the routine problems that rarely come out outside of school – even if it is necessary.

It is a common problem to know something but not to be able to use the knowledge in a related situation. Whitehead (1929) called this phenomenon as memorized knowledge, namely, a kind of knowledge which is possible to be used just in cases very similar to the previous one although it is
applicable in a variety of problems. Whitehead claimed that learning environment produced memorized knowledge. On the other hand, anchor teaching is based on researching in laboratory and class, and thus tries to help the knowledge to be less memorized than the knowledge gained by means of traditional class activities such as remembering and exercise. This fundamental principle is a good example of structurist learning that emphasized the importance of inclusive learning. The techniques that help anchor teaching to be used effectively are target structures, students’ active participation, content, applicability, awareness and cognitive apprenticeship.

**Target structures** activate short-term memory. It provides the necessary and enough opportunities of repetition that helps the development of cognitive areas that are a must in problem solving by means of accelerating the students’ effort to keep and recall knowledge and thus passing from short-term memory to long-term memory. These structures also help the formation of specific definitions of successful or unsuccessful processes of production.

**Students’ active participation** helps students to form their knowledge themselves. This technique associates the subject with real life and it increases students’ performance.

**Content** is the area where learning takes place and it inevitably has a great effect on learning. Content that is not irrelevant makes the most meaningful effect on learning. After all, it should be kept in mind that content includes all processes of learning.

**Applicability** sets forth that students are asked to solve a new problem at this level. The problem should be new in quantity and in quality besides being relevant to the real life. The student should employ the related principles, generalizations, methods and techniques while solving this problem. The main goal of applicability is that students are expected to use the gained knowledge within connecting it with real life, change this knowledge and re-shape it. Within the framework of this basic idea, students are expected to achieve creative thinking, to explore and to produce.

**Awareness** seems to be the step where we receive the first signals about the students’ attitudes and inclinations. Students’ low level of inclinations to be sensitive to participate in intellectual process and to be just aware of this process makes up the core of awareness. At this level, students experience the feelings of first conceding, the inhibitory or facilitating sides about accepting clearly (receiving) the expression of opinion (attitude) informed to them. It is an important detail that “remembering” which is accepted as a very important cognitive product at the information level of cognitive areas related to this principle is not included in awareness. It provides us with the opportunity to explain behaviours with affective processes, not with mental processes.

**Cognitive apprenticeship** is acculturation of students through real applications together with activity and social interaction. The concept of apprenticeship emphasizes the importance of experimental activities in learning. Moreover, learning is accepted to be context-based, circumstanced and acculturating. The traditional apprenticeship is to carry out easily-visible and learned duties. Apart from this, thinking processes should be made clearer in cognitive apprenticeship. It will be easier and more likely to improve processes when students can easily have access to the teacher’s thought and students’ thoughts are clearer and comprehensible for teachers.

**Design Elements of Anchor Learning**
In anchor teaching, atmospheres that are rich in problems, that makes students’ active participation sustainable and that is called as guide are in question instead of classical problems that are typically used in teaching maths. These certain learning environments create opportunities for some activities while not allowing other activities. Traditional classical problems provide students with the necessary numbers for a goal and aimed calculations. It provides students with the opportunity to find only the true mathematical processes. On the other hand, daily situations provide students with a big opportunity to solve problem in terms of sustainability based on complexity and richness. Students have to set the goals of the situation, define the problem, produce a number of strategies in order to solve the problems, choose the right one among these strategies, implement the choice and evaluate
their performances according to their goals. For example, the video called Jasper and other guides created by CTGV are designed to provide students with the opportunity to solve problems that are mostly faced in daily life. Seven features of design gain importance in ensuring this opportunity. These features are;

**Derivative learning style**, outline of the story creates a meaningful content for problem solving. Students by means of resistance stability create the end of the story. It gives students motivation to create the end of the story. Students enjoy determining the end of the story themselves. An additional benefit of derivative learning style is that it helps students to be active when produced by means of resisting and when the necessary sub-problems are solved.

**Video environment** helps students to understand complexity in a better way and to make contact between problems instead of presenting information in a text format. It is especially useful for students who have difficulty in reading, because it creates a rich image or a mental model related to the problem. Video enables characters, events and places to be described in rich, lively and realistic situations where presentations just based on text are difficult to be successful. The second benefit of video based style is that it enables related past (basic) information to be established that can motivate other problems to be studied in maths and other subjects.

**Narrating style**; characters are designed with content where a major event and successive events are seen as slide and information is placed within. The struggle and resistance at the end of the video (narration) creates an image for students in which they feel that they solve the problems in a realistic way instead of just a conference presentation. Moreover, it helps students to use mathematical concepts more authentically to tell the events in a more colourful and graphical manner. For example, the guide called Jasper is designed as a story that presents a realistic problem. Stories have structures, which enable even children to understand the stories. In the story, there is a major character who has got a certain goal and who faces with difficulties in achieving his/her goals. A new solution is not presented related to the problem of the major character in the story. Instead of this, students are expected to solve the problems and find the solutions themselves. The reality of the story provides the students with the opportunity to use the information they gained in daily situations and this reality helps them to perceive the relationship between maths and reasoning on one side and daily events on the other side.

**Problem Complexity**; steps having a number of relations presented to the students are a complex problem. Complexity is based on an intentional and a very simple concept: The expected benefit of this style is that students will be able to cope with the complexity in the real world more easily when they are raised up like this. Unfortunately, traditional class activities do not provide students with the necessary motivating opportunity to solve the complex problems by means of necessary mathematical thinking skills. Video presentation of resistance not only keeps the complexity of the work in secret but also ensures it to seem interesting and solvable.

For example, even the simplest Jasper video presents 16 sub-problems that are related to each other. This complexity provides students with the opportunity to do the necessary exercises to define and describe the problem. CTGV guides are described as challenging problems that encourage students to explore mathematical dilemma. Complexity ensures exploring to be sustainable. The problem situations presented in the guide has got a lot of solutions as is the case with real daily problems and these problem situations provide the opportunity to explore and compare multiple problem-solving strategies. Thus, an effective atmosphere is created where the students has the opportunity to learn that complex problems necessitate sustainable effort and planning.

**Data Design Embedded in a Scenario**; One of the important design features of mathematical texts is “embedded data base.” The information in the format of database necessary for the resistance to be solved is internalized by video. Video does not exactly define mathematical word problems that need to be solved to define the resistance. All in all, to know and determine the problem for the first time is to define the necessary information, to remember the presented information and then to
deduce information from the story. In other content areas, macro-text introduces extra resources to be used for gathering necessary information to the students.

Each guide includes all the necessary data necessary for solving the basic problem embedded in video (irrelevant information is given, as well). In daily problems, sometimes, some data are not clear and the problem solvers are obliged to guess the possible values of these variables. This causes the activity of problem solving to be difficult and mistaken, especially for inexperienced students who do not know the suitable values of variables. If data are given in the video, the students have equal chance to reach them without any effort and it gets easier to start the activity of problem solving. At the same time, certain real variables provide students with the opportunity to do the exact calculations necessary for formal problem solving. In fact, the typical way to solve daily problems is to arrive at the result through general guesses.

**The Group of Related Adventures:** Books and articles of cognitive science about learning just suggest concepts that are gained when content is annexed to a text and so it is not possible to come across usual evaluations and to use them in new situations. The adventures in Jasper series are designed in a way that each problem has got at least three parts: 1. Planning a trip, 2. Statistics, 3. Planning a work, maths and geometry. Students are provided with the opportunity to use or re-use mathematical concepts in these various texts. This helps the possibility to transfer to new situations to increase and the possibility of “inert” learning to decrease. In the original adventure, there is an also embedded “anagol” problem related to each adventure that helps students to reinforce and extend the mathematical concepts they use.

**Establishing contact with the programme:** Each video includes all the information necessary for solving the problem (resistance) in the story. In addition to this, the story also provides various opportunities from other subjective situations to the matters of introduction. For example, maps are used for help to the figures about solutions in the part of planning a trip. These are composed of important parts of the planning a trip in geography, trip and famous events. It establishes a natural connection such as Charles's passing Atlantic on his own.

These seven principles of design affect each other mutually and work as a gestalt (deduction) rather than a sum of independent features. For instance, using video motivates students and takes them out of the class to the real world. This text makes it possible for those students who have difficulty in learning from a material to solve complex maths problems. While this kind of wording, productive design of stories, the complexity of the struggle and indeed the adventures, learning opportunities of presenting data internalized in producing sub-goals hold back the the complexity of finding information about the subject matter and job (duty) management, the job includes encouragement in local decision-making. The wording makes the internalized data easier and mentions indirectly about the related problems that provide opportunities for connections while passing to the programme. Anchor teaching provides the students who have lack of motivation to learn with the necessary guidance and help.

<table>
<thead>
<tr>
<th>Chart 1: Comparing Anchor Learning and Traditional Teaching</th>
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<tbody>
<tr>
<td><strong>Today, the effectiveness of learning-teaching processes are limited. The methods that are being used cope with the problems only superficially and as a result of this, students cannot transfer information.</strong></td>
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<tr>
<td><strong>Traditional learning-teaching processes aim at equipping students with theoretical information instead of having students do practice.</strong></td>
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</table>
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<table>
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<tr>
<th>Traditional methods do not create an atmosphere that helps the effective class conscious. These methods even turn the classes into a frightening atmosphere.</th>
<th>Anchor teaching provides an atmosphere that helps to encourage students to participate in learning actively by means of anchor teaching or situation around an interesting subject.</th>
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<tbody>
<tr>
<td>Traditional teaching approach accepts information as the goal. This understanding encourages students to memorize the information instead of learning it.</td>
<td>Anchor teaching sees information as a means of learning. It encourages students to do research, to make assumptions, to evaluate the accuracy of their findings and to make sense of them by means of scenarios based on a goal and new principles and concepts embedded in these scenarios.</td>
</tr>
<tr>
<td>Teacher-based paradigm that supports the competition between students do not increase students’ motivation, on the contrary, it prevents students to use their potential because of fear.</td>
<td>Anchor teaching increases motivation by means of individualizing teaching and creating an atmosphere where students are not afraid of mistakes. Moreover, it provides students with the opportunity to control their own information’s pace and effectiveness.</td>
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<tr>
<td>Teaching techniques used in traditional teaching cannot establish a connection between real life and learning, so students are delayed to concretize and learn the abstract information.</td>
<td>“Target structures” used as a technique in anchor teaching establish a connection between learning and real life, and so increases students’ motivation, develops the appropriate information structures and helps all the products to come out necessary for solving scenario problems.</td>
</tr>
<tr>
<td>The traditional educational paradigm focuses on “what students should learn.”</td>
<td>Anchor teaching tries to find an answer for “how students will learn” and focuses on making the information permanent and also making it easier to learn concepts.</td>
</tr>
<tr>
<td>The teacher is an information presenter.</td>
<td>The teacher is a leader of class, a guide, and advisor and a coach.</td>
</tr>
<tr>
<td>Passive learning. Giving back the previously prepared results and second hand reasons.</td>
<td>Active thinking, research, exploring and first hand reasons.</td>
</tr>
<tr>
<td>Equipping students with memorized information.</td>
<td>Providing students with pragmatic bases. In other words, filling in the gap between theory and practice.</td>
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**Features of Anchor Learning**

1. Anchor teaching is a form of situated learning.11
2. An event, a story or texts in which information is built are common.
3. It is related to problem-based learning.
4. Open-ended problems are used, but the problem includes clues or some data are embedded in the skeleton of the problem.12
5. Learning and teaching activities are often designed around an anchor, which is mostly a story.
6. Teaching materials include rich resources that can make explanation for students to try out in order to decide how to solve the problem.
7. It emphasized the need to provide students with the opportunity to study on and think about the problem.
8. Group or co-operative problem solving is possible.
9. The goals of the programme provide students with the opportunity to use actively on the situation establish a connection and explore.
10. Activities of anchor learning support learning in associating ideas with other content areas or enlargening them.

Anchor learning appeared as a result of the problem that has been mentioned in the field of education since 1929 and that accepts the fact that information is usually stable and it cannot be used in many
different situations or problem solving activities. The finding is that learning is situated where the experts facing the same professional dilemma transfer their experience to students and where the problems are realistic. An apprentice structures the problems authentically depending on realities with real data where the performance is also authentic about the real jobs when one can face while working as an apprentice of a historian, physicist or businessman.

Although anchor teaching is accepted to be an explanation and discussion rather than simple reading or watching of the presented story, it is similar to situation-based learning. It is also similar to problem-based learning, but not to open-ended learning. In problem-based learning, students want to do research at first hand where learning environment includes external resources. Anchor modules typically include all the necessary information to solve the problem in order to carry out problem-based learning more easily in limited time or with limited resources. Although some experts claim that anchor teaching is a method mostly related to teaching science and maths, anchor teaching is also related to reading, writing and history besides science and maths.

Anchor stories use internalized data. The necessary steps to solve a problem are defined for the design of a anchor story. Then, they are built in a story line. CTGV has developed Jasper Woodbury problem-solving series for learning maths at secondary school level. In the scenario of Wounded Eagle, students are supposed to find and define the best way to move a wounded eagle, the amount of fuel in the ultrahigh plane, the weight of Cargo and other data. It should not be easy to solve the problems; some of them should be complex since students should think on the problem and structure their various ideas by means of defending them in a discussion environment. All the Jasper problems are so complex that they need 14 steps to reach the correct solution. Those problems having more than one solution are good and it is better to go into the classroom together in order to define the solutions of different groups.

Provisions of Implementing Anchor Learning
1. An effective plan should be prepared about the related subject.
2. It should be determined from which resources students are supposed to get help for problem solving.
3. Students should be informed about how the tools will be used.
4. Students should be given help about using the tools when necessary.
5. The stories having problem situations in them should be explained to students using technology such as macro-media means in order to form realities and information.
6. Students should be encouraged to re-arrange the data necessary for solving the problem and to explore the story once more.
7. Students should be made to develop solutions for the problem and to present these solutions to the class.
8. Ideas against or for the presented solution should be discussed in class.

There are three methods that can used for students to understand the subject while making a plan:
The method of valid movement: It is a method that is formed by means of putting forth an example event that can be used in real life.
The method of invalid movement: It is making a story of elements that cannot be implemented by the individual in real life because of physical possibilities.
Incomplete method: It is about not being able to complete an action because of some reasons although it gets started with the belief that it can be completed. For example, a pilot sets off in order to fly a plane, but he/she cannot fly the plane because the plane runs out of fuel.

STEPS OF IMPLEMENTING ANCHOR LEARNING IN CLASS
1. Step: Choosing a field of study
2. Step: Defining an anchor
3. Step: Introducing the anchor
4. Step: Discussing the anchor
5. Step: Establishing groups and research questions
The teacher as below uses all the steps mentioned above in class:

1. **Step : Choosing a field of study**
   This step is the first step of anchor teaching and a field of study is chosen here. While choosing a field of study, the needs, interests and preliminary information of students are considered and the field is chosen in order to provide students with an atmosphere where they can express their ideas comfortably. At the first step, students are got known for anchor. The anchor can be a video segment that includes a complex problem and data necessary for solving the problem. In another class, video content can be enriched with information that maintains thinking about target concepts or with information related to the text and that necessitates comparison for in-class discussions.

2. **Step : Defining an anchor**
   This anchor can be a video presentation that includes a complex problem where information that will help the problem to be solved is embedded. Various scenarios are arranged in video presentations and the basic characters in the scenarios try to solve an important problem. What students are supposed to do is to determine these characters, to do research about the information necessary for problem solving and to help the characters in the scenario to solve the problem. At this step, students develop sharing expertise around the anchor. The anchor makes it possible for students to carry out multiple visits to special programmes and to develop expertise on certain views. At this phase, the teacher leads the discussion of anchor. While students’ information about the anchor increases, students can take the responsibility of their own learning more than before at the same time. If the teacher and students develop expertise about the anchor, the connection passing to the programme and their previous experiences can find a common platform of sharing in class.

3. **Step : Introducing the anchor**
   The anchor prepared at the second step is introduced to students through watching. Sub-titles can be determined for anchor in this environment. Students explain the anchor with their own research. The intervals in the information gained through using the anchor can be necessary for students to search the related materials. In an educational technology class, students can learn new technologies by means of using anchor for content material. For example, students can create a Hyperstudio that is meticulously formed about one of the subjects in the anchor.

4. **Step : Discussing the anchor**
   After watching the anchor, the teacher and students discuss what they have understood about anchor in class. This discussion about anchor can provide students with the opportunity to look at the situation from different angels and they can be aware of the fact that they themselves are responsible of their own learning. Students use their information as a means to solve the problem. They use this information to put forth the solutions for the anchor itself or to associate the information with other problems in other fields of studies. At this step, teachers can prepare the outline (skeleton) in order to help students to solve the problem. For example, those teachers using Jasper Woodbury series to teach problem solving and other mathematical skills can encourage students to define how to handle the problem by means of providing them with the necessary resources in the process.

5. **Step : Establishing groups and research questions**
   At this step, students sit in a way to carry out-group work in order to review the information at hand and to establish research questions. After establishing the questions, research groups are established. The teacher can want each group to prepare their research project. At this step, students are allowed to study on projects related to the anchor. Students work on related projects for anchor. At this step, students are provided with the opportunity to express their ideas about their own subject (information) and other related subjects. Some of the examples of this step include reading more about the subject, writing a report or an essay, or preparing a multimedia report.
6. **Step : Running the research**

At this step, students are expected to do research. At this stage, students develop two basic skills, which are:

a. Learning how to work cooperatively in a learning group
b. Learning special research skills.

These two basic skills also include these skills that teach students how to run the research:

a. Using library and media centers while collecting the necessary information,
b. Finding and recording important information, writing a research report.

7. **Step : Presenting the research**

At this last step where anchor teaching is completed, students present the research they have carried out and that includes the answers of previously determined questions to their friends in line with the investigation among groups. Students share what they have learnt from the project. The process of sharing not only makes them be proud of their studies but also they gain an important point of view including how their classmates have solved the problem. At this point, students are encouraged to compare their solutions in the video and to evaluate the strengths and weaknesses of each approach.

Anchor learning provides teachers with the opportunity to carry out a gradual structurist implementation with anchors instead of making a sudden change in their classrooms by means of these steps. The fact that teaching is arranged around an anchor makes teaching a bit more manageable for teachers.17

**The Principles That the Teacher Should Keep in Mind About Using Anchor Teaching in Class**

Anchor learning is a student-based learning method. The teacher is a guide and coach while using the method of anchor learning instead of just transferring the information to students and having them get the information passively as is the case in traditional teaching14. While using this method in class, the teacher should act as a coach and participate in research with his/her students by means of taking the role of a learner just like the students. While using this method, the teacher should design learning environment with the principles stated below:

- Multi-media, web-media or other interactive technologies should be used as much as possible in story telling.
- The teacher should encourage student groups to choose and get key clues, realities and information.
- Students should be encouraged to re-arrange the necessary information and to “re-play” or “re-explore” the story in problem solving.
- There should be created an atmosphere that allows students to develop solutions and to present their ideas to the class.
- All ideas should be discussed with for and against arguments.
- Students should be encouraged to think about the original scenario with expressions such as “what if, if, now that, unless” by means of using similar problems and new data.

Some exercises should be done by means of asking different problems about the scenario at the beginning.18

Video should be used as much as possible in order to make realistic anchor stories while implementing the method of anchor learning. CD-Rom or videodisc can be preferred just as videotape. Students can watch the parts of the story again while discussing the steps of the story when necessary while solving the problem.

Students should study on the problem in small groups. As a result, they present a report of all their solution plans to the class. During the presentation, various ideas for and against can be discussed. Logic problems (for example, if you do not agree with this idea) can help students to understand the problem in deep by means of explaining the relationship between appropriate variables. The studies of
additional problems necessitating similar skills or strategies used in the first scenario can be easily transferred to different skills. In studies conducted with fifth and sixth grade students, CGTV students have been found to “get higher marks than average in standard maths success test.” However, they are not successful in recognizing and formulating the problem immediately (CGTV, 1992). Those students who are not good at finding a problem internalized in a story can primarily deal with this issue. Students can improve in formulating a problem by means of hard working (four-five group problem). The teacher in class as below uses the steps mentioned above;

The Advantages of Anchor Learning
- It helps students to be a more independent thinker who can apply information.
- It increases teacher-student interaction about problem solving and supports the process of problem.
- The fact that problems are given depending on necessary clue and exploring develops students’ skill of transferring information.\(^{19}\)
- It enables understanding the logic of concepts and problems instead of memorized information.
- It enhances permanence in learning.
- It provided opportunity to associate what has been learnt with real life.
- It encourages students to learn.
- It motivates students to think critically and explore.
- It motivates students to solve a problem effectively.
- It provides a rich learning environment.
- It makes it easier to understand information.
- It enables students’ active participation.
- It associates what has been learnt with real life.
- It increases sensitiveness to scope.
- It increases the quality of learning process.

The Constraints of Anchor Learning
1. It takes time to formulate a problem.
2. Need for educational technologies are more than in traditional classes.
3. It causes false learning and waste of time if the teacher and students do not have enough information about the method.
4. It is difficult to mention a previously inbuilt programme.
5. It takes more time than traditional teaching approach.
6. The role of the teacher turns from information presenter to a coach and sometimes to a learner.

One of the most important disadvantages of anchor teaching is that it does not have a standard programme. Teachers feel a must to hide the amount of content that is inappropriate and thus lecturing on this content or defining it (like a drug) turns into just an applicable curtain model.\(^{20}\)

The Process of Evaluation in Anchor Learning
Learning is a complex process. Individuals always change their mental structures. The effectiveness of learning environment depends on the programme, learning activities, students’ motivation and students’ growth. Trying to measure this complexity with tests limits information and cannot do an exact and correct measurement.\(^{21}\) Anchor learning claims that the types of evaluation mentioned above cannot contribute to the individual since evaluation should focus on the processes of performance and thinking rather than what they know about a certain subject depending on their ability to memorize information. The teacher watches students’ performance, evaluates and grades their skills in line with a group of values. In other words, originality and conformity with the form is important.\(^{22}\) Such activities open the door to the necessary deep thinking and questioning. They bring creative thinking, exploring, getting into action and being active together with performance evaluation. In traditional evaluations, the low rate of students’ understanding causes low results. In such cases, some activities supported by anchor learning should be presented such as motivating students to
determine goals depending on thinking, to analyze alone, to develop skills of arranging information, learning how to learn and getting awareness of the thing that will be learnt.23

Evaluating students’ information should not be accepted as a separate process different from programme and teaching. Teachers should gather different evidences that show teaching. Documents and observations related to the learning duties of students should be included in evaluation. Structured and unstructured observations and interviews, examples of studies, worksheets, project works, performances and presentations, performance exams, various type short answer questions can be used in evaluation. On the other hand, according to structuralist learning approach that constitutes a base for the formation of anchor learning, the system of evaluation should allow students to reflect what they have learnt in a multiple way and it should be in parallel with students’ understanding.

Because of this reason, evaluation activities in anchor teaching include not only exams carried out in the middle and at the end of the educational period, but also observation, interview, discussion, files including all the products produced by students during learning activities (reports, notes, graphs, home works, project studies, pictures, bulletins, collections, etc.) all throughout the educational period and with a multiple way of view. When this is done, teaching through multiple points of view comes out with multiple evaluations. As a result of this, individual development, creative effectiveness and social sense of responsibility are encouraged. This also helps each student to get feedback about his/her own efforts.

According to anchor teaching approach, the teacher to guide teaching should use the results of evaluation. The teacher should ask the question of what should be done for students’ development, and should arrange the next learning environment according to this answer.24 The basic principle of evaluation is composed of the problems to be solved in the to-be prepared programme, inbuilt implementations, mutual feedbacks, establishing a connection with real life and evaluating performance with multiple points of view.25 Evaluating students’ information should be handled separate from programme and teaching.

Structured and unstructured observations and interviews, project works, performance exams, various type of short answer questions can be used in evaluation.26 On the other hand, according to the structuralist learning approach that constitutes the base of anchor learning, evaluation is in line with the understanding that the system should let students reflect what they have learnt in multiple ways.27 Because of this reason, evaluation activities in anchor teaching include not only exams carried out in the middle and at the end of the educational period, but also observation, interview, discussion, files including all the products produced by students during learning activities (reports, notes, graphs, homeworks, project studies, pictures, bulletins, collections, etc.) all throughout the educational period and with a multiple way of view.

REFERENCES

CHAPTER 6: THEORY OF MULTIPLE INTELLIGENCES

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TRADITIONAL UNDERSTANDING OF INTELLIGENCE

What intelligence exactly means and which skills it includes is one of the fields on which studies have been carried out for years. In 1904, for the first time in the world, the Ministry of National Education in France wanted Alfred Binet to develop a tool in order to determine students who were likely to fail at primary school level. Then, the test developed by Binet was adapted to English by one of the psychologists of Stanford University in 1916. This test was called Stanford-Binet Intelligence Test.

According to Binet, intelligence stood out in complex processes such as perception, decision-making, reasoning and each child’s intelligence could be developed with a well-planned education. However, on the contrary of this belief, in time, tests called IQ tests began to be accepted as a basic criterion for measuring students’ mere capacity of intelligence, in other words, students’ intelligence and it became a widespread view that a person’s intelligence could be measured objectively and reduced to a mere figure known as IQ. According to this view, intelligence began to be accepted as a stable, measurable and unchangeable concept determined by birth.

In the following years, Piaget, Vygotsky, Feuerstein and many other researchers have put forth with the researches they have conducted that intelligence is not stable. For example, Piaget went beyond traditional concept of intelligence and stated that intelligence was not the point one got at an intelligence test and defined intelligence as “the power of mind to change and renew itself.”

Many researchers had discussed the question whether intelligence was formed by genetic reasons or mostly by environmental conditions. In the following period, intelligence began to be accepted as a phenomenon formed by genetic skills, experiences and environmental elements. Scientists who were studying on behavioral genetics came to this conclusion as a result of the conducted researches: “Heredity determined the highest and lowest limits of behavioral features. Where the behaviour will be within these limits is determined by environmental conditions.” In this sense, the final form of behaviour is determined by the continuous interaction between genetic heredity and environment.

An exact agreement on the definition of intelligence could not be achieved in this process; but a common pattern stands out in the definitions which state that intelligence is the ability to (1) compare abstractly, represent mentally, solve problem, make decision (2) adapt to the environment (3) learn. If we have to summarize the traditional perception of intelligence in general, we can come to these conclusions:

1. Intelligence is gained by birth and it is stable. Intelligence cannot be changed or developed.
2. Intelligence can be measured numerically and expressed as a single number.
3. Intelligence is singular.
4. Intelligence can be measured (with certain intelligence tests) by means of isolating oneself from real life situations.
5. Intelligence is used to classify students according to certain levels throughout their educational lives and predict their future success.

Today, it is possible to come across a lot of people having special skills and potentials that do not exist in the test (IQ test) developed according to the traditional understanding of intelligence. This situation proves the insufficiency of traditional sense of intelligence and the need of an intelligence
theory that reflects the complex skills and performances possessed by people. Multiple Intelligence Theory (MIT) is a theory created out of this need.

HOW MIT CAME INTO VIEW

Howard Gardner, one of the lecturers in Harvard University, developed multiple Intelligence Theory that has brought a new sense to the concept of intelligence in 1983. Gardner gained a more comprehensive point of view to the concept of intelligence and named people’s skills and potentials as “areas of intelligence” and defined intelligence as “(1) problem solving and (2) the capacity to create new products in rich and natural environments.” Gardner means different and independent skills whose number is not known with the word “multiple” which he used in the concept of “multiple intelligence.” In other words, the key word in the sense of intelligence handled by this theory is “multiple.”

Although Gardner does not appreciate standardized tests such as IQ test, he used such tests in his studies while determining the first seven intelligences. Because of this reason, this theory is also supported by psychometric findings. Gardner states that a feature should have a system of symbols, have a cultural value, enable production of goods and services, and enables problem solving in it to be defined as intelligence. Moreover, Gardner does not accept that intelligence and skill are different things. According to him, intelligence in terms of its traditional meaning is a group of certain “skills” that come out in the fields of language and/or logic.

Within the framework of this theory, Gardner (1993) defines intelligence as “the skill of solving problems of shaping a product that has got a value in one or more cultural structures.”

Types of Intelligence According to MIT

While the number of intelligence areas is 7 in Gardner’s book “Frames of Mind” published in 1983, this number has risen to 8 with the additional naturalistic intelligence he added in his book “Intelligence Reframed” published in 1999. These intelligence areas are as below:

1. Linguistic-verbal intelligence
2. Logical-mathematical intelligence
3. Spatial intelligence
4. Bodily-kinesthetic intelligence
5. Musical intelligence
6. Social-interpersonal intelligence
7. Intrapersonal intelligence
8. Naturalist intelligence

Linguistic-Verbal Intelligence

When ...writing ... all the natural instincts are at work the way some people play a musical instrument without a lesson and, others, even as children, understand an engine.

LILLIAN HELLMAN, An Unfinished Woman

This type of intelligence includes the skills of listening, reading, speaking and writing. This intelligence expresses the capacity to use language effectively as means of communication. This intelligence requires people to use their own language in conformity with the language’s grammatical structure, word order, stress and meaning of concepts.

According to Gardner, a person with high linguistic-verbal intelligence tells stories, makes jokes, fabricates events and has a good memory; he/she likes word games, reading and writing, has a rich terminology when compared to his/her peers and has a good verbal communication. Some of the professions suitable for such people are: poet, writer, teacher, journalist and politician.

The activities that address students with high linguistic-verbal intelligence are as below:

- Note-taking,
- Telling a story,
• Writing a play, an article or a letter,
• Associating a story or a novel with other subjects\(^1\).

Moreover, some activities that can used to activate this intelligence are as below\(^1\):
1. Read one of the stories you like and write an end for the story.
2. Listen to the views of people around you on a specific subject matter and discuss this matter with them.
3. Learn a new and interesting word every day and try to use it in your daily life.
4. Make a speech on a subject that attracts your attention and that is exciting for you.
5. Subscribe to a magazine or write a diary about your observations on daily events.

Some of the people who have come to the forefront with their linguistic-verbal intelligence in Turkey and in the world are Nazım Hikmet Ran, Cem Yılmaz and William Shakespeare\(^7\).

**Logical – Mathematical Intelligence**

*The first man who noted the analogy between a group of seven fishes and a group of seven days made a notable advance in the history of thought. He was the first man who entertained a concept belonging to the science of pure mathematics.*

**ALFRED NORTH WHITEHEAD\(^12\)**

It includes individuals’ skills to think logically, use numbers effectively, producing scientific solutions for the problems, recognizing the relationship between and pattern among concepts, classify, generalize, express with a mathematical formula, calculate, test a hypothesis, draw an analogy\(^13\).

People with a high logical-mathematical intelligence are good at perceiving objects and the relationship between them; using concrete concepts and abstract symbols representing objects; establishing and testing a hypothesis; defining, analyzing, mathematical subjects and solving problem and they like matching similar things, deducing a shape out of complex pictures, maths, puzzles and problem solving\(^7\).

The activities that address students with high logical-mathematical intelligence are as below\(^1\):
• Doing puzzle and playing maths games,
• Writing a problem,
• Turning problems into equations,
• Making a time line,
• Doing an experiment, comparing and classifying phenomena.

Study fields appropriate for such people are maths, statistics, accounting, banking, engineering, computer programming and science\(^1\). Some activities that can used to activate this intelligence are as below\(^15,9\):
1. Compare two objects. For example, find four specific typical features of typewriter and computer and then find four common typical features of these two objects.
2. Make a persuasive speech with reasons on some subjects that are deemed to be nonsense. For example, the advantages of playing football with a basketball.
3. Participate in a project that necessitates usage of scientific methods.

Some of the people who have come to the forefront with their logical-mathematical intelligence are Sir Isaac Newton, Albert Einstein, Bill Gates and Cahit Arf\(^7\).

**Spatial Intelligence**

It includes individuals’ thinking with pictures, images, shapes and senses besides their skills of perceiving and comparing\(^4\). The capacity of this intelligence is related to record and perceive the objects and event in the world correctly; recognizing faces, designing three-dimensional objects, direction finding and paying attention to details\(^7\).
People with high spatial intelligence can see clear mental images, can easily read maps, graphs and figures, are more imaginative than their peers, like artistic activities, enjoy jigsaw puzzle and games such as finding the way, learn more with pictures instead of words while reading.

People whose spatial intelligence is strong tend to be hunter, guide, scout, architect, decorator, artist and designer. Some of the activities addressing these people are:

- Reading a map,
- Taking photo,
- Puzzles,
- Three-dimensional experiments and exemplifying with cartoons, posters and pictures,
- Creating a slide show, video or photograph album,
- Story-telling looking at a map.

These activities are recommended to improve spatial intelligence:

1. Use some tools (crayon, clay, paint and marker) to express your dreams. For example, tell what the 21st century will look like by means of using these tools.
2. Dream. For example, imagine your ideal holiday place and the visual details of this place.
3. Do exercise to improve your imagination. For example, imagine yourself in a specific period of history.
4. Use your design skills such as pictures, graphs or a poster in order to tell your opinions to people around you.

Some of the people who have come to the forefront with their spatial intelligence are Leonardo Da Vinci and Piri Reis.

Bodily-Kinesthetic Intelligence

It expresses how a person uses his/her body and movements. It is the capacity to solve a problem, produce something and use materials artfully by means of using all the body and some parts of the body effectively.

Bodily-kinesthetic intelligence includes skills such as controlling body movements, controlling previously-planned body movements, being aware of the body, establishing a strong connection between mind and body, pantomiming, using the body well as a whole (Lazear, 2000, cited). People who have high bodily-kinesthetic intelligence possess a good relationship between brain and body; they can imitate artfully; they are good at coordination, harmony and muscular movement; their bodies are flexible; they have a strong sense of touching and they are good at handcraft.

These people can be successful if they are actor, dancer, pantomime artist, operator, technician and sculptor.

The activities stated below are recommended to activate this intelligence:

1. Play in a drama. Play a role about an idea, an opinion or a feeling.
2. Play a game that needs physical activity/role. For example; a group people who don't know each other's name can express their names with arm and hand movements.
3. Do physical exercises such as folk dances, running, swimming and hiking.
4. Observe yourself carefully while carrying out jobs you do every day and that need physical effort such as shoveling snow, washing the dishes and parking your car in order to be aware of your bodily functions.

Some of the people who have come to the forefront with their bodily-kinesthetic intelligence are Charlie Chaplin, Tan Sağtürk and Selim Sırrı Tarcan.

Musical Intelligence

It is the skill to think with sounds, notes and rhythm; to recognize different sounds and to produce new sounds and rhythm. It includes abilities such as playing a musical instrument and finding the similar one of a song.
Musical intelligence includes the capacity to value the structure of music and rhythm; to shape graphs about music; to be sensitive to sounds; to imitate, recognize and create melody, rhythm and sound; to use different features of tone and rhythm (Lazear, 2000, cited). People with high musical intelligence can learn rhythm; melody and music best and very effectively; these people not only remember musical works easily but also try to think about, comment on and express events in a musical way. These people enjoy playing a musical instrument, murmuring, composing a song and singing this song.

The activities stated below are recommended to activate this intelligence:
1. Listen to different kinds of music that will heal your mood. For example; listen to instrumental music to get relaxed during or before a stressful event.
2. Sing song to express your feelings and compose a simple song about your family.
3. Make rhythms in your head with murmuring. For example, read one of the vowel sounds with a different pitch and intonation in each time.
4. Record a cassette of different sounds in the nature (wind, waterfall, storm). Ask ourselves what you can learn from the noise and rhythm of the nature.

Some of the people who have come to the forefront with their musical intelligence are Wolfgang Amadeus Mozart, Aşık Veysel and Fazıl Say.

Social-Interpersonal Intelligence
The scope of this intelligence includes communicating with people, empathizing with them and interpreting their behaviours. It is the capacity to work cooperatively in a group, communicative verbally and non-verbally, understand and interpret people’s feelings, ideas and behaviours, and to persuade people.

People with high social-interpersonal intelligence have the capacity to communicate with people effectively through verbal or non-verbal means, to read one’s mood and feelings, to work cooperatively in a group, to listen to a person with his/her own point of view, to empathize, and to gain and create synergy (Lazear, 2000, cited).

The activities stated below are recommended to activate this intelligence:
1. Make a group within the framework of a to-be completed project. Assign a task to the members of the group.
2. Do exercise to listen to the person across you effectively.
3. Guess what a person thinks and feels according to his/her mimes, then control the accuracy of your guess.
4. Find different ways to communicate a person. For example, communicate with mimes, body movements, gestures and sounds.

Some of the people who have come to the forefront with their social-interpersonal intelligence are Mustafa Kemal Atatürk and Mahatma Gandhi.

Intrapersonal Intelligence
It is the capacity to understand yourself, who you are, your limits, wishes, reactions and interests. This intelligence expresses the cognitive skill of an individual to hear and understand himself/herself. People who have high intrapersonal intelligence can understand the limits of their own enthusiasm and they can consider these limits while directing their own behaviours.

People with high intrapersonal intelligence are independent; they know their strengths and weaknesses realistically; they can direct themselves; they prefer working alone to working in groups and they have a high level of self-confidence. These people are good at understanding their own feelings and ideas, concentrating, focusing, thinking beyond objects and they like self-focused activities.
The activities stated below are recommended to activate this intelligence:\(^5\):

1. Try to be very careful in a routine activity. Be aware of what is happening all around you. For example, be aware of sounds, body movements, feelings and your mimes.

2. Try to observe your feelings, ideas and behaviours as an observer from outside.

3. Write an answer of 25 words or a short answer to the question of “Who am I?” Review what you have written every day for a week and make the necessary changes and amendments that you think are necessary.

Some of the people who have come to the forefront with their intrapersonal intelligence are Mevlana Celaleddin Rumi and Sokrates\(^7\).

**Naturalist Intelligence**

It can be defined as recognizing plant species, recognizing the important differences in natural life and using this ability productively (hunting, farming or biological sciences)\(^13\). It includes the capacity to recognize and research all the living beings in the nature, and to think over creation of living beings\(^16\). This intelligence includes the capacity to commune with nature; to be sensitive to natural flora; to be sensitive to the reactions of the nature; to interact with other living beings; to recognize and classify the plants and animals in the nature, and to grow a plant (Lazear, 2000, cited\(^5\)).

People with high naturalist intelligence know the characteristic features of natural life; they compare the observations carried out in the nature with other observations; they enjoy dealing with the nature; they draw or take photos of the objects in the nature; they enjoy joining trekking\(^16\). The professions suitable for these people are biologist, jeologist, florist, archeologist and meteorologist.

Some of the people who have come to the forefront with their naturalist intelligence are Charles Darwin and Hayrettin Karaca\(^7\).

**ENVIRONMENTAL FACTORS DETERMINING INTELLIGENCE AREAS**

According to Gardner’s analysis, all of the people have at least seven different types of intelligence. Each intelligence is shaped by factors valued in one or more cultural environments and they help problem solving. Intelligence tests measure linguistic and mathematical, and perhaps visual intelligences. However, people also possess musical, bodily-kinesthetic, intrapersonal and interpersonal intelligences. Although everyone has got all these mentioned intelligences, none of them has these intelligences in the same form and at the same level\(^1\). The development of the mentioned intelligences is also different in one individual. Gardner (1993) summarizes the factors that can be accepted as environmental factors affecting the development of the mentioned intelligences and that can be an advantage or disadvantage for people as below\(^5\):

**a. The chance of reaching the resources:** For example, if the financial situation of the family is not good, the child cannot easily reach musical instruments such as violin or piano that can develop musical intelligence. Because of this reason, it may be difficult for this intelligence to be strong in that child.

**b. Historical-cultural factors:** For example, if the education system in a society primarily focuses on maths or science, the students’ logical-mathematical intelligence is more likely to develop than others.

**c. Geographical factors:** For example, a child who grows up in a rural area uses his/her body more than a child that grows up in city center and so s/he will be more likely to develop his/her bodily-kinesthetic intelligence.

**d. Family factors:** The level of importance given to an area by a child may be related to the child’s family’s wishes. For example, if the family of a student wants their son or daughter to be an engineer, they will provide the student with more opportunities to use his/her mathematical intelligence.
e. **Situational factors:** For example, individuals who grow up in a large family have more chance of benefiting from social opportunities when compared to individuals growing up in small families.

In general, if we have to summarize the new understanding of intelligence, we can come to these conclusions:\(^1\):

1. The capacity of intelligence brought by the individual’s birth can be improved.
2. Since intelligence can show itself as a performance, it is a variable that cannot be calculated numerically.
3. Intelligence is not singular, but a multiple system. In other words, intelligence can be expressed with various tools.
4. Intelligence presents students different ways to be successful.
5. The concept of intelligence cannot be isolated from experiences of daily life. In other words, it is an applicable area.

**THE PRINCIPLES OF MULTIPLE INTELLIGENCE THEORY**

The general principles of multiple intelligence theory can be summarized as below:\(^1\):

1. Multiple Intelligence Theory emphasizes that intelligence does not have a singular feature, on the contrary, there are a lot of various types of intelligences. According to this theory, each person has got nine different types of intelligences and can use all of these intelligences to a certain extent. While some individuals can have good skills in a few of these intelligence areas, some can have good skills in all the areas.
2. Multiple Intelligence Theory defends the idea that each person has got his/her own specific intelligence profile that helps the person to put forth products valuable for the society in which this person lives and to solve the problems he/she faces, and that is composed of a special combination of strong and weak intelligences.
3. According to Multiple Intelligence Theory, different intelligence areas of individuals can be improved. In this context, it is possible to determine the intelligence profile of individuals composed of their active and passive intelligences by means of a rating scale developed in line with Multiple Intelligence Theory.
4. Although Multiple Intelligence Theory admits that the intelligence has got nine dimensions, it claims that these intelligences have got a complex and simultaneous process. For example, a ballet dancer uses bodily-kinesthetic intelligence while dancing at the stage, spatial intelligence while recognizing the dance floor in order not to get out of the stage, linguistic-verbal intelligence and bodily-kinesthetic intelligence while learning the choreography, musical intelligence while recognizing the music with which she/he will dance, intrapersonal intelligence while presenting the choreography by means of living it.
5. Multiple Intelligence Theory has got a dynamic and developing feature unlike the traditional approach. This theory is always open to innovation and Gardner admits that there may be some other intelligences different from those ones known today.

**IMPLEMENTATIONS OF MULTIPLE INTELLIGENCES**

When Gardner was asked what Multiple Intelligence Theory could contribute to education, he stated that MIT was not a goal of education in itself, that the intelligence areas mentioned in the theory were just strong means to reach the goals of education\(^2\) In traditional education, schools mostly deal with linguistic and logical intelligences and they do not give importance to individual skills and different learning methods. On the other hand, according to MIT, students do not have to learn with a single curriculum and the same method all the time\(^3\).

Implementing MIT in the field of education gives the opportunity to run educational programmes around different learning methods addressing different types of intelligences and to help students to handle the same subjects with different dimensions and different points of view by means of these educational methods\(^4\).
According to Gardner, all the intelligence areas of individuals have the capacity to be improved by means of appropriate teaching, an enriched environment and a good guidance since the process of education should focus on and support students’ strengths instead of focusing on their weaknesses. Only by this method can the principle of “equality of opportunities” that exists in modern educational approach be implemented.

But, for this purpose, the teacher should internalize MIT and follow the results of the implementation. The first step of this for the teacher is to determine the students’ intelligence areas accurately. According to Armstrong, “Each child is a genius in multiple intelligence classes and these geniuses have some features such as curiosity, game spirit, imagination, skepticism, wisdom, spirit of invention, liveliness, sensitiveness, flexibility, humor and cheerfulness. If teachers want to pick the genius of the students out, they should be careful about arranging activities that will improve students’ features in and outside of class.”

This theory puts emphasis on being “according to the student” in educational activities. This understanding also complies with “student-based education” or “student-centered education” on which the Ministry of National Education has been putting great emphasis recently. The model of teacher in this teaching approach is quite different. This difference changes the definition of teacher. From now on, teacher is a multi-dimensional model who can present information to students in different ways and who can help students to process information in a creative and flexible environment.

**Determining Intelligence Areas**

Gardner is against the idea that separate tests should be developed for each intelligence area and thus separate points can be available at the end of each test. Intelligence areas can be evaluated through observation. Observing how children spend their free time generally gives a good idea about their dominant intelligence area. In determining different skill areas, some inventories such as “Multiple Intelligence Areas Observation Form for Students” and “Multiple Intelligence Area Profile for Students” can be used. These inventories are not IQ tests and they should not be used for this purpose. However, it is important for the teacher to determine intelligence areas of students to be able to understand which student will learn through which method and to help students in their learning. Moreover, it is also important to determine students’ dominant multiple intelligence areas in order to arrange suitable in-class activities that comply with these intelligence areas. The points stated below should be kept in mind while determining intelligence areas:

- It is important to run teamwork with other teachers and staff at school.
- It is important to organize conferences on related subjects for parents.
- It is important to make use of newspaper/magazine, autobiography, artistic activities, discussion groups, projects, one-to-one interviews in order to determine students’ multiple intelligence areas.
- It is important to use questionnaires and check lists.
- It is important to observe students’ performed and unperformed behaviours.
- It is important to document students’ performances.
- It is important to look at school records, exam results, students’ success in different lessons and different comments on students.

A person can be taught a lot of things that this person has difficulty in learning by means of using people’s dominant intelligence area or in other words, using the teaching method that is best and specific to that person. To be clearer, one can open the doors to meet and learn different areas for a person by means of using that person’s interest and skill areas that he/she enjoys most as an effective tool.

The necessity to teach everything through seven or eight different ways is not the core idea of MIT. According to MIT, each subject in all lessons can be taught by means of different ways. Teachers should have a rich and vivid imagination and should help students to understand something better in line with their intelligence areas.
Steps of Implementing Multiple Intelligence

Campbell has divided the steps of using MIT in curriculum under five headings (cited17):

1. **Lesson Design Based on Multiple Intelligence**: Intelligence areas are accepted as the starting point in designing a lesson. For example; using bodily-kinesthetic intelligence area and helping students who have difficulty in learning maths and geometry to learn the formulas by means of the method of role-making.

2. **Inter-disciplinary Programme**: Core programme approach is recommended in order to pick students’ intelligence areas out. According to this approach, students learn common core subjects first of all. Then, they have lessons about their interest areas in line with their intelligence areas.

3. **Students’ Projects**: With this approach, students are helped to do research in their interest areas, to interpret the results of their research and to discuss these results with their friends in class.

4. **Evaluation**: It is not enough to use fill in the blanks or short answer tests at the step of evaluating students. Instead of these, students should be evaluated by means of creating situations in which they can reveal their advanced thinking skills, generalize what they have learnt, associate their lives with the content of the lesson and transfer knowledge they have to new situations.

5. **Apprenticeship**: The curriculum of primary and secondary schools should be run so as to provide students with the chance of apprenticeship and in an individualized manner. Students can be included in three different areas of apprenticeship; education on apprenticeship about 1) art and craft 2) academic field 3) dance and sports.

PREPARING LESSON PLAN ACCORDING TO MULTIPLE INTELLIGENCE THEORY

According to Campbell, within the framework of a teaching approach based on the principles of Multiple Intelligence Theory, it is necessary for the teacher to contemplate on how to adapt the to-be-taught subject or concept from one intelligence area to another appropriately (cited5). In order to help this purpose, the questions stated below can be used at the step of planning a lesson after choosing the subject17:

1. Logical-mathematical intelligence: How can I express this situation with numbers? How can I bring critical thinking skills, logical thinking principles and classifying into the class?
2. Verbal intelligence: How can I use spoken language and written texts in this subject?
3. Spatial intelligence: How can I use visual materials?
4. Musical intelligence: How can I bring music into the class and how can I use music in this subject?
5. Bodily-kinesthetic intelligence: How can I help students to use all body skills and handcraft?
6. Interpersonal intelligence: How can I get students to do group-work?
7. Intrapersonal intelligence: How can I awake students’ individual feelings and how can I give them the chance of choosing?
8. Naturalistic intelligence: How can I bring natural elements to the class?

EVALUATION ACCORDING TO MULTIPLE INTELLIGENCE THEORY

According to MIT, evaluation should be multifocal; it should be able to focus on multiple areas, not only a single area. This situation makes evaluation “authentic” and “equalitarian.” Original (authentic) measurements are important in that they show what students have learnt in the context to the teachers5.

In authentic evaluation, a portfolio (a file that includes all the works done by the student) is kept for each student and these portfolios ensure a more realistic evaluation when compared to standard tests (multiple choice, true-false or fill in the blank questions)5. According to this, as knowledge can be measured at least in eight different ways, students’ portfolios should include materials related to each of the eight intelligence types.

The most important component of an accurate evaluation is documenting students’ portfolio products and problem-solving processes. These documents may include these5: anecdote records, examples of
study, audio cassettes, videos, students’ diaries, informal test results, interviews with the students, check lists, class map and exams based on the understanding of absolute evaluation.

FINAL WORD!

According to Multiple Intelligence Theory, each individual has got at least 8 intelligence areas. In his book "Multiple Intelligence," Gardner underlines especially a subject, which constitutes the base of the theory. This subject can be summarized as below:

One or two intelligences are improved when compared to others in a person; but every individual needs every intelligence area. For example, a conductor needs spatial, intrapersonal and interpersonal intelligences as well as musical intelligence. Moreover, the success that an individual displays in different fields is the product of different intelligences he/she has. In other words, MIT has got as its basic idea that “there is not just one or two ways to be intelligent.”

REFERENCES

CHAPTER 7: PROJECT BASED LEARNING

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INTRODUCTION

In the simplest sense, learning can be defined as permanent behavioral change as a result of an individual's interaction with his/her environment at a certain level. Learning is very important in terms of an individual's life. The power that activates students to learn, in other words, motivation to learn is very important in school learnings. Teachers have important roles and responsibilities at school for learning, which is an important dimension of teaching process to be effective for students. The one who is active about teaching services at school and in class is the teacher. So, the quality of teaching is very important. While ensuring the quality of this teaching, the signs or directions presented to students, students' active participation in learning process directly or indirectly, reinforcement presented to students related to learning, the function of the system of feedback and correction are each very important. While talking about learning, some of the criteria reached by learning theorists should be kept in mind. Some of the criteria that should be used to evaluate any learning-teaching method are remembering what has been learnt, transferring what has been learnt to new situations or to problem solving, the level of cognitive processes included in learning and the positive attitude and feelings about learning.

It is possible to reach effective results in learning by means of considering the basic concepts and elements about learning. Studies about learning as a comprehensive concept have always been carried out. Permanent learning is aimed in classed in the light of what is known and done. There have also been changes about teaching methods and approaches within the framework of studies to dynamize learning process. One of the situations aimed with the new learning approaches and methods is to ensure students to use what they have learnt more effectively.

The last innovations and developments have also affected the activities related to learning and teaching. Structuralist learning approach, which has been effective on educational systems all over the world, affects the classed in that sense. Structuralist theory emphasizes the necessity in education for the individuals to think and understand more, to be responsible of their own learning, and to learn how to control their behaviours. At this point, the points which are just some of the features of structuralist class environment and which are stated below are quite important:

- Students' wishes, needs and questions about various subjects have a wide coverage in teaching process.
- The activities related to educational programme are mostly based on primary resources.
- Students are accepted as individuals who are responsible of their own learning, who make sense of the knowledge they get from around in their mind and for this reason who are active in learning.
- Teachers interact with students mutually as a learner in the process of learning and they arrange learning environment.
- Students generally carry out-group work.

All these features also affect teaching approaches. Especially when new teaching approaches such as problem-based learning, cooperative learning and other new approaches are examined; the points stated above are realized to be leading features. One of these new approaches is Project-Based Learning.
WHAT IS A PROJECT?

The concept of project includes multi-dimensional activities composed of small and big projects. The concept of project is sometimes used in the meaning of homework. When the duration dedicated to exercise, homework and project is studied, it is clear that an exercise needs 0-2 hours; homework needs 2-12 hours while a project needs 12-60 hours. At this point, it is useful to answer the question of “What is a project?”

<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>is a task or a series of tasks that have to be completed by students individually or in groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td>is a whole of studies carried out by the students individually or in groups in order to solve a problem related to ensuring a concept or skill to be acquired.</td>
</tr>
<tr>
<td><strong>Project in terms of education:</strong></td>
<td>a deep research, implementation and sharing of a subject that is worth to learn more about (Katz, 1994; cited: Doğanay and Tok, 2007, p. 234).</td>
</tr>
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</table>

Projects are complex tasks; they are based on challenging questions or problems; students carry out activities such as design, problem solving, decision making or investigation; students are given the opportunity to study for a long time and realistic products are produced at the end.

In project tasks, students are usually presented an individual subject to do a deep research. In this type of study, students study independently to do, write and present their research. A project task can also require a group of students to study on the same problem but on the different dimensions of the problem. Moreover, projects are expected to be long-term, to require team work among students and to result in a product, and these results prepare students to deepen their level of understanding, to develop new skills, and thus to develop in academic means and to use them in their future business lives.

Projects are mostly open-ended. A study of project or homework is a creative process at the same time. This process requires these steps in general:

1. **Deciding on the goal:** At this point, an answer is sought for the question of “What are expected to be achieved with this project?”
2. **Reviewing the resources:** At this point, these questions are tried to be answered: Is there enough time? What is the appropriate place for a special material or project work? Is library work necessary?
3. **Reviewing the necessary skills:** How much do students know how to benefit from a library for this project? Are they skilled enough to carry out the tasks?
4. **Designing the activities:** This is the step where one should be sure of the fact that the activities will meet the goals.

By means of project works, students develop skills such as examining a problem or a matter, arranging result, putting the data in a graphic form. On the other hand, a project can be in two different forms and both forms can be used at schools: (1) classical project which is effective in learning scientific study and (2) creative project which is effective in producing new and original ideas. Both types of projects are important in the process of learning and motivate students for new learnings.

In other words, projects can be accepted as an opportunity for individual learnings. In the course of teaching, these opportunities presented to students can be developed by means of ensuring students to believe in themselves about achieving the goal and to see where and how they will use what they have learnt.

Project should be designed so that a connection can be established between activities and basic conceptual knowledge that is aimed to be developed. At this point, a problem that is not well defined has quite an important function.
Some of the features of a project are as below:

- Projects should ensure students to join a constructivist research. Students should construct knowledge within the scope of central activities of the project.
- Students to a great extent should direct projects. In these projects, students choose, they have got a deadline for studying and they take responsibility. Traditional projects do not have these features.
- Projects are realistic. Projects have features that ensure originality. These features include subject, tasks, the role of students, the context in which the project will be carried out, the people with whom students will be in the project, the products, the target audience of the products that will come out at the end of the project or criteria which will be used to evaluate products (performances).

In brief, projects are very important for teachers when they are used effectively and they have really got a strong impact when they are used correctly.

Within the framework of project based learning (PBL), project is the basic teaching strategy; students learn the basic concepts of the related area. When the projects from which students learn are out of programme or are "enriched projects", this technique is not PBL. PBL projects focus on questions and problems that ensure students to come across central concepts and principles of an area. PBL is one of the teaching approaches that can be used to provide students with such opportunities.

WHAT IS PROJECT BASED LEARNING (PBL)?

One of the oldest programming approaches is known to be "project work". It is clear that Project Based Learning, which has been accepted to be one of the modern teaching approaches, is also a subject studied by John Dewey at the beginning of the 20th century. On the other hand, it can be said that PBL is a synthesis of project implementations of the past.

In terms of philosophical fundamentals of Project Based Learning, teaching trends of pragmatism and progressivism have impact on them. As is known, while pragmatism centers the learner, defines the teacher as a guide in this process, centers the interests and skills of learner as the core of the programme, progressivism emphasizes that education is not a period of preparation for the life, but it is the life itself. Moreover, constructivist approach is also influential in PBL approach.

PBL displays the features of a constructivist approach as a student-centered approach. However, PBL does not have a common model or theory. Because of this reason, a lot of various PBL researches have been carried out. This causes difficulty in studying the researches that have been carried out. For example, it is difficult to determine what is a PBL. In other words, it is difficult to differentiate PBL and "a real project." On the other hand, there are some PBL implementations although they are not called PBL. These implementations are called "purposeful learning" or "problem-based learning".

Different educators emphasizing the similar themes define project Based Learning Approach. For example, Project Based Learning (PBL) can be defined as "a model that organized learning depending on projects".

Another definition is that PBL is a learning approach which puts forth that learners try to solve a problem they can come across in real life by means of establishing relations between different disciplines and handling the problem in the framework of a scenario in a class environment.

PBL can also be described as an approach that envisages the students to solve a problem depending on concepts and principles they have learnt in different disciplines, to project a research individually or in groups in order to reveal a product and to carry out studies using scientific methods. PBL comprises real situations where the focus is an original question or problem, and where there is a possibility to implement solutions. Five criteria that define project based learning are as below:

1. PBL projects are not out of the programme, but they are in the center of it.
2. Students of PBL projects focus on questions or problems in order to come across basic concepts and principles of a discipline.
3. Projects ensure students to carry out a structuralist study.
4. The students carry out projects.
5. Projects are realistic.

The three concepts that constitute the core elements of Project Based Learning Approach emphasize that: (1) PROJECT: project is a design, (2) BASED: project is a process, (3) LEARNING: the approach is student-centered. Learners join a research by means of asking important and meaningful questions according to PBL approach. In the course of this research, students ask questions, guess, design research, collect and analyze data, use technology, form a product and share their ideas. Some of the features of project based learning are original content, original evaluation, and teachers as facilitating but not directing the process, clear educational goals, learning based on cooperation, using deep thinking and adults’ skills.

In the process of project-based learning (PBL), students understand a subject matter better since they learn through doing and experiencing. Indeed, it is not new to have students carry out project works. On the contrary, carrying out project works at school and developing interdisciplinary subjects have a long past.

PBL is an interdisciplinary method. Subject matters of a project can be studied independently while they can also be studied in relation to a lesson. However, the theme of the project is searched by means of establishing a relation with other disciplines no matter how it is planned. By means of PBL, students also learn how to establish a relation between lessons such as maths, social sciences, and science while trying to find a solution for the problem on which they are carrying out a study. During this process, students establish inter-disciplinary relations themselves by means of using information they have learnt and reached before.

In the course of project based learning, students build knowledge and make new decisions by using their research and background information. Thus, their motivation increases in terms of studying and learning, other skills such as strategic thinking and guessing also develop. Students learn more voluntarily since the project subjects address real life in PBL. Students learn how to reach different resources, how to benefit from different resources in the course of PBL. Students reach written, visual, electronic, etc. resources and try to find a solution related to the subjects or problems on which they study within the framework of a project and thus their skill to gather data and use the data in line with the problem develops.

Implementing PBL in class also requires some amendments on the organization of the class. For example, if a learning environment has to be created by using this approach, students should be arranged to sit in groups in class. This kind of arrangement will facilitate students’ discussing among themselves, sharing information and producing solution offers by thinking together.

On the other hand, PBL can be carried out individually, as a whole class or as team works. Thus, when PBL is designed as an individual task, it will maintain the development of independent working skills and when PBL is designed as team works, it will maintain the development of students’ skill to work in groups as a team.

In brief, some of the leading features of Project Based Learning can be summarized as below:
- Planning and implementing PBL is not so easy. Especially, it can be difficult to plan, manage or evaluate PBL and it is necessary to implement PBL in a supportive context in order to diminish these difficulties.
- In PBL, there are some cases where students have difficulty in benefiting from situations, which they direct themselves especially when complex projects are in question. The leading difficulties faced by students are starting and directing the research, time management and using technology...
effectively. It is necessary to have students gain a lot of values such as helping them to learn how
to learn for PBL to be effective as a teaching method.

- Students and teachers believe that PBL is beneficial and effective as a teaching method. According to direct and indirect findings gained from students and teachers, PBL is a more popular method than traditional methods.
- According to the results of some PBL researches, PBL has got some beneficial but unintentional results. Some of these are like that: increasing the communication between students and teachers, increasing the rate of students’ attendance to school and taking responsibility and improving the attitudes towards learning.
- PBL is also either a bit better or equal to teaching methods about achieving acquisition in general academic success.
- According to the findings reached with the studies that do not include comparison group, PBL is an effective method to teach some complex processes such as problem solving, planning and decision making to the students.
- There are some evidences, which prove that PBL is more valuable than other traditional methods about increasing the quality of learning.

**STEPS OF PROJECT BASED LEARNING**

One of the most important elements of project-based learning is projects around which students will carry out their studies. It is not easy to determine the scope of the project. Because of this reason, study plan should be prepared clearly with the guidance of the teacher and this plan should be followed regularly. At this point, steps to prepare a project should be considered. The steps stated below should be kept in mind in the process of running individual or group projects:

1. **Determining the theme and sub-themes, and making groups:** Students can offer questions for a framework project after searching various resources. Questions are classified by means of creating interesting problems. Students contribute to the formation of project groups.
2. **Groups prepare project plans:** The members of the group prepare a project plan all together. They seek answers for the questions such as where and how they will go, what they will learn. They choose resources, define roles and distribute plans by means of planning their studies. Thus, they do division of labour among themselves.
3. **Implementing the project:** The members of the group analyze the data and information in an organized way. They seek answers for the questions, collect data, organize information, interview with the resource people, combine and summarize their findings.
4. **Planning the presentation:** Students decide on the basic points of the presentation. They ensure preparation of materials necessary for presentation after planning what kind of a presentation will be made.
5. **Making a presentation:** Presentations are made in class and in other previously determined places (in other classes, at other schools, etc.) and a feedback is given to the class.
6. **Evaluation:** Students share the feedback about the project and they do the necessary comments with the teacher and other students.

These steps can also be listed similarly as follow: (1) Choosing the subject / problem (2) Collecting preliminary information (3) Following a scientific way (4) Preparing a study plan (5) Collecting data (6) Interpreting the data (7) Deducing results and suggestions (8) Writing a report (9) Preparing a board (10) Making an example presentation.

The main steps of PBL learning can be listed differently as below (002): (1) determining the goals (2) determining and defining the job to be done or the subject to be handled (3) forming teams (4) determining the features of the final report and the form of presentation (5) making a study calendar (6) determining check points (7) determining evaluation criteria and sufficiency levels (8) collecting information (9) organizing and reporting the information (10) presenting the project. Moreover, the implementation steps of project based learning approach can be handled in three steps. The steps and their features are given as a graph below.
1. **STEP**

**INITIAL PHASE**
- Teachers and students study together to choose and organize research subject.
- The teacher or the students can determine the subject. While choosing the subject, some criteria such as being related to students’ daily lives and being rich enough to do research should be kept in mind.
- The teacher brainstorms with students and forms a mind map of sub-themes related to the subject. The questions to be used throughout the research are determined.

2. **STEP**

**FIELD SURVEY**
- Generally, field trips and direct research are carried out to search the previously determined project subject.
- Mostly students are active.
- Students do research, note their observations, form models and record the results.

3. **STEP**

**SUMMARIZING AND CONCLUDING**
- Students prepare and present a report related to their findings.
- At the phase of presenting the report, all the studies carried out throughout the project are shared and evaluated with the class.

If the content of teaching is in line with the expectations and goals of the student, the active participation of students and thus the level of learning increases.

**THE BENEFITS OF PROJECT BASED LEARNING**

Project based learning is said to have a lot of benefits in terms of learning. For example, four benefits of PBL for students can be explained as below:

1. Learners combine the content and process, and thus they develop a situation of deep understanding,
2. Students learn to study together in order to solve problems. This process of studying together requires to share ideas in order to find answers for the questions,
3. This approach improves responsibility and team work,
4. Needs of many different students are met since students carry out different tasks according to this approach.

Some other benefits of project based learning for students can be listed as below:

- **PBL**;
  - ensures deep understanding of the subject and concepts,
  - ensures students to get interested in the subjects of the field and thus to learn more easily,
  - ensures students to improve their skills to work all together,
  - develops the permanency of knowledge and skills and the skill to use them in new situations,
  - develops the advanced cognitive skills of students such as data analysis, problem solving, etc. and ensures the increase of students’ responsibility towards their physical-social environment,
  - increases students’ motivations and ensures the creation of new interest areas,
  - develops students’ skills to make a decision,
  - ensures the development of students’ skill of self-management,
  - helps students to form and improve critical thinking skills,
  - helps students to participate in the process of project actively and to shape their ideas,
  - helps students to reveal their interests and skills,
LEARNING AND Teaching : THEORIES, APPROACHES AND MODELS

- helps students to gain life skills (planning, etc.)
- helps students to use the information and skill they have gained by means of transferring to real life,
- helps students to learn how to understand the relationship between different disciplines and benefit from this in the process of problem solving,
- helps students to combine application and theory,
- develops students’ study skills,
- helps students to learn how to work as a team and take different responsibilities,
- ensures the development of students’ advanced thinking skills,
- ensures the decrease in negative behaviours in and out of class, and thus helps teachers about class-management,
- helps students to improve their research skills,
- helps students to learn how to evaluate their own and each other’s studies,
- offers multiple ways in order for the students to reflect their information and to join,
- helps students to learn and develop the problem solving techniques and the steps of scientific method.

Resources: (51,52,53,54,55,56).

This list shows that project based learning ensures multi-dimensional benefits for students. It shows that project based learning has benefits in terms of different dimensions when each of the clauses are examined.

It is possible to explain these benefits of PBL as various skills that develop in students:

- **Vital skills**: managing a meeting, preparing a budget, making a plan, etc.
- **The skill of using technology**: using computer, television, radio, video, etc.
- **The skills of cognitive process**: Decision making, critical thinking, etc.
- **Self-control skills**: setting goals, organizing processes, time management.
- **Attitudes**: interest in and curiosity about learning, etc.
- **Tendencies**: self-control, the feeling of success.

These skills are also important in that they are some features, which are important all throughout life.

**THE LIMITS OF PROJECT BASED LEARNING**

As project based learning is an approach that focuses on deep research, this approach of research may also require doing some changes in class environment. Since different students will do researches on different subjects, the role of the teacher will also change just like students’ roles change. This process should develop slowly in class, because the process of deep research will require more time to understand a subject. In this case, it is very important to design the projects so as to realize the goals of the programme. Another important point is that since students will join the study in groups or as a team according to PBL, it will provide great advantage if the students have got the habit and skills to carry out group work beforehand.

As is clear, project based learning has some limits as well as benefits. The format of team work can be difficult for students who are used to individual studying more. On the other hand, it may be difficult to determine how much the students contribute to the study in the course of the project unless an effective evaluation is carried out. Moreover, PBL can be accepted as a time-consuming approach.

A limit with a few dimensions may exist in teaching with PBL. The content knowledge of the teacher, students’ inexperince about this approach and so their choice of more traditional approaches, their preference of less demanding learning environments, time concerns can be included in these limits. Some of the situations that can be accepted as the limits of project based learning include:

- It may take a long time for students to complete the project.
- If the project is carried out of teacher's guidance, some important problems may arise.
- Some students may have difficulty in finding a project subject.
- It may increase teacher’s workload and responsibility.
LEARNING AND TEACHING : THEORIES, APPROACHES AND MODELS

- It may be time-consuming to control students’ studies.
- It requires necessary materials for the study to be ready.
- Time dedicated to learning may be longer.
- If the boundaries of the study cannot be defined well, divagation and breaking down can be inevitable (60, 61, 62).

In brief, if an effective plan is not made, students can have some troubles. In this case, the limits of PBL instead of its benefit come into prominence.

EVALUATION IN THE PROCESS OF PROJECT BASED LEARNING

The final phase of learning process is evaluation. One of the indispensable elements of project based learning is also evaluation. Evaluation is carried out for different purposes. One of purposes of evaluation is to help learners in the process of learning. In the process of project work, students are evaluated according to whom they study, how they carry on their studies and how they finalize their studies. Since the process of project-based learning is different from that of traditional learning, the roles of the learners have changed as mentioned before. Students are not passive any more they are active now. Students also keep their active roles in the process of evaluation. Students can join the evaluation individually or in groups. Another advantage of the learners in project-based learning is that they can get an instant comment, contribution, feedback or an evaluation related to an amendment63.

Within the framework of project based learning, students can also be evaluated through different techniques such as evaluation based on sample situation, individual and peer evaluation, performance evaluation and evaluation of developments which are also used in traditional methods. According to the related body of literature, traditional evaluation techniques are less appropriate techniques in order to evaluate concepts and skills gained through project based learning approach64.

In the course of PBL, evaluation develops in a different manner. In other words, the dimension of evaluation within project based learning approach has got a different structure when compared to traditional teaching approach. Evaluation is effective throughout all the steps from the beginning to the end of the process in PBL. In this approach, it is emphasized that evaluating students’ level of success at the end of learning process is not sufficient, so it is necessary to evaluate all throughout the process from the beginning to the end. In project based learning, a lot of techniques can be made use of such as written homeworks, observation, presentation, and discussion.

When a teacher uses project based learning techniques, she/he can make use of the criteria stated below in the process of evaluation65:

- Defining the project well in a written format and giving the necessary details for this
- Ensuring the evaluation to be transparent and complying with the criteria set at the beginning
- Ensuring the goals of the project to be clear and funny
- Students’ sufficiency for the tasks defined in the project
- Sufficiency of resources
- Ensuring students’ motivation of students for the job in the course of the development of the project
- Ensuring all students to complete the project successfully
- Commenting on the good and bad features of the project in the course of evaluation
- Checking what students have learnt from the project

In brief, evaluation is very important PBL. PBL implementations should certainly be evaluated. Does it make any difference on students’ attitudes and behaviours about learning to have learning experiences based on this approach? Do the critical thinking skills of students develop? Such questions should be answered through studies66.
THE ROLE OF THE TEACHER IN PROJECT BASED LEARNING

Teachers have important roles in project studies. Some problems may arise especially when the job of designing the project is merely carried out by the student. Students can misinterpret and misunderstand the given task, or they may fail because of following a wrong path. In other words, students may define the task in a completely different manner from what the teacher expects. Students’ long hours of studying may result in failure. Although it can be defined as a mistake on a technical level, none of the students would like to be unsuccessful after long hours of studying. This situation may also create a negative atmosphere about motivation towards learning. In this sense, the teacher should be a good motivator throughout the project process, which is already one of the expected roles of the teacher.

The teacher has got a lot of roles in learning process. The teacher can make the scope of teaching suitable for children’s goals by means of various ways. Thus, she/he can ensure their effective and meaningful participation. According to PBL, the teacher does not transfer information directly, she/he just guides students and helps students to structure knowledge. The role of the teacher has changed according to PBL. The teacher is no more a person who just lectures or is interested in teaching but also a person who supplies resources, shapes learning atmosphere, acts a guide. Some of the problems faced by the teacher while implementing PBL can be classified under five dimensions:

Time:
It may take longer to implement a deepening teaching-learning approach such as PBL.

Class Management:
The teacher should establish a balance between students’ need to study on their own and the need to keep the order in order to help students to study beamly.

Supporting learning:
Students should not be given too much independence or too little feedback; they should be supported when and where necessary.

Benefiting from technology:
Teachers have difficulty in using technology especially as a cognitive means.

Evaluation:
Teachers have difficulty in designing types of evaluation through which students can display what they understand from their studies in PBL implementations.

On the other hand, the advantages of PBL for the teacher can be summarized under three headings:

1. Teachers may find such kinds of studies entertaining and interesting, as teaching will be different every time because of the new projects they find.
2. The teacher gains new ideas continuously in PBL.
3. The problems about class management and discipline will diminish when students are involved in teaching environment.

Briefly, students carry out the projects in PBL implementations and the projects are long-term; it may take one term or two terms. In the process, the teachers has got a role who facilitates the process of learning or guides; namely, students take on the role of searching for knowledge instead of receiving knowledge directly.

Another role of teachers in PBL is to prepare a document, which tells students what to do for the project. Such a document to be prepared for each study can be distributed to students; thus, they may have a written guide about what to do. In such a document:

1. The goals and aims of the project should be defined clearly.
2. The tasks should be emphasized clearly.
3. There should be a draft for the criteria to be considered at the end of the project.
4. The role of the participants and resources should be specified.
5. Timing information (the deadline for the project, the implementations to be done when the project is delivered in time, etc.) for the project should be set clearly.

As a result, if the teachers have got a strong motivation coming from their experiences, PBL can ensure the expected benefits for students and thus PBL can enrich their experiences more and more. Teachers take action for the projects based on certain principles in the course of design. These principles are as below:

1. **Defining the problem:** PBL has a meaningful problem as its basis. Projects start with an original subject or an important concept. Because of this reason, the problem or matter should be defined well at the beginning.
2. **Designing important questions:** A teacher runs the project on a purpose in PBL. The teacher defined what he/she expects from the students at the end of the project.
3. **Structuring the process of evaluation:** Students produce a result in PBL. The products of students are evaluated according to the criteria set at the beginning of the project.
4. **Retroactive plan:** At the end of PBL, enlarged learning experiences based on not only the end product but also on the process are gained. The teacher should be the one who directs his/her students throughout the project at this point.
5. **Being involved and studying:** The teacher should give importance to students’ wishes and choices and should arrange timing information.
6. **Setting the teams:** It is very important to direct the teams for a better performance in order to ensure a successful project.
7. **Thinking of the end of the project:** The process of PBL is an indirect process of problem solving and it may differentiate. In this process, a good teacher knows how to manage the flow of study through projects and prepares the students to do their best at the end of the project.

**RELATED STUDIES**

In a research carried out by Meyer et al., the problems faced by 14 fifth and sixth class students within the process of project based maths teaching were researched in five dimensions: taking academic risks, goals of success, self-sufficiency, will and influence. The data was collected through qualitative and quantitative techniques. The study resulted in important clues in terms of examining how students coped with problems in the course of academic studies such as project-based learning. The results of the study showed that motivation, will and influence played an important role in students’ decision-making process. Although students are motivated to complete their projects, their goals and intentional strategies are different. Moreover, the importance of preparations for the project study such as the questions asked by the teacher in project-based learning has been emphasized.

In another study, Krajcik et al. carried out a case study on eight students. These students were registered to two different seventh grade science classes. According to the findings of this study, students were proficient enough at the steps of making a plan and realizing this plan. However, they had difficulty in (a) making meaningful scientific questions (b) managing time and complexity (c) using the data (d) developing a logical discussion to support the claims. Throughout the process, students made questions without examining the positive sides of the problem and they prepared questions according to personal preference rather than scientific content. They created research designs insufficient for the research questions they had prepared, they developed incomplete plans in terms of collecting data, they came to results without establishing a connection with the questions and they did not generally use all the data while coming to the conclusion. This result shows that students should be supported in the course of research.

In another research, Korkmaz and Kaptan aimed at determining the impact of PBL approach in primary school science lessons on the academic successes, academic self-concepts and working hours of seventh grade students. Experimental design was used in the research. While science was taught by means of using PBL in experimental group, traditional methods were used during the lesson in the control group. The findings of the research show that there is a meaningful difference between the two groups to the favour of experimental group.
Özdemir\textsuperscript{81} investigated the impact of project based learning on the success of seventh grade students in geometry lesson and their attitudes towards geometry. In the research conducted at a private school with seventh grade students (n=24), the design of preliminary test and proof test with single group was implemented. Success tests of polygons, circles and cylinders apart from attitude scale of geometry, students’ feedback form, teacher’s observation scale and interviews were used in order to collect data. The findings show that project based learning improves the students’ success of geometry and their attitudes towards geometry. Some of the factors that create this result are that: students constitute their own models, they deal with daily life problems that do not have just one solution and they decide on dimensions and areas through trial and error method. Moreover, it has also been observed that poor performing students’ interests and wills to study have increased to a great extent.

In another research about PBL implementations, Moran\textsuperscript{82} studied with 24 teacher candidates who had been lectured on “methods of preschool teaching.” The teacher candidates were randomly divided into groups of three or four. Teaching teams composed of each group carried out a project study with a small group of preschool students for six weeks. Ten volunteer candidates were involved in investigatory interviews. Here, the role of the candidates’ educator was to provide the candidates with an atmosphere where they could form their own knowledge about learning and teaching process. However, at this step, since the candidates were accustomed to being presented ready information, they had difficulty in forming the information on their own. Because of this reason, it was very useful to have educator be ready there in order to guide the groups during the study in terms of finding answers for candidates’ questions. But, in time, candidates started to be producers of potential new information about teaching by means of benefiting from their own experiences related to the situation. Throughout the research, the study of 15 weeks conducted with the candidates was carried out in three steps: 1. The phase of orientation: during this period which lasted 5-6 weeks, candidate wrote diaries, observed the children, recorded children’s speaking and prepared documents. They watched the videos with a critical point of view. Thus, they experienced a preparation period to choose a project subject for themselves. 2. The phase of implementation: during the second step which lasted the next 6 weeks, the teams composed of 3-4 candidates implemented their projects together. The main focus of the lessons at this second step was that the candidates used class documents as a guide during the research. 3. The phase of interpretation: at this last step, teaching teams examined their projects for the last time for the sake of oral presentation and written reports. It supplied a lot of analytical tools, strategies and materials for the lesson to study in that way. In addition to this, candidates realized the importance and need to share responsibilities as a team while making decisions related to the programme.

Yıldırım\textsuperscript{83} aimed at revealing the level of achieving research skills intended to be gained by 4. grade students by means of project based learning model and to determine the factors that influenced this level. Qualitative and quantitative methods were used in the research, which was designed test model. According to the findings, there was a meaningful difference between the research skills of students for whom PBL was implemented and the research skills of the students in the control group to the favour of experimental group. The students involved in PBL implementation stated that they found their level above average in self and group evaluation in terms of research skills whereas the teacher found the students below the average according to his/her own evaluation results. When the students of the experimental group were interviewed, they stated their satisfaction with cases such as participating in a project study, activities of research process, forming a project, reaching new information, learning solidarity, experiencing the feeling of success and the increase in their self-confidence.

In another study, Aladağ\textsuperscript{84} examined the effect of PBL approach on the academic success of 4\textsuperscript{th} grade students about teaching maths. The design of preliminary test- proof test with a control group was used in the research, which was carried out by means of using experimental design. According to the results, there was a meaningful difference between the success levels of students to the favour of the students who were in class of PBL.
In another study by which the effectiveness of implementing integrated teaching programme with an approach based on cooperation and project based learning method was investigated, Demirci5 observed that the features (academic success, self-confidence, affective and social developments of students) observed when integrated teaching programme is implemented through learning techniques based on cooperation and the approach of project based learning are proved to be more effective.

Another set of studies investigated students’ views about PBL. Some of the examples of these findings are stated as below.

Başbay and Ateş86 reached to the conclusion that students had a positive opinion about PBL after the interviews with the students. Students emphasized that they could learn by means of using their own experiences with this approach, that they could learn how to study, that they had great time while learning, etc. Similarly, Wedel and others87 conducted a research in which students emphasized that they could learn more in lesson of PBL when compared to other ones. In the study conducted by Frank and Barzilai88, students also emphasized that they could establish an inter-disciplinary relation with PBL and they could develop this dimension that they could improve themselves to find solutions for different situations, that their self-confidence about learning increased.

In another study, by Lam et al.89, the elements that contributed to the motivation of teacher about implementing PBL were investigated. 182 teachers participated in this study, which was conducted in Hong Kong. Teachers expressed their opinions through questionnaires. The design of structural equality was used in the study. According to the results of the study, teachers perceived their schools as supportive for teacher sufficiency and so they had a higher motivation for implementing PBL. Moreover, the teachers participating in the study volunteered for educational innovations and social factors were also important about motivating teachers to implement educational innovations.

In another study on project based learning, Panasan and Nuangchaleerm90 compared critical thinking and scientific process skills and learning successes of 5. Grade students who learnt through activities based on project based learning and research. The researchers divided 44 students into two groups. According to the findings, both project based and research based learning approaches had great impact on students’ learning success and skills in terms of effectiveness.

Boundee et al.91 designed a learning-teaching model that would develop the cooperation-based learning of technical college students by means of using PBL on the web. The students were instructed to form projects by means of studying on the web together. This model increased students’ real participation to the learning process and their motivation. Moreover, this model also helped students to develop cooperative study skills that would be useful for them in their daily lives and after graduation.

In another study on this subject, Dağ and Durdu92 received teacher candidates' opinions on the process of project based learning. In the study, which was conducted with the participation of 364 prospective teachers, the opinions of the candidates were studied under sub-dimensions such as the skills of group work and cooperation, research, resource, skills of time management and academic skills. In this study, a teaching period where PBL was used within the scope of computer lesson lectured in the faculties of education was designed. The results depending on the analysis of implemented questionnaires showed that students’ skill to work in groups changed in a positive manner with project study while students had problems about sharing and carrying out tasks.

Doubtlessly, the studies on project-based learning are limited to the ones stated here. Researchers have carried out studies related to PBL implementations in many various disciplines (93,94,95) and they have studied with students of all grades (96) about project-based learning. Especially as a result of implementing this approach in primary and secondary schools, effective results have come out about communication and understanding (97). Likewise, the reformative attempts about teaching maths...
started by maths teachers’ council (1989) emphasize the importance of leaving memorization aside and making use of deeper learning methods such as application and problem solving. One of the ways to achieve these goals is to make use of project based learning designed for the purpose of having students involved in examining “original problems”.

It is definitely impossible to mention all the studies carried out about project based learning here. However, as can be understood from the given examples, project based learning is used at all levels from preschool teaching to university education. But, the success of PBL is parallel to teachers’ knowing PBL well and using it in education in line with its principles.

**SUMMARY**

PBL is a method of learning, which accepts students as the center of learning process. The teacher guides students who follows the goals of the project or who design their own learning in a class where PBL is used. As emphasized by Dewey (1938), PBL is one of the educational approaches in which applied experiences are of vital importance in learning. PBL is a new approach which is student-centered and which operates with the guidance of the teacher. According to PBL approach, students form their own learning by means of producing projects that reflect their knowledge and doing research in teams as well as directing it by means of questioning. In other words, PBL is a learning model, which is arranged around projects. PBL is based on problems and research questions that are formed with the contribution of students. There is research in the core of projects. Students determine the question they will search about with the guidance of the teacher. However, the key factor in this approach is student’s own choice. The factor of choice is very important for student's success. The teacher controls all steps of the process. Students can have a deep understanding about a subject, they do deep reading about the subject and they are more motivated to learn with PBL. One of the key roles of PBL in learning is to bring up individuals who can think and learn effectively. Children solve real life problems by means of designing their own ways of search, they plan their own learning, and they use multi-dimensional learning strategies.

PBL can be defined as an educational innovation that combines theory and application by means of using real life problems as a tool. In other words, project based learning is learner-focused strategy and it is an approach depending on gaining or forming knowledge through projects and transferring and using this knowledge when necessary. The use of PBL in the implementation period also ensures those who study for this project to focus on reflective studies. In other words, those who join the project by means of reflective applications can easily catch the products of project experience and the meaning of the project. Reflection is necessary for learning to turn wordless expressions into a clear information. In this sense, projects can be used as a tool to form reflective applications, to focus on research at all stages and to reach a common understanding. All these prove the importance of reflective applications for project-based learning. Those who learn through reflective applications can develop a multi-dimensional point of view, and this plays a facilitating role that will help them to struggle the problems they face. Moreover, some features such as using original question, using study society and technology-based tools attract attention about the definitions of project-based learning.

One of the important points of PBL is that there is no standard structure in a learning based on such an approach. There is a more complex way of study in PBL and processes take longer time. In general, PBL has got a flexible structure. It develops interaction between learners and the teacher as well as between learners themselves in the process of learning besides improving the skills of cooperative working. When learners complete their projects, they feel about the job they have done and this feeling motivates them to produce better projects in the future.

As a result, project based learning is a strong teaching strategy that encourages students to learn, that motivates them to learn by understanding, that arouses curiosity, that helps students to explore, that provides the students with the skills of problem solving and presents students the chance of implementing what they have learnt. PBL can be used effectively almost at all levels starting from
primary school. It is also clear that PBL is used in many disciplines at universities today. Student-centered approaches, models, methods are tried and used in many fields. For example, student-centered approached are used to prepare students for their professions in engineering. Moreover, PBL comes to the forefront in many educational systems all over the world. For example, in Hong Kong education reform offer, PBL is defined as a teaching strategy that helps students to associate knowledge, skills, values and attitudes, and to form knowledge through various learning experiences.

Because of this reason, it will be possible to benefit from this approach more effectively just by means of knowing all the principles, advantages and limits of this approach and evaluating all these in terms of learning environments to be designed. It should be kept in mind that to know and to do are two different concepts. PBL is a teaching-learning model that puts these two concepts together.

REFERENCES

6. Saban, A., Mentioned Source
9. Petty, G., Mentioned Source
15. Petty, G., Mentioned Source
16. Saracaloğlu, S., Özyılmaz Akamca, G., Yeşildere, S., Mentioned Source
19. Senemoğlu, N., Mentioned Source
20. Th omas, J.W., Mentioned Source
21. Petty, G., Mentioned Source
22. Th omas, J.W., Mentioned Source
27. Th omas, J.W., Mentioned Source
28. Th omas, J.W., Mentioned Source
29. Başbay, M., Mentioned Source
31. Th omas, J.W., Mentioned Source
34. Th omas, J.W., Mentioned Source
35. Saracaloğlu, S., Özylíma Akamca, G., Yeşildere, S., Mentioned Source
36. Th omas, J.W., Mentioned Source
37. Doğanay, A. ve Tok, Ş., Mentioned Source
38. Saracaloğlu, S., Özylíma Akamca, G., Yeşildere, S., Mentioned Source
39. Gözütok, D., Mentioned Source
40. Saracaloğlu, S., Özylíma Akamca, G., Yeşildere, S., Mentioned Source
41. Doğanay, A. ve Tok, Ş, Mentioned Source
43. Th omas, J.W., Mentioned Source
44. Gözütok, D., Mentioned Source
47. Erdem, M. ve Akkoyunlu, B., Mentioned Source
48. Çıbık, S.A., Mentioned Source
49. Senemoğlu, N. Mentioned Source
50. Frank, M. & Barzilai, A., Mentioned Source
51. Reece, I. & Walker, S., Mentioned Source
52. Th omas, J.W., Mentioned Source
54. Saracaloğlu, S., Özylíma Akamca, G., Yeşildere, S., Mentioned Source
55. Gözütok, D., Mentioned Source
56. Başbay, M. ve Ateş, A., Mentioned Source
57. Çıbık, S.A., Mentioned Source
59. Frank, M. & Barzilai, A., Mentioned Source
60. Reece, I. & Walker, S., Mentioned Source
62. Çıbık, S.A., Mentioned Source
65. Petty, G., Mentioned Source
67. Petty, G., Mentioned Source
69. Senemoğlu, N., Mentioned Source
71. Frank, M. & Barzilai, A., Mentioned Source
72. Th omas, J.W., Mentioned Source
73. Frank, M. & Barzilai, A., Mentioned Source
74. Th omson, K.J. & Beak, J., Mentioned Source
75. Petty, G., Mentioned Source
79. Th omas, J.W., Mentioned Source
80. Korrmaz, H. ve Kaptan, F., Mentioned Source
86. Başbay, M. ve Ateş, A., Mentioned Source
88. Frank, M. & Barzilai, A., Mentioned Source
89. Lam, S-f., Cheng, R.W-y., & Choy, H.C., Mentioned Source


95. Thompson, K.J. & Beak, J., Mentioned Source

96. Thompson, K.J. & Beak, J. Mentioned Source

97. Th omas, J.W., Mentioned Source


100. Lam, S-f., Cheng, R.W-y., & Choy, H.C., Mentioned Source


107. Thomas, J.W., Mentioned Source


109. Çıbık, S.A. Mentioned Source


111. Lam, S-f., Cheng, R.W-y., & Choy, H.C., Mentioned Source

112. Markham, T., Mentioned Source
CHAPTER 8: MASTERY LEARNING MODEL

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(INTRODUCED BY SEDA DURAL)

INTRODUCTION

The models of Tyler, Bloom and Carroll that made an echo in the world of education from 1949 to 1964¹ 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 methods⁵.

Although there are crucial factors like other students, printed materials⁶, the physical features of the classes, family, counseling, peer groups, the features of teachers and the education opportunities⁷ 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,⁶,⁷.

Walberg and his friends¹⁰, 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 psychology¹¹,¹².

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:
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.
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. These achievement indicators acquired in various stages of learning show that there are growing differences among individuals. It is accepted that those who are deprived 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.
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 minimized21. 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 variable23.

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.

**Cues**

**Participation**

**Reinforcing**

**Feedback and Correction**

**Learning Level and Type**

**Learning Speed**

**Affective Outcomes**

Figure 1: Mastery Learning
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.

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 assure that 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. 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.

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. According to Fidan (1982) cues are “the messages which are impellent and help the desired behaviors happen”. Cue involves the signs and explanations showing the students what to do and how to do during the teaching-learning process. 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 certainty.

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”. Participation is the effort of the student for learning in accordance with cues and guidelines. 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

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

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.

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
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 achievement.

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. 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 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.

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”.

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 masterd 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.

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.

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.

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\textsuperscript{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\textsuperscript{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\textsuperscript{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\textsuperscript{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\textsuperscript{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\textsuperscript{54}.

REFERENCES


CHAPTER 9: CONSTRUCTIVIST APPROACH

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COGNITIVE DEVELOPMENT

The studies of cognitive development deal with how thinking processes of children change in time. Cognition includes the acquisition and usage of the knowledge. Cognition includes not only the processes, which are purposeful and needs diligence bearing decision within but also processes that automatically performed and unconsciously remembrance of any familiar face and object. Cognition cannot be observed directly but it is understood as a result of behaviors. Development defines the changes in construction and function. Cognition studies emerged with the cognitive psychology (and cognitive development) in the 1950-1960s.¹

BASIC ASSUMPTIONS OF COGNITIVE PSYCHOLOGY

The basic assumptions related to learning of cognitive psychology can be summarized as follows.

- Cognitive processes affects how and what is learned. Cognitive psychologists bring many explanations how the human processes the knowledge in his mind. It is the Information Processing Theory that brings these explanations together. According to this;
  - People learn easier if they associate the new knowledge with their prior ones.
  - If they can combine many independent pieces of knowledge by associating them with each other, people learn these pieces of knowledge easier.
- People have the chance to choose what and how they process and learn. When they are exposed to infinite number of stimulus, people pay attention to only a small part of them or just one of them. They have to make a choice for life or for a more comfortable life. When students are exposed to knowledge constantly, the thing that must done in terms of education is to make them aware of that they don't have to learn everything and to help them in choosing which stimulus they should or shouldn't pay attention to.
- Knowledge is not acquired directly from the environment; instead the learner constructs it. Some cognitive theorists emphasize especially issues related to learner's construction of knowledge and these theories are known as Constructivist Theories. Construction process is at the heart of many cognitive learning theories. A person uses a great number of different knowledge to make sense of his environment, learn and explain what is going on around. At the end of teaching, knowledge is constructed not just as it is presented before, on the contrary it is constructed as suitable for every learner's own mental structure but as different from each other. This makes it essential that during the teaching process it should be determined through questions what the learner have learned and corrections should be made when necessary in order to reach common learning.
- Prior learning and beliefs affect how people construct knowledge in their mind. Main reason for learning different things of students in a class at the end of the teaching process is that each of them has different previous learning and different beliefs. Every student has his or her own experiences and diverse environmental and cultural properties. Many cognitive psychologists believe that knowledge existing in the mind determines what will be learned from new experiences and how effective the learning will be.
**LEARNING AND TEACHING : THEORIES, APPROACHES AND MODELS**

- People participate in their own learning processes in an active way. Cognitive psychologists do not believe that people acquire and internalize the knowledge just as it is. Instead, people take part in their learning processes actively.  

**SOME BASIC TERMS USED IN COGNITIVE PSYCHOLOGY**

Four important terms used in cognitive psychology are memory, storing, encoding and retrieving.

1. Memory: It includes the process of storing learned information, the places where information stored — short term (active) memory and long term memory — and skills.
2. Storing: The term — storing — means acquisition of new information and it expresses storing the learned information in memory.
3. Encoding: Knowledge mostly is not acquired as it exists in the environment but it is encoded in memory in a different way — changed and modified (depending on prior learning, beliefs etc.).
4. Retrieving: It is the retrieval and recall of the information stored before. In other words it is the finding of knowledge stored in memory. The recall process is sometimes easy; sometimes more difficult or sometimes pre-recorded information could not be reached.

As a result of studies lasting many years, psychologists have revealed many approaches and theories dealing with why and how a child's thinking processes change. Only the three of them, which are accepted more and thought as more effective — Jean Piaget, Lev Vygotsky and theories of information processing theorists—, are explained here. Each of these theories, in fact, could explain learning and cognitive development partially and it will be the introduction of a full explanation only if they are brought together harmoniously. Criticisms and additions made recently by theorists and educators to these theories and development works based on the three theories are given below.

**PIAGET’S THEORY OF COGNITIVE DEVELOPMENT**

Jean Piaget (1896-1983), one of the scientists considered as pioneers in learning and cognitive development, had worked with children for many years. Piaget revealed that some ideas and concepts including assumptions related to development of logical thinking. The major of them:

- Children, curious by nature, are active in their learning and motivated. Smedslund, a member of Piaget school, emphasizes that important cognitive process is primarily an “internal organization and coordination” about external motivation. According to Piaget, children search knowledge and make sense of the world by questioning it. In this process, children experiment — ask questions like scientists and seek answers of these questions.
- In the process of constructing knowledge, children adhere to their experiences. For instance, Piaget says it is a huge mistake to say that children learn numbers and other mathematical concepts thanks to ordinary teaching and emphasizes that crucial learning occurs with the processes which children enter independently and alone. According to these approaches, children's knowledge is constructed to form a whole but it is not independent and isolated information pile. According to Piaget, children and adults construct their own beliefs and meanings related to the world adhering to their experiences, thus Piaget's views are named as constructivist theory or constructivism.
- Knowledge, in Piaget's words, is constructed in schemas and after new learning, these schemas are organized and developed better and new connections are established. These connections develop after new experiences.
- Learning and cognitive development occurs with processes of assimilation and accommodation, which complete each other. During the process of assimilation, new information is placed in existing schema without causing any changes in it; during the process of accommodation, either existing schema is changed in the form of including the new information or a new schema is established for the new information. The new information is analyzed to associate by activating (remembering) the existing schemas. Thus, the occurrence of accommodation process is very unlikely without assimilation process.
LEARNING AND TEACHING: THEORIES, APPROACHES AND MODELS

For the cognitive development, an individual must communicate with his physical and social environment. On the other hand, like children and adults’ construction of the information and beliefs related to their physical environment, their own beliefs, other people’s beliefs and information about morality can be explained by constructivist approaches. Moreover social interaction is also very important for cognitive development like physical environment. Children interacting with other individuals whose views are similar or not with theirs realize that there may be new views and information and their thought and knowledge are not absolute. With this idea, Piaget pioneered to reveal the existence of information that is not compatible with the idea of “there is no true” which is the other basis constructivist approach and with the debate about proper viewing.

- Balancing process – one’s effort to keep the balance of his cognitive structures allows the development of the structures of thought. Piaget explains the concept of imbalance as the situation of mental discomfort in which new information could not be explained with the existing schemas thus assimilation process cannot be achieved. In this occasion, it is reached to balance thanks to accommodation. Piaget mentioned about a natural motivation in the elimination of the status of mental disorder caused by the status of imbalance. It can be regarded as an emphasis on the learner-centered approach.
- Knowledge is subjective because people construct it.
- Cognitive development occurs step by step. Piaget says that as a result of maturation and experience children pass four stages of cognitive development. These are sensori-motor stage (0-2 years), preoperational stage (2-7 years) and concrete operational stage (6-12 years). In preoperational stage, egocentric thinking and speech are important properties put forward by Piaget. Accordingly, children in this stage cannot look events from another’s point of view. According to this view, there is only one true and it is theirs.

THE CRITIQUES TO PIAGET

These views put forward by Piaget were criticized later in a number of aspects. Nevertheless Piaget’s views are still evaluated and they are still the source of many studies. Piaget’s views are still accepted. They are as follows:

- Children create their own cognitive structures.
- They have to associate the new experiences with the background knowledge for learning.
- They have to revise the meanings in case they come across confusing information – which don’t comply with previous learning or cannot be explained with previous learning.

One of the important critiques about the processes, which the child can’t do according to the stages of cognitive development. For instance, some studies have revealed that, in contrast to Piaget, many children in primary school have the ability of abstract thinking. Some other studies have revealed that experiences and knowledge may affect his logical thinking ability and, in the presence of experiences and enough information, it may appear earlier than Piaget’s stages.

For example D. Field and Mayer revealed that four-year old children who are in preoperational stage can learn the law of conservation which can be learned in concrete operational stage according to Piaget when they interact with the people who are experienced and know the law of conservation well.

Another criticism against Piaget is about how an important effect that interacting with people has on learning and cognitive development.

Some studies have shown that some children who have physical disabilities can learn just from their observations without experimenting. On the contrary, some studies have shown that social interaction has much more effect on learning not only with peers but also with adults than Piaget realized. The importance of the social interaction will be examined in Lev Vygotsky’s cognitive development theory.

Despite it is supported by some studies, many researches have expressed acute stages as softer than Piaget realized. Also they emphasized that Piaget could only anticipate how children may think but he
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couldn't anticipate how they think. Some studies emphasize cognitive development is dependent on conditions, subject area and culture\(^20\). Lastly, di Sessa\(^21\) said in his studies, knowledge, in contrast to Piaget, exists in the form of isolated pieces of information thus they cannot be explained in theories\(^22\).

SOME SUGGESTIONS ON THE IMPLEMENTATION OF PIAGET’S COGNITIVE DEVELOPMENT THEORY
- Especially primary school students should be encouraged to play objects (do experiments) and to make discoveries.
- In cases student shows signs of egocentric thinking, one should pretend to be astonished and also it should be expressed that other people may have different thoughts. A common egocentric thinking and an appropriate response to it are illustrated:
  - A child asks to his teacher: “What is this?” The teacher could not see the thing that the child is pointing. Therefore he demonstrates an egocentric thinking approach. Although the teacher can estimate what he is pointing to, he should say "what are you asking? I cannot see what you are looking to!" so the teacher should make him aware of different perspectives.
  - The teacher should not be contented with the answers given by them, they should be asked to explain what consequences and how they have reached them. In addition, children’s answers that do not make sense should be questioned by the teacher.
  - Teachers should be sure that students have basic scientific skills required to complete the processes set as a target for them.
  - Abstract ideas should be converted into concrete and observable events.

VYGOTSKY’S COGNITIVE DEVELOPMENT THEORY

Lev Vygotsky (1896-1934) made many studies dealing with children’s thinking – children development, learning and teaching. Vygotsky’s basic assumptions are compared here to Piaget’s. Piaget emphasizes that despite cognitive development is mostly individual (individual constructivism), elder children make mental activities on their own. But Vygotsky believes that adults in a society let the children’s cognitive development occur in a desired and systematic way (social constructivism). Adults put the children into activities strengthening them mentally and help them to achieve these activities. Vygotsky cares about spoken language. His theory is referred to as a socio-cultural approach because he, in cognitive development, emphasizes these terms through caring about society and culture.

- Adults, as a result of formal and informal communication, transfer the meanings-cultural values such as ideas, terms, terminology etc. - through language, symbols, math, art, literature and so on.
- In the early stages of childhood, thinking and language are quite dependent on each other. Vygotsky says that thinking and language are separate functions in early infancy period and thinking is not dependent on language. Language is first used as a means of communication by the child. Then, in addition the communication function the child begins to think with words. When he is about two years old and now thinking and language are associated with each other by him. In this stage, the child does self-talk-it includes an approach resembling to the explanations of Piaget’s egocentrism- and he guides and directs his own behaviors. It is considered that this guidance is similar to the guidance that adults apply to themselves and it is thought to be inspired by them.
- Complicated mental processes begin with social interactions; as children develop, they internalize the processes they have used in social situations and begin to use them independently. Vygotsky emphasizes that many mental processes are acquired as a result of social interactions. As children talk and discuss about objects and events around them with wise adults, they learn about their society and world knowledge of adults’ culture and they begin to use words, concepts, symbols and strategies that adults use. Not all mental processes develop thanks to interactions with adults; some of them develop thanks to their interactions with peers.
- Successful people’s help let students reach difficult targets. Vygotsky mentions about two different skills. One of them is actual development level meaning the top level which children can succeed without help and the other one is potential development level meaning the top level
which children can reach with the help of a person who is at a higher level. To be able to truly define a child’s development stage, both of his skills must be evaluated.

- The difficulties encountered in achieving the works contribute to the highest level of cognitive development. The works which a child could not succeed himself but could manage it with the help and guide of other people are defined as Proximal Development Zone (PDZ) by Vygotsky. At first, a child’s PDZ includes his learning and problem solving abilities and naturally it develops as works are succeeded. Vygotsky says that he learns little from the works he could succeed on his own. On the contrary, development occurs only with the works which can be completed with the help of a more successful person. In other words, development occurs by achieving the works in the child’s PDZ.

- Games, for children, aren’t waste of time but rather they include activities that get them into adults’ world successfully. Vygotsky emphasizes that a child sometimes behaves as if he was older and he says the changes in behaviors make them learn to plan the future, to think before act and to keep himself from some behaviors23,24,25.

**THE CRITIQUES TO VYGOTSKY**

Some criticisms have been made on Vygotsky’s views. Vygotsky focused on processes children developed rather than establish a relationship between their age and skills. On the other hand, it has been claimed that Vygotsky’s descriptions of the development process are not clear and detailed. Therefore, Vygotsky’s theory is considered as more difficult to test than Piaget’s theory. But in spite of everything theorists and educators has benefited greatly from Vygotsky’s ideas. The most utilized idea of Vygotsky is his emphasis on how culture affects cognitive development. Thus the transfer of society culture to new generations is guaranteed. Recently contemporary theorists emphasizes adults’ help, named as social construction of meaning, children to make sense of their surroundings by sharing issues experienced by adults with children. In addition interaction between children is considered as an important approach to the explanations of their surroundings.

Contemporary theorists accept that correlation debates is of great importance in helping children to make sense of their physical, social and academic world. This idea is known as Social Constructivism. Following the discussions in this section, this idea will be given in a more detailed way in the next section.

Another issue that contemporary theorists are concerned with is cognitive tools such as terms, symbols, strategies etc. These tools comprise of abstract terms and they facilitate the daily life as other devices –knife, book etc. - do.

Contemporary theorists need to discuss variations what can be done to help children in reaching difficult objectives. The term mostly used for this help is supportive (scaffolding). This term was put forward by Bruner. Scaffolding is a support mechanism conducted to learner in reaching a target which is in his zone of proximal development. According to this mentality, when the child reaches the target without supporter, the support is reduced.

Another approach named as guided participation includes having children do the things which can be done by adults by constructing and supporting. In this process, it is important to make them familiar with the terms of adult world by using words such as hypothesis, evidence, theories, etc. consciously.

Another important term named apprenticeship -can be seen in many societies- „in which a child and an adult interacts both formally and informally, contains an approach in which an adult teaches a child through a concept appropriate to child’s ZPD to embroider, sew, play musical instruments, translate a text into a different language. As a result of this interaction, the child not only shows the related behavior but also learns to think about target skills. For example, children and adults work together to discuss how best to solve the problem or to achieve the target performance and they find the best approach. In this process the adult is a model for the child how best he can complete the process. Master-apprentice relationship comprises of six approaches. The first one is being model approach in
which the adult demonstrates how the process should be performed while the child is observing. The second one is master approach in which the child repeat the process, the adult assesses the child and gives feedback suggestions and clues when necessary. The third one is supportive approach in which the adult makes the process easier - for example he divides the process into steps. The fourth one is explanatory approach in which the learner informs the adult about the process by telling what, how and why he is doing. The fifth one is reflective approach in which the learner evaluates himself through adult’s questions. The last one is discovery approach in which in case of succession the degree of difficulty in achieving the desired targets is being gradually increased and the adult allows the learner to draw the boundaries of application area of what is learned by self-regulating questions and problems. Although it seems difficult to implement it in the class, many theorists think adult-learner interaction essential in the acquisition of skills and the development of appropriate ideas related to different issues.

Finally, contemporary theorists emphasize peer interaction causes a different development from children’s interaction with adults. Therefore, they emphasize the necessity of the peer interaction. Adults have been equipped more with knowledge and skills than children. In children’s process of achieving the goals with their peers, it is possible to talk about four different benefits of their being in interaction. The first one is that debates about a problem or an issue allow the child to be aware of different perspectives about the subject and this generally provides a more holistic learning on the subject. Secondly, as debates contain disputes and conflicts, children internalize the process of discussing and gain the ability to look independently an issue at different perspectives in time. Thirdly, more challenging issues are achieved with peer support. Another benefit not emphasized so far is that children learn social behaviors such as planning processes to work together, impersonating different roles, etc. thanks to cognitive processes with their peers.

**STRUCTURING KNOWLEDGE THROUGH SOCIAL PROCESSES (SOCIAL CONSTRUCTIVIST APPROACH)**

Contemporary constructivists and educators whose numbers are growing gradually believe that when worked together the meaning is understood better than when worked alone. In social constructivism, while two or more people may have common knowledge structures. In the circumstance of structuring the information lonely, despite being in the same learning environment, two people have different information structures. The meaning sometimes can be constructed by multiple people at the same time, social construction takes weeks, months and even centuries. For example, by developing common terms, the formation of academic disciplines such as science, math, history, literature, music, etc. take centuries. At this point, the culture plays a major role in the process of knowledge construction. Because in order to communicate and explain the world –in other words, their experiences- different branches of science form different terms and principles for themselves. There are some important benefits of social constructivism approach listed below in learning a subject:

- Students openly express their own ideas, organize and defend them against others.
- Students are given the opportunity to learn deeply by extrapolating, setting up hypotheses and asking questions.
- Students are given the opportunity to meet other students who may learn the subject better and have different ideas.
- Students are given the opportunity to become aware of consistent and inconsistent information in their learning and complete the missing parts.
- Students are given the opportunity to realize that the explanations and ideas of other people having different cultural and ethnic backgrounds may be different and equally valid.

Other than the above-mentioned ones, there are different benefits of children interactions below:

- Peer discussions contribute to cognitive development.
- As a result of debates and controversies children gain concept, thinking skills and causality (reasoning) which they can use in their social interactions. In this process, they also gain the ability to look an issue at different perspectives through internalizing the process of discussing.
- They can develop more effective interpersonal skills.
They can be a model to each other in thinking skills and academic approaches. During the debates and controversies among them, they gain the opportunity to learn and apply approaches used by scientists while they are defending their own ideas or emphasizing the strengths and weaknesses of an idea—for example by using evidences. Also they get the opportunity to realize that a series of ideas are required in order to obtain the knowledge and knowledge develops in time.

Seeing the success of their peers may increase their self-confidence. Activities of learning that their social needs are met motivate students to participate in the learning activities.

Consequently, in social constructivism, during their regular and interactive studies on a topic, students gain too much in terms of not only the cognitive aspects but also the motivation for personal and social learning.

**SOME SUGGESTIONS ON THE IMPLEMENTATION OF VYGOTSKY’S COGNITIVE DEVELOPMENT THEORY**

- Students should be allowed to soliloquize and think aloud in the process of solving challenging problems. For instance, a student trying to remember sulfuric acid should be allowed to repeat a code prepared in advance.
- The cognitive tools should be prepared to simplify the challenging problems. For example preparing experimental apparatus can form a formula.
- Put forward problems, which students cannot achieve without help.
- In the process of solving challenging problems, students are supported until they can achieve on their own.
- Students are brought into small groups to work and succeed the challenging tasks.
- An ambiance is created for them to play the roles of adults. For example, they are given the chance of publishing a school newspaper and they are given the tasks of editor, caricaturist, photocopier, and distributor and so on.
- They should be given the opportunity to play adult roles through games.

**INFORMATION PROCESSING THEORY**

It is an approach appeared in 1950s and early 1960s and has developed since then. Initially, many information-processing theorists believed that humans contemplate like computer. But later, they realized that human thinking system is much more complicated. Nowadays, information processing theory which is alike to Piaget’s and Vygotsky’s approaches has constructivist approach: Children are active in the process of making sense of their world. Children cannot be considered as having the capability of storing the information in the external world such as a computer.

Information processing theory actually includes a range of processes in which children get the information, compare it to their prior learning and make sense of it, recall, change and use it. Many information-processing theorists reject Piaget’s approach of developmental stages. According to them, children’s cognitive processes and development of skills occur within the greater periods and in the form of slow changes. Also they say that children learn more quickly and remember more. There are some important properties of development in the theory of information processing below.

- **Attention:** Two approaches of cognitive development about a child’s attention important.
  - Distraction of children by unrelated things reduces in time. The situation that young children pay attention to things that they should not happens frequently but as they grow up, children gather attention better.
  - What and how children learn depends on what they are intending to learn. Older children could learn and remember more things but it doesn’t ensure that they have learned the right things.
- **Learning strategies:** Learning strategies can be defined as learning methods of significant and purposeful information. As children grow up, they develop some learning strategies to enable
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them to learn and remember what they have learned. There are frequently observed approaches related to the development of learning strategies.

- Though doing over is not a successful approach in terms of learning and recalling processes, it is important in terms of short-term recall of the information. Not observed in pre-school, doing over develops in time (especially during primary school).

- Well-constructed information is easier to learn and the possibility of recalling it completely (as it is constructed) increases. Organization of knowledge develops in primary and secondary school stages. As children grow up, they construct information more frequently and effectively.

- Elaboration is a process which extends the new learning by applying learned information (experiences) to new ones thus there is much more learning than targeted before. Elaboration process is first observed in preschool stages and it keeps developing till adult stage. Elaboration process is a conscious strategy that allows children to learn and make sense of new information. Some studies have shown that only successful high school-level students try to use information including repetition to learn new information. The organization of knowledge and elaboration processes are processes that clearly show the constructivist approach: Learner gets the information, rearranges it according to prior learning or adds it to prior learning and finally construct a meaning peculiar to him.

- Learning strategies become more effective as they grow up. When children first begin to use learning strategies, they use them less frequently, mostly ineffectively and by consuming more power. With time and usage, their ability to use learning strategies more quickly, more effectively and to use them in different matters develops.

  - Knowledge: Children's knowledge on the basics of the subject and the world changes at least in two ways as they develop.

  - Children's information evolving constantly facilitates their learning of new things. Children's information about the world develops over the years step by step in a limited way. The reason why adults and older children learn more easily than younger children is the increase of existing knowledge in years. Older children have more information than needed in understanding and elaborating new ideas and events. In case children have more information on a subject, they learn more easily than adults and older children.

  - New connections are established among children's information in time. As emphasized before, older children are more successful in organization of new information and elaboration because both processes require the establishment of relation among terms and knowledge of older children, knowledge and terms of younger children are more isolated from each other. A reason why older children have information more connected and associated with each other is, as stressed by Piaget, may be that older ones make conclusions easily and have the ability of more logical thinking.

  - Metacognition: people become aware of how they think and learn over the years. For example a person may realize that he can learn a text in a book only after reading it a couple of times or they will learn new information better and more meaningful if they use their prior learning to extend new information. Metacognition includes one's own cognitive processes, learning by using these processes effectively and consciously, and keeping metacognitive information in memory. As children develop, cognition knowledge and skills develop in the following ways:

    - Children become aware of the limits of their memories in time. Children are generally too optimistic about their memory and they suppose that they can remember everything they have learned.

    - As they get older, children realize that this is not the case. Children's skills to specify what they know and do not know advances in time. Though little children do not know enough to do something, they think that they have known and learned them. This situation prevents them from studying new information enough.

    - Children learn much about effective learning strategies in time. As mentioned before, children use the strategies of repetition, organization and elaboration better in time. Besides, their awareness of in which situation which learning strategy is more successful increases depending on their experiences.
It should not be forgotten that students are not as effective as adults and teachers in teaching. Also it should not be forgotten that a range of factors – such as attention, motivation for learning, prior learning, awareness and usage of effective learning strategies – affecting learning skills develop slowly in school years. Adults and teachers should not expect students to learn as fast as them and to use the same strategies as they do.

Teachers should suggest to children what and how they should study and which strategy they should use. This suggestion is appropriate not only to Information Processing Theory but also to Vygotsky’s view of how important adults are in children’s learning (in their cognitive development).30,31

THE CRITIQUES TO INFORMATION PROCESSING THEORY

Information Processing Theory has been exposed to some criticisms by some other theorists. The first of them is that while Information Processing Theory explains the strategies children use in acquisition of new knowledge, it does not explain why they approach similar learning situations in different ways. The second one is Information Processing Theory has not emphasized much the effect of children’s social and cultural diversity on cognitive development. Another important criticism is that it could not explain the reason of development of children’s cognitive skills. In fact, this is a critique to not only information processing theorists but also Piaget and Vygotsky. Even if the theories on the development of the brain or for example the ideas of that much more complex learning strategies develop after working make recommendations about the development of cognitive skills, no theory could explain exactly how a newborn baby turns into a relatively specialized adult in terms of cognitive development.

Finally, in order to ensure children’s cognitive development, all the theories must be well known and research results must be used well.

SOME SUGGESTIONS ON THE IMPLEMENTATION OF INFORMATION PROCESSING THEORY

- Especially in the education of little children, the things distracting children should be kept away. For instance, materials should be put away except for the materials being used during the experiment.
- Education should be based on students’ prior learning.
- The implementation of learning strategies appropriate for the age being worked with and the subject being discussed increases students’ success. Students should be encouraged to determine to use different learning strategies in different situations. For example, the teacher asks students “Now that, the population of the country changes in years, can we demonstrate it with a graphic?” (organization)
- Students should be given different assessment opportunities to check their own learning.

THE IMPLEMENTATION OF CONSTRUCTIVIST APPROACH IN CONCEPT LEARNING - MISCONCEPTIONS

Whether a person on his own as Piaget emphasized, or within the framework of social constructivism as Vygotsky emphasized or as emphasized in IPT, the process of structuring of knowledge in the mind could be developed through explaining with constructivism approaches.

In the process of meaning the environment, it could not be expected that the learned information is exactly the reality itself. For the rest, unrealistic learning may happen. As discussed before, many cognitive psychologists are against the idea that learning is just recording the reality in the environment in the mind in a simple way. According to them, learning includes a unique construction of information in the light of their experience. Different people infer different meanings (learning) from the same stimuli. One of the reasons for this is that each individual has come to the learning environment with their own experience and different knowledge. Except for the prior knowledge and experience, the fact that people have different expectations also affects their learning. If there were
an uncertainty in the new information, previously learned information and the expectations of the learner would affect especially the new learning because the information providing complete and accurate perception of the knowledge would not be reached at and new information is more prone to be affected by prejudices and expectations. In order to avoid misunderstandings, the information should not include uncertainties. However, the fact that learned information is different from the information which will be taught can be seen as a circumstance peculiar to every lesson in the school curriculum. Sometimes only some parts of the knowledge recalled from the long-term memory can be remembered. In this case, a restructuring process affected by recalled parts of the knowledge, expectations and other information may occur. This may result in the formation of some incorrect constructions. What should be done in terms of teaching is to facilitate the remembrance of the issue with its accurate details by making them pay attention to the important details of the process of coding.

Organization of Information
In the process of knowledge construction, information is organized in different ways at the same time, so information about each other occurs in the long-term memory. Some of this knowledge is concepts, schemas and theories.

Concepts
Concept is the way to categorize or group the interrelated objects and events. Concepts are at the heart of thoughts and some theorists think that the concepts are the smallest building blocks or units. While many concepts are shared by different communities, others vary depending on the culture. As discussed in social constructivism, communication is facilitated by producing different concepts in different academic disciplines. Human beings have a tendency to organize objects and events around them in their mind and this tendency begins when they are three months. A school-age child usually knows 8000-14000 words. Children learn thousands of different concepts at school. Concept learning sometimes takes place quickly but learning of some concepts takes long periods of time. In cases when concept learning takes long periods of time, concept adapts to new situations over time – Piaget’s adaptation for the new situations. In the time between the concept is not known and it is completely known, a person knows the related concept partially in a missing and incomplete way. One of the most frequently encountered examples is children’s assignments of the concept of animal – some children define the concept of animal just as four-legged, having fur and carrying her babies in the womb. Another example is that after learning the concept of rectangle, children describes square as a rectangle.

In some cases, students may do a low-level generalization of the concept. They implement the concept into a part of all objects or events covered by it. It is an example that a student does not classify insects, fish and birds as animals instead they take only mammals in the concept of animal. The above-mentioned situation of square-rectangle is an example of a low-level generalization. In some other cases, students may overgeneralize. In case of overgeneralization, students suppose that an object and an event belong to a category which actually does not include them. For example, the fact that students include the words, you and I, into the category of name is a common example.

A concept is not accepted as fully learned if examples of covered or not covered by the concept are not learned. So it is important to provide a large number of samples not covered by the concept as well as samples covered by the concept.

As Piaget and other researchers emphasized, as children grow up, they begin to learn more abstract concepts. This development has a positive effect on the learning concept. For example, while circle is initially perceived as something round by children, in the coming years, they can define it as a shape forming as a result of connecting points equidistant from a point. Similarly, while pre-school children define season of summer as a holiday, hot weather and sea, over time, they begin to define the concept of summer as a concept about settlements between the sun and the earth. Therefore, in order to learn abstract concepts, one needs formal education and to reach a certain age.
Connections between concepts
As discussed before, there are connections associating the information in the long-term memory with each other. Therefore, an important part of concept learning includes the formation of connections between concepts. In some cases, the concepts are connected with each other in a hierarchical manner. While the concept at the top this hierarchy is mostly abstract, the ones at the bottom of it mostly consist of concrete concepts. For example, the concept of vertebrate is an abstract concept and it is at the top of the hierarchy.

Piaget expresses that little children think a concept always belongs to only one category and they do not think they can place the concept in more than one category. Piaget says that children accept that a concept can belong to more than one concept only after concrete operational stage. In the new term holistic cognitive psychology, the fact that a concept can be given as an example of more than one category is not a product of an age-dependent skill but it develops as a result of formal education and it develops when children learn that multiple links with different characteristics can be established between different concepts.

The nature of the concepts
Theorists have different views about exactly what is learned about learning a concept. For example, some of them say properties list of the concept is learned, some say prototype is learned and some say that students learn the concept as a range of examples.

Properties list: some theorists say that as a result of learning a concept, examples of this concept are learned. For example, a person who has learned the concept of square learns the properties defining the square – it has four edges, angles between the edges are 90 degrees and so on. The more concrete and familiar the properties of the concept are, the easier it is learned. Children sometimes remember and use the properties including striking comparisons which are remembered easily, not the properties defining the concept they first met. For example, like the example given above, the reasons why children do not see the square as a rectangle may be that they could have seen the edge lengths of the rectangle in a different way and they could have drawn their attention more. This situation can be removed by giving many examples. In another example, children think- as animals-properties, which are defining the comparative properties about mammals and easy to remember, and creatures having fur, consuming food not producing instead of properties defining the animal. In terms of education, students should be taught what properties objects and events must have in order to be an example of the concept. On the other hand, properties defining the concept should be emphasized and it should be expressed that other comparative properties do not have the power to define the concept. Examples of the concept should be given and criticism should be made on them. Finally, it will be appropriate to encourage students to give different examples and make an evaluation.

Concepts in the form of prototype: learners create prototypes for many concepts in their minds. Prototype is a typical idea that the learner construct in his mind and it usually exists visually in the mind. Prototypes are examples of a concept which a person usually encounters. For example, when people hear the concept of “bird”, many of them picture sparrows or pigeonsin their minds but few of them think penguins. After the learner has created a prototype in his mind, he compares new objects and events with this prototype and decides whether they are the examples of that concept or not. In the process of understanding, whether the new object or event is in the previous concept group, as the degree of similarities and differences between the old concept and new arrivals increases, the process of reaching the right decision will be easier.

Concepts in the form of example group: some concepts are constructed as the example group of a concept. This is because there are differences between the examples of the concept and the learner has to pay attention to them. For example, people think different fruits when they hear the concept of fruit. In this case, in order to understand whether the new object or event belongs to the related group concept or not, the learner will have learned much information to compare it with. One the
other hand, illustration process has to get more attention because these types of concepts need more and more examples.

**Some Suggestions on Teaching Concepts**
In the process of teaching a concept, steps given below are mostly applicable.
- The concept is defined.
- The properties defining the concept are introduced.
- It should be taken into consideration that comparative properties should not be emphasized and learners should not define such properties.
- The best example or prototype is given.
- Examples of the concept are given. Anderson suggests that the examples of the concept should be given after the ones which are not the examples of it.
- Examples which are not of the concept, the ones most similar to the concept and the most confusing ones determined by researchers are especially emphasized.
- Evaluation studies, in which learners inquire whether a range of concepts belong to the related concept group or not, are made.
- Students are asked to give examples which are and are not related to the concept.
- The fact that connection can be established between different concepts is explained to the learners.

**Schemas**
A schema is a number of well-organized facts on an object or issue. Schemas are not just knowledge storages where information is organized. Schemas also take place in the process of explaining new knowledge. Sometimes schemas provide the completion of missing parts of the new knowledge. Schemas are different in diverse cultures. In terms of education, it must be ensured that one should have the necessary schemas for reaching the target set before education and in the absence of these schemas, they must be completed.

**Theories**
Long before children begin formal education, they have general belief systems -theories- about the world events. These theories include many concepts and the relationships between these concepts (for instance: comparatives, cause-and-effect relationships). When they become school-age children, they have developed some basic theories about their environment. Not only do these theories provide learning a concept but they also provide organizing and making sense of experiences and new information. For children are not in the guidance of adults or people who are more developed in terms of cognition, their first theories are named “naive” and thus they include wrong beliefs and misconceptions.

**Misconceptions**
The fact that learners’ knowledge they have constructed about the environment in their mind reflect the truth is not guaranteed. Beliefs which are not suitable to the explanations accepted by scientists are called as misconceptions (alternative concepts, alternative conceptual structures, theories and ideas not based on the experiences). Researchers have revealed that both adults and children have misconceptions. Students’ misconceptions have many reasons. Most of these occur when they give meaning to their observations. For example when two events happen at the same time, learners sometimes consider them cause and effect. Society and culture can lead to the formation of misconceptions. For example, “the sunrise” and “the sunset” statements used in Turkish may result in the formation of the knowledge that the Sun revolves around the Earth. In addition, stories and cartoons may cause misconceptions. Sadly, students receive misconceptions from other people including teachers and the authors of the books.

No matter what the sources of the students’ misconceptions are, they affect and disrupt new information. Meaningful learning and elaboration processes are important approaches in removing misconceptions. Ausubel explains meaningful learning by comparing it to learning by heart. As a result of learning by heart, knowledge is isolated from cognitive structure and therefore it may be disrupted
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by prior or next learning. On the other hand, learned and recalled meaningful learning interacts with new information properly\(^4\). Besides preventing the formation of misconceptions, teachers should remove the misconceptions existing in children.

**CONSTRUCTING THE KNOWLEDGE EFFECTIVELY**

In the learning process, knowing that constructed information does not guarantee that education would be done properly. Cognitive psychologists recommend different ways to construct the knowledge effectively. Some of them are given below:

- **Providing facilities for experimenting:** first-hand experimenting with objects and creatures around them make learners explore properties and laws of the world. Teachers should give opportunities to students to learn by doing activities such as touching objects, playing with them, changing and combining them. Teachers generally have students make experiments step by step -a cookbook style- and thus they try to lead students to success. But it will be more helpful for students’ cognitive development if they decide on -on their own- this method and when and which steps they take. Even in the cooking classes, students should have the chance to cook their own meals by using ingredients as they wish.

- **Providing opportunities for consulting:** it has been discussed before that two or more people can construct knowledge by studying together for some time. One’s constructing knowledge by studying on his own is of great importance, but it is more important to provide students with opportunities for studying with teachers in the process of constructing knowledge. For instance, an experienced person who has already constructed the information on a subject contributes to the person who has got no information about the subject. This contribution, as Vygotsky emphasized, may occur when the learner gives names to the objects and events around him, determines the principles causing the events or explain the events.

- **Emphasizing the importance of conceptual learning:** learners sometimes have isolated information which they could not associate with each other. There is no doubt that when students learn the facts, concepts, and other ideas by associating them with each other in a holistic and meaningful way, their learning will be much more useful. In other words, the issues will be more useful if they are learned in a conceptual manner. It is much more important that students learn how the processes put forward the mathematical principles than learning mathematical processes by heart. It takes some time for a comprehensive and integrated construction. Many educators suggest “less is more” approach. Accordingly, few subjects will be learned better if they are studied in long periods\(^42,43\). Below are some suggestions for the achievement of conceptual learning.
  - Units should be based on basic ideas.
  - Each topic should be studied deeply.
  - New information should be associated with students’ experiences and prior learning.
  - It should be shown openly that conceptual learning is more important than learning information in an isolated way by telling students, giving homework and using them as criterion in the evaluation process.
  - Students should teach their learning to others. This duty makes students focus on their learning more carefully and organize them better.

- **Providing classroom conversations:** it has been discussed before that when worked and interacted together, students learn better. Similarly, classroom conversations have an important contribution to students’ learning. During these discussions, the teacher can get valuable information about students by observing them. For example, teachers can identify students’ misconceptions in this process.

- **Using authentic activities:** as Vygotsky emphasized, children learn many things when they take part in activities appropriate to the conditions of real, cultural life in which they can interact with adults and more experienced people. Many holistic constructivists extending this idea say that children learn more useful, productive and integrated information through authentic activities in class-activities that they may encounter outside. For example, in language classes, children should be asked to write to real people instead of writing essays showing their only grammar skills. Especially at the beginning of the process, students may need support. Furthermore, authentic activities are also important as they put forward why the learning is learned. Thus,
students can be encouraged to learn by showing them that they can use their learning in their future life. In addition, students’ knowledge and skills are also assessed through authentic activities.

- Creating learning-centered classroom: psychologists and educators considering the advantages of creating a constructivist classroom environment with interaction between students emphasizes that it is beneficial to create a learning-centered classroom where the teacher and students help each other to learn by studying together. Such a class has the following characteristics:
  - All the students are active.
  - Interactions between two or more students are often experienced and such interactions are considered as important.
  - Differences in students are tolerated and respect between them is valued.
  - Teachers and students help each other to learn by working in coordination but nobody has dominance to have special privilege in others’ learning.
  - Every individual is a potential source for others. Different students may be the “expert” of different topics.
  - The teacher guides and directs the class activities but students can show these features.
  - Students regularly evaluate others.
  - The process of learning is emphasized as well as learning product.

On the other hand, it is worth mentioning to weak points of the approach of creating learning-centered classroom. In the approach of learning-centered classroom, a student’s learning is limited to his own learning and others’ learning in the classroom. There is a high risk that students may transfer their misconceptions to others in the classroom.

**Correcting Misconceptions**

Any information given on a subject in the classroom does not guarantee to remove the students’ misconceptions on that subject and replace it with the right information the teacher have given. Researches with a range of age show that even the educations, organized in order to eliminate misconceptions, do not eliminate the misconceptions. Below are theorists’ estimation about why misconceptions is so resistant to change:

- Existent beliefs affect the explanation of new information: the learners describe the new information dependently on their prior learning. This means that they continue to believe what they have believed until that time. This is an approach applied naturally for elaboration and meaningful learning.
- Preference for self-validation: many students tend to find information validating his prior learning and to ignore or consider others as worthless.
- Misconceptions can be supported by daily life: scientifically-learned information can be “not applicable” in daily life. For example, metals —although good heat conductors- are used in making flasks.
- Some concepts (misconceptions) are so integrated with many theories and concepts with close connections: in this case, eliminating some misconceptions require changing many well-organized schemas, not destroying a single belief.
- Students may not realize that their existent knowledge and new information are different although they are different: this may be because students learn information by heart and they do not organize and associate them with their other information well.
- Students may be connected to their existent information personally or emotionally: in some cases, the student rejects the right information (accepted scientifically) as he thinks that it is against his culture, religious beliefs or his ego.

The more the number of students’ misconceptions, the more difficult to provide them to learn theories. In terms of education, not only do the learners need to learn the new information but also they need to eliminate the information and theories not accepted scientifically. In other words, teachers should have students make concept corrections.
Some Strategies for Correcting Misconceptions

There are different strategies to eliminate the misconceptions. Eliminating some of the conceptions may need multiple strategies. Below are some strategies applicable in eliminating misconceptions:

- Misconceptions existing before education are determined.
- Students should be convinced that their existent information is insufficient. In order to provide conceptual change, students should realize that their information is incorrect or insufficient. In Piaget's words, the state of imbalance must occur first in children. In this process, demonstration experiments, experiments conducted by students, teachers' descriptions and student discussions can be used.
- Students are motivated to learn scientific information.
- It should be done in a respectful manner while proving students that their information is insufficient. The students should not be afraid that he would be mocked.
- It should be determined why students insist on misconceptions by observing them and then a strategy should be developed to eliminate this cause.
- In accordance with the constructivist approach, students should be exposed to the situations surprising them and therefore they are obliged to assess their prior learning, revise them and look at them critically. However, this approach does not mean that the newly learned knowledge to be accepted as unquestionably right. It should be ensured that the new information is obtained through scientific methods.

In spite of all these proposal of strategies, the most important principle which should always be kept in mind is that: construction or re-construction after teaching is carried out by the learner himself. In other words, cognitive processes (meaningful learning, organization, elaboration, etc.) depend on the person himself.\(^{45,46,47,48,49}\)

SUMMARY

- Cognition includes acquisition and usage of the knowledge.
- Humans have the opportunity to choose what and how they process and learn in their mind.
- Cognitive processes affect what and how is learned.
- Knowledge is not acquired directly from the environment; instead it is constructed by the learner.
- Prior learning and beliefs affect how people construct the knowledge in their mind.
- People participate in their own learning processes in an active way.
- Knowledge, in Piaget’s words, is constructed in schemas and after new learning these schemas are organized and developed better and new connections are established between them.
- According to Piaget, learning and cognitive development occur with assimilation and accommodation processes which are completing each other.
- Vygotsky believes that adults in a society provide the cognitive development of children in a desired and systematic way. (social constructivism)
- According to Vygotsky, it is important that adults put the children into meaningful activities which strengthen them mentally and help them to succeed these activities.
- Social Constructivist Theory emphasizes that when worked together the meaning is understood better than when worked alone.
- Constructivist theories support or reject each other in some ways but if they all were analyzed together, one could learn important information about cognitive development and learning.
- Today, information processing theorists have a constructivist approach resembling to Piaget’s and Vygotsky’s approaches.
- Information processing theory includes a range of processes in which the learner get the information, make sense of it by comparing it to his prior learning, recall, change and use it.
- Constructivist approach is applicable to education.
- Constructivist approach can be applied in concept learning in terms of constructing knowledge. It explains the formation of misconceptions and includes useful information about the prevention of misconceptions.
REFERENCES

3.Ormrod, J.E.
4.Ormrod, J.E.
6. Bjorklund, D.F.
7. Anderson, R.C.
9. Bjorklund, D.F.
12. Ormrod, J.E.
13. Bjorklund, D.F.
18. Gruber, H.E. and Voneche, J.J.(ed.)
22. Ormrod, J.E.
23. Ormrod, J.E.
24. Howe, A.C. and Jones, L.
26. Ormrod, J.E.
27. Ormrod, J.E.
28. Ormrod, J.E.
30. Baysen, E.
31. Ormrod, J.E.
32. Ormrod, J.E.
33. Bjorklund, D.F.
34. Ormrod, J.E.
38. Anderson, R.C.
39. Baysen, E.
40. Anderson, R.C.
42. Baysen, E.
43. Driver, R., Guesne, E. and Tiberghien, A.
44. Ormrod, J.E.
45. Howe, A.C. and Jones, L.
46. Driver, R., Guesne, E. and Tiberghien, A.
47. Carin, A.A.
INTRODUCTION

A considerable amount of studies on human beings or related to human nature focus on human behaviours. How human beings know, how they acquire behaviours, how and according to what they behave in which situations, the reason of the differences between behaviours, factors that affect human behaviours are some of the subjects that are studies through these studies.

As is known, people acquire all their abilities throughout their lives after birth except for a few innate behaviours that are species-specific. This information is very significant because it emphasizes the fact that people have a capacity that can be improved. A person can learn what a behavior means or how it is formed through his/her direct or indirect experiences, on the other hand, this person can display the said behaviour(s) whenever it is possible and the person wishes to do so. In short, except for innate behaviours, the answer of a substantial amount of human behaviours is hidden in the concept of learning$^1$.

Learning is relatively permanent products of experiences that come out as a result of the interaction between individual and environment$^2$. A part of a person’s all learnings occur incidentally while an important part of it occurs in a specially structured learning environment in a planned and programmed manner. The concept of learning which is of vital importance in terms of explaining human behaviours is one of the important subject areas whose questions are tried to be answered in the body of literature such as how and through which processes learning occurs. In the historical process, there have arisen many theories that are still acceptable despite of some criticism. Learning theories that are interested in learning and ways of learning in order to understand and explain learning process explain learning as a process in which behaviour changes, is shaped or controlled. These theories may be classified under different headings according to some criteria. On the other hand, although these theories have some common views, they also have different points of view, which have been developed considering biological, psychological, physiological, neurological structure of human. Some of these theories are stated below.

In behaviorist learning approach, measurability and observability of human behaviours are considered important while unobservable and immeasurable human behaviours are ignored to the extent that they are disregarded completely$^3$. In behaviorist approach, learning is explained as a process in which a stimulus and a response are matched, and a response given to a stimulus is reinforced. Behaviorist theory results from the idea that learning occurs mostly through repetition, motivation and reinforcement. According to this approach, there are basically two types of learning. In classical conditioning, which is the first of them, a neutral stimulus is matched with an unconditioned stimulus. On the other hand, operant conditioning is behaviour is reinforced and so is more likely to repeat.

As some situations about learning could not be explained with the principles of behaviorist theory, researchers headed towards re-defining human learning and as a result of this situation, cognitive learning theories started to gain importance. Cognitive approach, which claims that learning cannot be explained through the connection of stimulus-response, claims that learning is determined by the mental processes of learner, and states that student is not a passive receiver of external stimuli, but is...
an individual who internalizes them and thus actively shape behaviour. Cognitive learning theories examine mental processes of human while making sense of the world. According to this theory, learning is the change of mental structure of an individual, and it is emphasized that with this change, behaviours of a person are also changed or a person acquires new behaviours. Cognitive theorists are also interested in internal structures of individual as well as observable behaviours while explaining learning.

Another approach, which researches learning, is constructivism. This theory claims that knowledge is produced by learner’s value judgements and experiences. Those who defend constructivism explain learning as finding and structuring knowledge by means of associating them with previous experiences and knowledge. According to constructivism, learning is an internal process that takes place in a person’s mind. A person is not passive receiver of external stimuli, but is an individual who internalizes them and thus actively shape behaviour. Constructivism is a learning approach that states that learners learn something by means of using and structuring their own experiences instead of receiving knowledge in an organized form as given to them. Learning is a process in which students construct their own knowledge in theie mind related to a certain object, event, phenomenon or concept or at least, in which students interpret the truth grounding on their previous experiences.

We can say that views of constructivist theory and cognitive theory are similar to each other to a great extent.

Brain-based learning, which deals with the concept of learning in a neuro-physiological context, accepts and explains the process of learning as a bio-chemical or electro-chemical change. According to this approach, the process, which is called, learning, is a process of establishing a connection between brain cells and an intercellular connection, and a new connection is established between brain cells with each new learning.

In this chapter of the book, brain and its fundamental features, what kind of a relationship there is between brain and learning, brain-based learning theory, how this theory deals with learning, its foresight about the formation of learning, its suggestions about maintaining quality in learning, its superiority and sides that are open to improvement and such other qualities are addressed and explained.

**Brain and Its Fundamental Features**
Reviewing basic information related to human brain will make it easier to understand brain-based learning better. Structure and processing of brain, intercellular relations, brain hemispheres and lobes (parts), processes at which each part is good at and structural qualities of brain hemispheres are some of these features.

Brain is the organ which is connected to the other organs of the body, constitutes the center of nervous system, weights about 1400 grams, holds almost %25 of the blood in the body and consumes energy the most. Brain is composed of three layers that are related to each other which are called forebrain, midbrain and hindbrain. As is seen in graph 1 and 2, cerebrum that constitutes the real mass of the brain comprises a big part of brain including the two hemispheres. Corpus callosum maintains data transfer between right and left hemispheres with more than 250 millions of cells. This part is also the place where thinking, memory and speaking are coordinated. Brain stem is at the top of spinal cord and connects lower and middle brains. Brain stem instructs heart and lungs, and thus coordinates two vital systems which are circulation and respiration. Apart from these, balancing body temperature is also the task of brain stem. Cerebellum is located at the back border of brain stem; it directs balance, motion, coordination and other kinetic processes.

Hipocampus, which is located in midbrain, coordinates the memory systems of thalamus and amygdala. Thalamus is responsible for collecting information coming from sense organs and distributing this information to the related parts of the brain; amygdala is responsible for establishing connection between feelings; just like hard-disc in a computer, hipocampus is responsible for re-
coding data transferred from other structures to short term memory and then given to it and thus maintaining the durability of the information.

Graph 1: parts of forebrain, midbrain and hindbrain

Graph 2: The structure of the brain
Source: [http://www.brainwaves.com/images/brain-basic_and_limbic.gif](http://www.brainwaves.com/images/brain-basic_and_limbic.gif)

Brain is a structure that is composed of a number of parallel processors that carry out a lot of processes at the same time. Hemispheres and lobes of the brain can be busy with different tasks at the same time. However, each lobe has its specific structure, tasks and processes. So, if a part of brain is damaged, processes carried out in that part may also end.
Frontal lobe that is located in the front part of brain is the part where planning, creativeness, thinking, problem solving and decision-making are carried out, and speaking processes are coordinated. Temporal lobe which is located in the middle of the brain when viewed from the side and which has parts in right and left flocculus is the part where listening, speaking, making sense are carried out and hearing processes are coordinated. Another part of the brain, parietal lobe is located in the upper side of the brain and it is the part where sense and movements are coordinated. This part is thought to be related to arithmetic and language skills. Occipital lobe, which is located at the backside of the brain, is the part where activities of sight are coordinated.
LEARNING AND TEACHING: THEORIES, APPROACHES AND MODELS

As is mentioned at the beginning of this chapter, brain-based learning theory defines learning as establishing connection between brain cells. In this context, brain cells (neurons) which are the basic structures where learning occurs make learning possible by means of establishing connections (dendrite) with other cells. It is predicted that an adult brain has almost 100 billion neurons. Intercellular relations, axon terminals and their fibers are developed to carry certain messages.

As is seen in graph 4, a cell is composed of three parts, which are dendrite, nucleus and axon. Electrical currents coming to neurons, cell body and dendrites influence neurons. While some of the electrical current stimuliates neuron, some other causes a change of behaviour in neuron. When neuron is sufficiently stimulited, it gives response by means of sending electrical signs from axons. Electrical messages reach other neurons through axons and thus they are also stimuliated and get ready to give response. In this way, there occurs data transfer (neuron activity) between a numbers of neurons. Dendrites are structures developed to maintain connections between a neuron and the others and between nerves. On the other hand, axons are structures that maintain data transfer between neurons through electrical currents by means of transferring from one cell to the other. Axons are covered with myelin steath that is composed of fat and protein structures in order to be protected from irregular electricity fluctuations coming from external factors and to increase the speed of data flow, as is the case in electric cables. If myelin steath is damaged, this may slow down data flow up to 400 times. When myelin steath is damaged, a person’s physical responses slow down and there may be losses of function in other parts of the body that are related to neurons. One of the structures, which should be emphasized about this, is synapsis. Synapses are end points where connections between nerves and data transfer between neurons are carried out. Data transfer in the electrical signals between neurons increase the number of synapses, and the more synapses increase in number, the more learning there will be. In other words, the more signals there are, the more data transfer there will be; the more data transfer there is, the more learning there will be. If neurons are not enough in number or if there is less data transfer between neurons depending on age, synapses will also decrease in number and there will be difficulty in learning. High number of synapses is influential on data transfer being quicker and multi-dimensional; therefore it is one of the determining factors about the increase in the capacity and power of cognitive process. After some explanations about the structure and qualities of human brain, the relationship between brain and learning is explained in detail below.

Brain and Learning
Depending on the findings of the studies about neurological and physiological structure of human brain, brain-based learning theory claims the idea that learning activity takes place by means of new connections (dendrites and synapses) established as a result of data transfer between neurons. According to this approach, learning is a brain function and is a biological process developed mostly through an individual’s intentional behaviours and sometimes through stimuli coming from external factors independent from individuals, themselves. Dendrites continually scan data out of neurons and try to find new data sources. When there arise situations that allow data exchange, data exchange between neurons occurs and a basic is founded to let the formation of new dendrites and synapses connections. When data exchange between neurons reach a certain level, this affects other neurons in the environment and thus a close interaction comes out between neuron groups. If the physiological structure of the brain is suitable as well, the processes of establishing new connections for data exchange and of creating new meanings (meaning quest) are included in a cycle.

Although brain is the basic factor in learning, learning is also affected by environmental factors, psychosocial qualities of the individual and chemical structure of the organism; and these interactions reflect on the process of learning. As scientific studies about brain processes increase, more information is gathered about how brain can be used in learning process in the most effective way. According to studies, just one brain cell can establish connections with 50,000 other brain cells. When the number of cells in the brain is considered, the number and amount of connections reach to an unbelievable level. There are almost 100 billion cells in human brain. On the other hand, it is claimed that total number of connections between cells can reach 100 trillion. According to a view, the cells in human brain can make connections as many as the number of leaves on all the trees of a
According to Hebb (1980) who is famous for his studies on brain, if learning occurs in brain and if brain is a live structure, the related part of brain must experience a change through learning when compared to the state previous to learning. Hebb mentions two concepts about these changes, which are cell assembly and phase sequences. **Cell Assembly:** Each event or object faced by the individual activates a group of cells that are related to each other. The number and size of cell assembly changes according to object or event. For example; the number of cells activated in relation to pen is less than the number of cells activated in relation to car, because a car has more details than a pen and each detail requires more connections to be established between cells. **Phase Sequences:** It is explained as the series of cell assemblies that are related to each other. It is also defined as the state that cell assemblies form various combinations and influence each other. In these cell assemblies, one can be trigger or cause of others. For example; the smell of a perfume may remind us of our mother. The smell of a perfume, which our mother uses, is recorded in the related cell assembly in our brain together with information about our mother. When we perceive the same smell, this smell will remind us of information about our mother.

According to Hebb (1980), it is natural to have differences between age periods in terms of learning. Learning comprises cell assembly process in babyhood and childhood. Piaget mentions formation of schema in this period. During adulthood, phase sequence is re-arranged. Because of this reason, learning during childhood can be said to be the base of the learning in adulthood.

According to brain-based learning approach, the focus point of learning is brain. In this context, it is useful to explain some concepts such as awareness, conscious, automatization (unconscious behaviour), feeling, sense and attention which are all known to originate from brain and which can be called the factors of learning process.

According to Churchland and Forber (1995), state of consciousness requires state of effective awareness about real-time events. From this point of view, it can be said that state of consciousness may comprise various states of awareness. Sensual awareness (state of using all senses against real-time events in a way to comprise stimulus-response relations), generalized awareness (state of awareness related to factors such as comfort, anxiety, state of body), metacognitive awareness (state of awareness created by the individual in mind or whose real source cannot be explained with concrete data) and conscious remembering (state of awareness that expresses the state of being careful against similar situations because of previous experiences). According to states of experiences, more than one type of awareness stated above can be experienced in a time unit.

It is a fact that each individual’s brain is different from others’ brains in terms of processing, accumulation, reactions, and frequency of intercellular connections. In other words, each brain is original and makes its owner unique in this way. It should be kept in mind that in learning process each individual has different brain, and their inner worlds, experiences, cognitive and metacognitive abilities, styles of awareness about events and durations of reactions are different. From this point of view, it is important to keep in mind that cognitive structures possessed by individuals will have different reflections on teaching process, teaching should be diversified as much as possible, sense and feelings which are thought to have close relations with conscious and awareness should also be included in teaching process.

Gazzaniga (1995), Hirst (1995), Churcland and Forber (1995) focus on expertised brain hemispheres as source of consciousness and awareness. Gazzaniga, Churcland and Forber divide hemispheres according to conscious or unconscious behaviours first of all. While left hemisphere is mostly conscious, acts with sensations, is source of sudden reactions, can carry out few tasks in a time unit and has a tendency to abstract processes; right hemisphere is stated to display unconscious or automatized processes and reactions (there are different explanations by different researchers in this subject), be influenced by real life conditions through sense and feelings. In addition to this...
view, Hirst (1995) and Restak (2000) express that brain hemispheres should not be used independently from each other, instead common activities that require them to work together should be preferred\textsuperscript{39-40}. In teaching process, a learning synergy that will require right and left hemispheres of learners to be used can be created and level of learning can be improved to a great extent\textsuperscript{41-42}. For example; it is possible to realize qualified and permanent learning by means of a teaching environment with abstract and logical processes\textsuperscript{47-48} that will let previous learning experiences have positive impact on new learnings, that will stimulate left brain\textsuperscript{43-44} as well as by including right brain into the process through creating an environment of trust that will lead learners to have positive senses and feelings, and through physical stimuli such as sufficient heat, light, oxygen, cleanliness\textsuperscript{45-46}. Studies about brain state that brain hemispheres specialize in different processes and they get dominance over the other at certain time intervals. Jenson (1998) and Hirst (1995) express that brain realizes high and low intensity processes at 90-110 minutes in a day, and that right or left brain may be dominant over the other during these time intervals. From this point of view, in learning process, it can be said that it is important in terms of the quality of learning to include activities that will make right hemisphere more functional such as intuition, insight, creativeness, holistic thinking and editing, process-oriented evaluations (portfolio, observation, etc.) as well as activities that make left hemisphere functional.

Another concept that should be handled in this subject is attention. Jensen (1995) states that quality time of attention for a person is about 10 minutes, however, he also states that processes of attention such as starting, continuing and ending can be lengthened through various stimuli\textsuperscript{49}. For example; in primary schools, a period of lecturing that lasts for about 10-15 minutes should be followed by a break of two or five minutes, because this break will give learners time to process and internalize what they have learnt. Likewise, this is also true with different time periods for higher levels of education. For example; a lecture of 15-20 minutes with high school or undergraduate students should be followed by a break of 1-2 minutes.

Van de Graf (1998) and Jensen (1998) emphasize that brain wave propagations of different frequencies while carrying out various processes and having individuals live similar experiences through some devices may contribute to the increase in the quality of learning\textsuperscript{50-51}. Brain waves different propagations for different processes it carries out. These waves can be divided into four according to frequency. The activities below can be given as an example of brain waves and related processes according to their frequencies: \textit{Beta waves} are repeated 13-25 times in a second and they are waved in the frontal lobe of the brain. They come out as a reaction to visual and cognitive activities. In teaching process; discussions, exercises, contest and complex Project Works can cause such waves. \textit{Alpha waves} are repeated 10-12 times in a second and they are waved in the parietal and occipital lobes of brain. They cause relaxed stimulation. In teaching process; reading, writing, watching and problem solving cause such waves. \textit{Teta waves} are repeated 5-8 times in a second and they are waved in temporal and occipital lobes of brain. They refer to the best time to process information. \textit{Delta waves} are repeated 1-5 times in a second and they can be waved all throughout cerebral cortex. They come out during deep sleeping.

There are some examples of qualities of brain hemispheres related to cognitive processes and learning, and also to strengths\textsuperscript{52}. 
Table 1: Qualities and strengths of brain hemispheres

<table>
<thead>
<tr>
<th>Left Brain</th>
<th>Right Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is realistic, logical.</td>
<td>It is intuitional.</td>
</tr>
<tr>
<td>It is verbal and numeral dominant.</td>
<td>It has visual and spatial tendencies.</td>
</tr>
<tr>
<td>It is planned and structural.</td>
<td>It is spontaneous and natural.</td>
</tr>
<tr>
<td>It solves problems through analysis.</td>
<td>It solves problems through synthesis.</td>
</tr>
<tr>
<td>It controls feelings.</td>
<td>It lets feelings free.</td>
</tr>
<tr>
<td>It ends up with objective judgements.</td>
<td>It ends up with subjective judgements.</td>
</tr>
<tr>
<td>It remembers names.</td>
<td>It remembers faces.</td>
</tr>
<tr>
<td>It sees details.</td>
<td>It sees the whole.</td>
</tr>
<tr>
<td>It likes hierarchically structured interaction.</td>
<td>It likes participative informal interaction.</td>
</tr>
<tr>
<td>It tends to think realistically.</td>
<td>It considers feelings while thinking.</td>
</tr>
<tr>
<td>It is analytical and logical.</td>
<td>It is creative, reactional and abstract thinker.</td>
</tr>
<tr>
<td>It focuses on vertical angle.</td>
<td>It focuses on horizontal angle.</td>
</tr>
<tr>
<td>It thinks convergently.</td>
<td>It thinks divergently.</td>
</tr>
<tr>
<td>Deduction.</td>
<td>Induction.</td>
</tr>
<tr>
<td>It is time-oriented.</td>
<td>It is environment-oriented.</td>
</tr>
<tr>
<td>It prefers writing and speaking.</td>
<td>It prefers drawing, using objects and imagining.</td>
</tr>
<tr>
<td>It controls right side of the body.</td>
<td>It controls left side of the body.</td>
</tr>
<tr>
<td>It deals with one task in a time unit.</td>
<td>It tends to focus on different tasks simultaneously in a time unit.</td>
</tr>
<tr>
<td>It tries to find differences.</td>
<td>It tries to find similarities.</td>
</tr>
</tbody>
</table>

Adapted from Jensen, 1998.

Researchers in the Field of Brain-Based Learning and Their Contributions

When the related body of literature is examined, it is possible to come across some researchers contributing to the improvement of brain-based learning.

A lot of researches have been carried out about brain, learning processes of brain and adaptation of brain’s learning processes to teaching. Some of these researches have developed principles, rules and suggestions about how brain learns and about how to relate brain’s learning style to teaching.

R. N. Caine and G. Caine have come up with some explanations through 12 principles they have developed about brain’s tendency to learn and how to reflect these tendencies on education. Explanations about these 12 principles developed by Caine and Caine are included under the heading of “principles of brain-based learning.”

E. Jensen is one of the leading researchers in the field of brain-based learning. Jensen (1998) mentions nine principles that should be considered important in his study revealing the qualities of brain-based learning. These principles and their indicators about learning process are: Reading; reading plan. Enriching; problem solving, critical thinking, preparing projects, arranging complex activities, and getting feedback of other learners. Attention; traditional and new, preferences of learners, individual activities, physical and emotional studies. Anxiety/Stress; free time, open guidance, techniques of diminishing stress, developing skills. Motivation; setting goals, being affected in a positive way, teaching emotion management, getting/giving feedback. Emotional conflict; role model, congratulating, discussing, presenting physical rituals, carrying out introspection. Motion; playing a role, activities of comprehensive expansion, playing dodgeball. Quest for meaning; basic learning activities, learning through cooperation, teaching patterns, grouping, playing role, setting high level social goals, developing complex projects. Memory; meaning structures, working structure models, operational learning and quick response activities.
Given (2002) mentions about five systems of brain based learning and explain signals of these systems in learning process as expressions of effectiveness. Five systems of brain based learning and their signals are:

1. **Emotional learning**: teachers should act mentors that diminish stress in teaching environment.
2. **Social learning**: learners should feel confident and should be encouraged to congratulate each other.
3. **Cognitive learning**: teachers should act as facilitators in order for learners to solve real life problems.
4. **Physical learning**: learners should be in close contact with teaching materials. In this process, teachers should act in a way that they let students manipulate materials and then turn them into their previous states again.
5. **Reflective learning**: students should be responsible for their behaviours and their own learnings, they should develop self-control skills. In this process, teachers, as a guide, should help students to teach each other and exchange their experiences.

P. Wolfe (2001) mentions about four basic principles and signals of these principles about reflection brain based approach on teaching process. These principles and their signals are:

1. **Brain has different experiences in different environments**: visual, audio and emotional factors should be kept in mind in teaching process.
2. **The system of memory forgets quickly**: students should be maintained to use strategies that help organizing what they have learnt in the teaching process.
3. **We have got long-term and operational memory types**: activities should be organized so that they help learning to be kept in long-term memory.
4. **Emotions are catalizators of learning**: emotional provocateurs should be watched carefully in teaching process. An environment where students feel safe should be established.

In his study that puts forth the dimensions of brain-based learning and the signals of these dimensions in teaching process, Hardiman (2001) states how teachers and students should act in teaching process. These learning dimensions and their signals are:

1. **Positive behaviours**: teachers should display model behaviours; activities that will ensure students to acquire positive attitudes should be organized.
2. **Acquiring and internalizing knowledge**: students should be allowed to use visuals, to realize tasks again and again, to manipulate written texts, to organize their own learnings.
3. **Using knowledge meaningfully**: students should be ensured to use pieces of information effectively and thus to make them permanent in memory. Students should be allowed to display what they know through drama, visual and audio activities, and presentations.
4. **Habits and mind**: students should be allowed to organize and evaluate themselves.

J. King (1997), who carried out studies about brain based learning, states that brain based learning theory is basically dependent on the theory of using posters, accelerated learning, theory of triple brain and their cognitive functions, theories of classified memory, the role of limbic system and feelings on cognition, uniqueness of individual learnings. According to King; explaining how brain works and how to establish connection between brain and learning will give important clues about which methods, techniques, models, strategies, materials to use and in which way to use in teaching process for quality learnings.

In his theory of proster learning, Hart (1992) claims that the best way to learn new things is to establish connection between previous learnings and new learnings. According to him, materials to be used in teaching process will be useless unless they involve preliminary information and establish a connection between preliminary information and new things to be learnt.

In his theory of triune brain theory, McLean (1978) claims that brain can be divided into three basic structures, and these structures are reptile complex that consists of brain stem which is accepted to be source of instinctive behaviours, mammalian complex that regulates feelings and that consists of limbic system, neucortex complex that ensures high level of thinking and learning. According to McLean, in case of anxiety, an individual will tend to use mammalian (emotional) and reptile (instinctive) brains instead of neucortex in order to survive. In this case, it can be said that an anxious individual will have difficulty in using his/her skills of high level of thinking and interpretation. From this point of view, brain based learning emphasized the teaching environment should be eliminated from worrisome elements. Some researchers do not agree with this idea and claim that anxiety is a necessity in learning to a limited extent.
In the related body of literature, it can be said that researchers draw attention to the points stated below:

- Brain needs sufficient nutrition, water and rest in order to realize the best learning.
- Feelings can weaken or strengthen learning.
- Learners should be active in the process.
- New learnings are built on previous learnings.
- Brain is composed of various structures and each brain is original in itself.
- Learning is a social activity and is a form of reaction that brain gives to the interaction with others.
- Stress diminishes the capacity of learning and even some types of high level stress can cause death of brain cells. Anxiety can dampen learning.
- Brain stores data in more than one place.
- Brain processes the gathered data beyond the awareness of learners.
- Reflection is an important part of learning and processing information.
- Brain has got two memory systems; short-term memory that stores unprocessed instant data and long term memory that processes data and stores for a later use when necessary.
- Brain can acquire information both through a holistic view and in a detailed manner.

**Brain Based Learning**

“Brain based learning is a new science that shapes learning process.”


Today, researches carried out about brain can explain the basic structure and operation of brain as well as how it learns to a great extent. Many researches carried out about especially physiological aspect of learning explain how learning occurs, what kind of physiological and chemical changes in learning process, which dimensions of brain are effective in learning process to which extent, how brain should be supported in order to strengthen learning.

While brain based learning has come to the point of explaining learning depending on researches on brain, it is also an approach that is going on developing today in terms of educational programs, teaching environment, teaching time and evaluation. Brain based learning can be defined as an approach that is built on the operation of human brain and that establishes a connection between learning and structure, functions and operations of brain. This approach emphasized the necessity of heading towards new models and methods considering people’s preferences.

According to Caine and Caine (2002); brain based learning is an approach that is based on the structure and function of human brain. In this approach, key concept is to maintain learning opportunities that are consistent with brain’s function as a result of its nature. Brain based learning comprises the idea that the principles of how brain operates should be accepted and teaching activities should be planned and organized depending on these principles in order to create meaningful learnings. Making sense in brain is much more important than receiving knowledge. Brain creates meanings in line with patterns, connections and feelings. According to brain based learning approach, learners not only see the connections about subjects on which they study but also create a meaningful learning by means of establishing connection between previous information and new information.

According to Jensen (1998), brain based learning can be defined as a systematic of questioning that focuses on ways and methods about involving brain in learning process. Jensen also defines brain-based learning as an interdisciplinary answer given to the question of “How can brain learn best?”

The basic foundation of brain based learning approach is the idea that brain is the basic organ in learning. In this aspect, factors that affect brain’s operations in a positive way should be supported and strengthened while factors that affect brain in a negative way should be eliminated in order to create quality learnings. In this context, it is very important to know the structure and operation of brain.
To sum up the information given until here; in brain based learning approach, learning is handled as a biochemical and electrochemical change. According to this approach, in learning process, intercellular connections (axon fibers) are built in brain cells (neurons). Each cell establishes new connections with other cells and thus realizes learning and other vital activities of life. Brain based learning focuses on how brain perceives, operates, interpretes, establishes connection, stores (such as establishing connection, coding, structuring matrixes) and remembers messages in learning process. According to brain based learning approach, learning not only occurs cognitively but also involves cognitive, sensual and kinetic whole. For example; a student who displays kinetic behaviours can operate his mind cognitively. From this point of view, it can be said that brain can carry out more than one tasks at the same time.

According to brain based learning approach, there are some factors that ensure learning to be meaningful and permanent. These factors are relaxed alertness, orchestrated immersion and active processing:

**Relaxed alertness** emphasized that when a person is in an environment where he feels relaxed and calm, learning will be influenced by this environment positively. On the contrary; when brain perceives states of tiredness and threat, learning is suppressed. In this aspect, a safe environment should be ensured for people in order to realize high level and quality learnings. Sense of security that accepts risks at appropriate levels is a part of the state of being relaxed.

**Orchestrated immersion** expresses that learners focus on learning content to which they are exposed. When a certain level of integrity and inter correlativity is ensured, learners will use memory systems in order to explore content and reach learning goals.

**Active processing** emphasized that a learning brain is an active brain. Teachers should carry out an intentional and conscious study together with learners so that the information to be learnt will be integrated and internalized coherently in terms of meaningful and conceptual ways by the learner.

**Principles of Brain Based Learning**

Researches on brain can have impact on many fields about learning. Some of them are developing educational programs, approaches of training teachers, teaching design, teaching strategies, and assessment applications.

Caine and Caine (1998; 2000) state that some principles should be kept in mind in order to realize a brain based and effective learning, and to have qualified learners. These principles are stated below:

The brain is a parallel processor. Human brain carries out many activities simultaneously. In other words, a number of operations (feeling, thinking, imagination, disposition, etc.) go on at the same time in human brain. Educational methods and techniques that will create learning synergy by means of having right and left hemispheres interact with each other should be involved in order to reach the goals set in the teaching process, and to enrich the learnings of students that have different cognitive structures and whose different parts of intelligence are powerful.

Learning engages the entire physiology. Brain is an organ that works according to its own principles of physiological operations, and that interacts and communicated with all the organs of the organism. Learning occurs in a natural way just like respiration. Today, fund of knowledge about the topic shows that learning can occur more easily through having brain influenced in a positive way. Eating habits of students, their level of stress and anxiety, manners of breathing healthily, whether their sitting manner is ergonomic or not and many other physiological states should be considered in teaching process. It should be kept in mind that learning occurs in proportion to the level of development of organism and so brain, and that there may be a lot of individual differences affecting learning, and learners should be compared in that way.
The search for meaning is innate. Making sense of experiences and acting in line with this occurs naturally. While brain looks for and answers new stimuli through dendrites, it also registers these stimuli automatically on the other hand. Making sense is a process that is continuous, that cannot be stopped but that can be directed. The process of making sense is mostly intentional whereas it may also occur while asleep. For effective learnings, it is important for the brain to carry out easy and difficult tasks consecutively, to look for solutions for problems that are new, unexplored or waiting for solution. For this purpose, activities that will encourage students to be curious and then to do research can be preferred in teaching process. Teaching contents should be attractive, meaningful and rich in terms of presenting alternatives.

The search for meaning occurs through patterning. Patterning means organizing and classifying information meaningfully. Brain is just like an artist or scholar who makes use of his intuition and creativity while patterning. While brain accepts information patterns that are meaningful for it, it denies the ones that are not meaningful. In this aspect, it is important to establish relations between pieces of information while ensuring information to be integrated. Patterning and making sense go on all throughout life. Activities such as problem solving and critical thinking that requires brain to operate actively are approaches that are influential in patterning meaningfully.

Emotions are critical to patterning. Emotions and cognition are inseparable structures. When emotions make it easier to store and remember information, they are very important for memory. Besides, many emotions cannot be revived or put out easily. Impact of an experience can come out much later than the event that causes this impact. From this point of view, it should be kept in mind that learning is influenced by the individual's emotions such as expectations, tendencies, prejudices, self-respect, etc. Emotions of learners should be considered important in constructing teaching process since emotional gains in a learning process have the capacity to have negative or positive impact on later learnings. Teaching process should be ensured to be supportive and in a way that learner will feel safe and need for respect is met.

The brain processes wholes and parts simultaneously. Although there are differences between right and left hemispheres in terms of their functions, there is certain integrity between two hemispheres. On the other hand, two hemispheres also have common tasks. While one hemisphere divides information into parts, the other integrates information and thus makes perception easier. While right hemisphere of the brain processes examples about the subject on which thinking is carried out, left hemisphere is responsible for processing much more general concepts and classes. Learning is an accumulative process. When parts and wholes are preferred over other in teaching process, it is possible to have difficulties in learning. While right hemisphere takes the whole picture, left hemisphere focuses on parts and details composing the whole.

Learning involves both focused attention and peripheral perception. While brain basically receives the information on which attention focuses on, it also receives information and signs apart from that one. Those sense organs receive things that are included within the area of perception and that we do not pay attention intentionally is a sign of the sensitiveness of brain’s sensual mechanisms. Teaching environments should be organized so that learners can focus on learning context, and it should be kept in mind that physical conditions such as teaching materials, heat, light, noise, colour are also influential on learning directly and indirectly.

Learning involves both conscious and unconscious processes. Learning consists of conscious and unconscious processes. We learn much more than what we understand consciously. This situation is an indicator that unconscious process works continually. A number of stimuli received from around goes into brain and gets into interaction without the learner’s awareness. Information arriving at the brain influences motivation and decisions. For example; if a student does not come across appropriate teacher’s behaviours while learning Maths, he also learns to hate maths or teaching. It should be kept in mind that if verbal expressions are supported by body language such as gestures, mimes, eye contact, this will also influence learning indirectly and will be effective in keeping students’ attention
alive and active. In teaching process, activities should be organized in a way that they increase learners’ experiences and give opportunity to make sense of their experiences sufficiently. A teaching environment where teaching materials are meaningful and valuable for learners will ensure learners to be active in learning process.

*We have two types of memory.* These are spatial and mechanical learning systems. It is not necessary to review some behaviour we have acquired. Because we have got a natural spatial memory system that makes it possible to store experiences for a short time. This system, which works non-stop, has a quite comprehensive capacity. While mental processes develop in time, our memory system also develops. It is not necessary to do rehearsal in order to remember with whom we play game the day before. In mechanical learning systems, the brain constructs skills and knowledge acquired in an isolated environment organized for a special purpose differently. This memory is a system constructed to store information. Rehearsal is insufficient in making sense and transferring learning into next ones. It is important in order to strengthen learning to retrieve knowledge in the memory through various activities, and to have knowledge be re-shaped in new situations.

*We understand and remember best when facts and skills are embedded in natural, spatial memory.* Experienced-based learnings are the best ways to use spatial memory. Activities that allow students to learn by doing and experiencing directly should be used in order to activate spatial memory. Activities that require multi-dimensional interaction and various emotions such as experiments, shows, trips, and metaphors should be used in order to turn students into active shapers of learning process.

*Learning is enhanced by challenge and inhibited by threat.* Brain’s performance decreases in case of a fear or anxiety. On the contrary, will of learning increases to a high level when the brain is forced appropriately (motivated to make an effort). The basic reason of the decrease in the performance is the sense of desperateness. In this case, perceptual area narrows down, flexibility decreases, and automatically, primitive and routine behaviours come out. Hippocampus, which is a part of limbic system, is the most sensitive part of the brain to stress. Some channels that go into some parts of the brain work less than expected capacity because of excessive sensitiveness of hippocampus in case of fear. Situations such as fear, anxiety, and stress prevent interaction at the expected level between brain parts. When the feelings of fear, anxiety, and stress are intense, hippocampus, which works just like a hard disk tend to cooperate with other parts of the brain less frequently, and thus, the quality of learning is influenced badly by this situation. A teaching environment, which encourages learners, which provides positive inspirations and instructions, is very important in learning to occur.

*Each brain is unique.* Although all people have the same system in terms of being an organism that is a species, individual differences cannot be denied. Moreover, learnings possessed by individuals also change the structure of the brain; therefore, the more learning there is, the more specific the individual will be. It will influence the quality of learning process positively to have a learning process that attracts attention of each of the learner, that addresses different parts of intelligence, especially the fields at which they are good, that includes visual, audio, tactile, emotional alternatives. Teaching activities should be valuable, meaningful, executable, and finishable for students. Thus, each learner can construct his/her own learning process, can enrich his/her learnings and thus have the opportunity to increase his/her fund of knowledge.

**Process of Brain Based Teaching-Learning**

*Brain is affected by all the states in the environment, so factors that can affect students’ positively/negatively should be watched carefully in teaching environments. Positive factors should be strengthened while negative ones should be eliminated.*


Some of the basic features of brain based learning are that it does not ignore other theories that explain learning, it allows students and teachers to make a choice about the process in teaching environments, it supports contingent thinking, it has a holistic system approach. Among traditional teaching strategies, brain based learning also comes to the forefront because it gives importance to
qualities of student, it emphasized rich learning environments lacking anxiety, it supports and strengthens inner motivation, it diversifies teaching according to age and level, it prescribes that all sub-systems of an individual work together\(^{41}\).

Brain based learning approach sets forth brain compliant learning environments. Brain compliant environments consider individual differences in teaching activities from this point of view that each student has a unique brain. The main idea of brain based learning approach related to teaching process is that the basic organ in realizing learning is brain, learning occurs in the brain, and so it is necessary to strengthen factors that contribute in a positive way to the learning of brain and to eliminate and minimize the factors that have negative effect.

According to Caine and Caine (1998 and 2002), it is necessary to know positive and negative factors in order to strengthen the positive ones and eliminate negative ones. The basic principles that are thought to influence the operation of the brain are stated below\(^{42-83}\):

- The organic / chemical structure of the brain
- Emotions
- Music
- Sleep
- Physical vitality
- Exercise
- Nutrition
- Genetic factors
- Lifestyle
- Stress / anxiety
- Motivation
- Social / physical / educational environment
- Health

Some other factors on which brain based learning approach puts emphasis for the sake of increasing the quality of teaching process include memory, capacity of intelligence, parts of intelligence, attention, reward, punishment as well as teaching strategies and assessment activities that will be used considering the individual differences of the learners.

**Memory:** Memory, which plays an important role in teaching and learning process, determines what we will learn from our experiences. Brain based learning prescribes that memory should be used actively in learning process. Human eye catches images just like a camera, but we send the ones that attract our attention to the brain as data. In other words, we choose and see what we wish to. In this process, our attention is influenced by our emotions. Teachers should foresee which type of memory needs being used in which teaching activity\(^ {84}\). There are five different types of memory according to the quality of what they do. *Semantic memory* processes rules, principles, concepts; *episodic memory* records about past times and places. *Procedural memory* processes what is done and when it is done; *automatic memory* processes mathematical operations, responses, sudden answers; *emotional memory* processes interests, feelings, phenomena such as good and bad, success and failure\(^ {85-86}\).

**Stress, fear and anxiety:** Brain based learning claims that all the systems possessed by an individual work together about learning. The impact of brain on learning process depends on the extent to which brain is influenced by environmental and biological conditions. Memory and remembering, music, stress, anxiety, feelings, mental patterns, ideas, learning experiences, nutrition, etc. are included in the factors that affect brain. Stress, fear and anxiety are very influential on brain’s learning. In case of fear and anxiety, behaviour is controlled by limbic system and r-complex down to the neuro-context and the individual displays primitive behaviours. It is necessary to have a low level of anxiety in order for the learning to be realized. Responses given by sympathetic and parasympathetic nerve systems in case of relaxation and resting changes when the organism has stress. Stress has negative effect on the operations of the organism; brain is influenced by the operations of the organism and thus affects learning\(^ {87}\). 

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Attention: Another factor that is influential in brain’s learning is attention. Brain should be used as actively as possible in order to enhance attention and awareness. It is necessary to inform the students about the subject and goals before starting the learning activities and they should be given enough time to get ready. Students should be ensured to be responsible for their own learnings and they should be provided with the opportunity to determine their strengths and weaknesses. A positive emotional environment should be organized in class and at school; necessary arrangements in line with students’ preferences and students should be encouraged to have a change. Cooperation should be supported and students should be given the opportunity to improve themselves in order to set standards related to themselves and their goals and to spend their free time well. Precautions against risks should be taken, students should be directed to alternative activities, different activities should be organized such as educational trips, visual projects, independent game time.

Rewards and punishment: It is important to use rewards and punishment carefully in teaching process. Punishment should not be used as much as possible, or it should be in a way that is not the same as the known ones and that will not cause an emotional depression. On the other hand, rewards should be given in line with certain educational goals and included in various activities.

Studies carried out by Jensen (1998) show that rewards that are given directly decrease the inner motivation, diminishes the will and value of learning, gives wrong messages and directs students towards a game of adventure lacking a winner. Instead of this, it is necessary to increase the feedback given to students in teaching environment, to provide students with the opportunity to make satisfying explorations, to support students to use the right to prefer and control related to their own studies and thus to encourage them to reach innovations in this way.

Educational programs: Brain compliant learning requires brain compliant educational programs and brain compliant teaching activities. Brain compliant programs provide students with the opportunity to know and improve them. The basic features of brain compliant educational programs are stated below (Jensen, 1998):

- It includes plans and lessons that are open for improvement and flexible.
- It includes general and specific cultural elements in the lesson.
- It supports the use of interdisciplinary materials.
- The relation between teacher and student is at a high level.
- It considers gender differences important.
- It prescribes social and emotional literacy.
- It provides the opportunity to improve the skills of learning how to learn.
- It includes daily physical activities.
- It includes metacognitive strategies.

Brain based learning prescribes that teaching programs should be developed considering the individual needs of learners. It is important to arrange multiple learning activities possessing visual, audio, kinetic and emotional dimensions so that individual and group learning is maintained in order to ensure students to participate in learning experiences actively. From this point of view, we can say that while arranging brain based teaching environments, multiple intelligence theory which claims that each individual has different learning qualities and each tends to learn through different ways and at different speeds, which offers teaching activities that will facilitate learners’ learnings, ensure students to know themselves and gain self-confidence and develop high level thinking skills should be made use of.

While designing teaching process, the question that should be kept in mind should be “How can my students learn best?” rather than “How can I teach best?” Activities that can provide contentful, multi-dimensional and emotional experiences should be used for students possessing different learning styles in order to help students to be able to create meaningful learnings, strengthen their scientific understanding, store data in their memories effectively and retrieve them when necessary.
Teaching activities follow a line of process. It is a well-known fact that activities used in teaching process are carried out through programs that have a certain framework. Because of this reason, although students have the capacity to achieve much more, they cannot succeed due to the limited content included in programs. From this basic point of view, brain based learning claims the idea that processes that affect brain and individual differences should be kept in mind while setting educational goals and arranging learning environments. It is possible through arranging learning environments in a brain compliant manner for the human brain to realize learning efforts effectively and productively. Learning can be improved by means of arranging environments having stimuli that support brain and the quality of learning, and eliminating factors that affect brain in a negative way. Some of the activities and behaviours that can be suggested for teaching environments are stated below:

- An atmosphere that gives courage and confidence should be arranged.
- Students should not be expected to meet high standards.
- Brain compliant assessment techniques should be used.
- Individual differences should be considered.
- Students should be provided with the opportunity to specialize in different subject areas.
- Group activities and cooperation should be supported.

Researches carried out about the operations of the brain show that human brain has a huge capacity to learn, however, most of the learning activities in the brain are realized unconsciously. Brain carries out a number of operations without the individual’s awareness, but the limited capacity of focusing attention prevents us to be aware of all these going on.

Jensen (2004) states that a teaching program that will be developed in line with brain based learning theory should have some qualities such as social fluency, individual development, scientific research, information literacy, and artistic expression. The key concepts related to the given qualities are stated below:

- **Social fluency**: emotional intelligence, appreciating differences, language skills, spiritual identity, suitable family manners, team works and conflict resolution.
- **Individual development**: stress management, physical relaxation, cognitive awareness and reflection, sense and goal of understanding, nutrition, habits of health and eating, heading towards the goal and success, skills of learning how to learn, personal and moral responsibility.
- **Scientific research**: environmental studies, future and global studies, studies on maths, physics, biology and chemistry.
- **Information literacy**: skills of reading and writing, searching and looking for, cognitive processing, skills of speaking and presenting, skills of technology.
- **Artistic expression**: music, story writing, dance, theatre, sports, hobbies and arts, design, visuality.

**Teaching strategies**: Brain based learning prescribes the use of various strategic alternatives as much as possible in teaching process. Some of the teaching strategies that can be used in teaching process are stated below:

- Defining differences and similarities
- Note taking and summarizing
- Reinforcing individual and group works, ensuring awareness
- Homeworks and applications
- Cooperative learning
- Making premises and testing
- Asking question and high-level organizing
- Active learning

Various strategies are made use of in brain based teaching process. Each strategy is used to ensure the brain to work and learn effectively. For example, some of the teaching strategies that can be used by the teachers in question-answer activities in teaching process are:

- **Time of waiting**: after teacher asks students a question, students are given a time to wait for about 3-5 seconds and then students...
are expected to give their responses and answers. This activity aims at developing behaviours of remembering in a short time. After the first responses coming from the students, a second short time is given to them to reflect their ideas. Students’ answers are not met with a reaction or response, students think over their own answers. In this way, the brain is expected to carry out some operations such as searching, establishing relations and organizing. *Time of reflective pause:* A time of pause is given for about 3-5 seconds after the question asked by the student before, during or after comment. Then, students are given time to transfer their ideas to each other. Activity goes on until students reach a big piece of information. Activity goes on for more 1 or 2 minutes in order to give students time to set their ideas more clearly, to do an overall thinking from the beginning to the end, to rearrange their questions. Reflection is a behaviour through which long term memory is fed.

*Time of work waiting:* It is an activity that is carried out by individuals or groups quietly and quickly for about 30 seconds to 2 minutes. Learners interact with each other by means of asking questions to each other. They carry out discussions and definitions related to information, skills and concepts. Partners in each group ask questions to each other and answer the questions, and thus they go on carrying out the activity in this way.

**Assessment:** In an environment where brain-based learning theory is used, assessment is accepted to be a study of identifying states. In a process of brain based assessment, assessment techniques that are often used include performance tasks, portfolio, conference, report cards, memory tests, multiple-choice tests, true-false tests, fill in the blank, observation, interview, books designed by students, drawings, projects, products, presentations, creative drama, mind maps.

**Brain Based Learning and Principles of Effective Implementation**

It will be very useful to arrange brain compliant classes, make use of mental models and brain compliant strategies, use brain compliant assessment processes and turn the school into a learning community in order to use the brain effectively and productively in teaching process. For this purpose; it is necessary to prepare brain compliant teaching programs by means of considering environmental factors that affect brain.

Suggestions made by Pridge (2002) as well as Politano and Paquin (2000) provide teachers with important clues about constructing brain based teaching process. According to Pridge (2002); while strengthening brain based teaching activities and increasing the quality of teaching process, it is important to carry out the activities stated below in order to prepare learners for learning, arrange learning environments, maintaining attention, storing and retrieving information:

**Preparing students for activities and learning**
- Giving information to students about how their brains work
- Setting the goals of learning together with students
- Teaching students the right styles of sleeping
- Telling students the impact of nutrition on behaviours and success
- Raising students’ awareness of the impact of water on their organisms, especially their brains
- Ensuring students to be aware of their learning preferences

**Arranging learning environment**
- Establishing a positive learning atmosphere
- Using music in activities
- Using positive visual reminders
- Creating an interactive learning environment

**Increasing and keeping student’s attention**
- Establishing a connection between emotional reminders and learning
- Allowing the behaviour of laughing in learning process
- Allowing students’ mobility in activities
- Avoiding factors that can create internal and external anxiety
Increasing memory and remembering
- Emphasizing the importance of emotions on learning
- Establishing a learning dilemma sensitive to learning
- Considering students’ individual differences about learning
- Including creative repetitions
- Remembering the most important first and last phenomena about the topic
- Using specific remembering techniques

Politano and Paquin (2000) offers some examples that can be classified under the headings such as individuality, assessment, emotions, meaning, multiple ways, unity of body and brain, memory, nutrition, cycle and rhythm, overcoming fears in order to enhance the quality of brain based learning applications in teaching process and the effects of these applications. Some of the examples about the given areas are stated below: 

1. **Individuality**: means providing learners with alternatives, providing the opportunity to establish a connection between preliminary information and new learnings, knowing the learning styles, feelings and strengths of learners. **Assessment** means ensuring students to give feedback at right time and to give feedback to each other, providing learners with the opportunity to reflect them, helping students to turn their mistakes into learning opportunities. **Emotions** mean encouraging learners to express their feelings, accepting games and fun as a part of learning, using positive expressions towards learners. **Meaning** is about using holistic learning, knowing individual appropriateness and emotional content, providing students with sufficient time to study, providing student with enough time to reflect what they have learnt and to transfer what they have learnt into their own developmental processes. **Multiple ways** includes implementations aiming at considering multiple intelligence, producing ways of multiple teaching designs, providing opportunities for various presentations, enriching teaching environment with visual and audio materials. **Unity of body and brain** is about ensuring effective learning and organizing activities such as trips, games, shows through which students will have the opportunity to move enough. **Memory** is composed of implementations about using organizational promoters (information, concept and mind maps) and providing students with rich learning experiences through using environment as much as possible. **Nutrition** includes informing students about nutrition and helping them to choose useful food, and having water and sugar, which are the basic needs of brain in the learning environment. **Cycle and rhythm** means arranging activities through which student will de-energize, knowing and managing students’ excitements, ritual, leading the proper use of innovations. **Coping with fears** includes activities aiming at managing stress, motivating learners by means of creating a democratic atmosphere in learning environment and strengthening learners’ inner motivations.

REFERENCES

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CHAPTER 11: PROBLEM-BASED LEARNING

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WHAT IS PROBLEM-BASED LEARNING?

In an age in which knowledge doubles every ten years and spreads too fast, it has become impossible for information to be memorized. This situation has brought to the forefront the individual who can use knowledge, question, think, discuss and solve problems and made it compulsory for him to be trained in this direction. The approach proposed for the education of such individuals is Problem-based Learning. Problem-based learning has taken its bases from John Dewey’s views of “learning from experience”.

Problem-based learning (PBL), which is a teaching method which tries to ensure that students learn by working in groups and in cooperation to research the real global problems, is known to have been pioneered and put into practice by The Faculty of Medicine, McMaster University of Ontario, Canada and used for the first time in the curriculum of Health Sciences in 1960’s. Since then, it has been a teaching approach used in many disciplines such as engineering, law and architecture. The use of problem-based learning in education began in 1980’s. Why problem-based learning started to be used in education is because it was noticed that students could keep only little knowledge in their memory and were not able to use knowledge in other fields by transforming it when the traditional method was used.

Problem-based learning constitutes one of the most important practices of the constructivist learning-teaching concept. Problem-based learning exposes students to a complicated situation or incident and encumbers them with the role of “possession of” the problem or of “responsibility for” the incident. Students define the real problem and learn whatever is necessary to work out a valid solution by means of research. Problem-based learning represents a learning based on experience, which calls for the active use of both the mind and skills of the individuals. Problem-based learning is an educational approach aiming to upskill students in learning how to learn and to increase their capacity for learning.

Problem-based learning is an approach, which focuses on the problem, from teaching objectives to students’ behaviour and from the method and technique to be used up to measurement and evaluation procedures. Consequently, first of all, the goals and behaviours need to be determined in such an approach. Subsequently, the methods and techniques to be used at the stage of problem solving will need setting.

While some educators consider problem-based learning as a teaching method, a great majority of them consider it an approach for a teaching and training program. Problem-based learning has evolved out of an extensive repertoire which searches how people will be able to obtain and transfer knowledge.

Watson and Matthews state that problem-based learning has three main characteristics:

1. It is an organization of problem-based teaching. It has a totalitarian structure and emphasizes especially cognitive levels.
2. It has a structure facilitating the experiences in small groups, special education and active learning processes.
3. It develops skills and motivation and maintains the skill for lifelong learning.

CHARACTERISTICS OF PROBLEM-BASED LEARNING

The Steps for the Practice of Problem-based Learning

Problem-based learning may include different steps of practice in the teaching of many disciplines. However, the basic steps for all problem-based learning practices in the literature are as follows:

1. Meeting the problem and defining it
2. Determining what one knows and what he needs to know and putting his thoughts into order
3. Gathering and sharing information
4. Producing potential solutions and hypotheses
5. Determining the learning issues
6. The application of the new knowledge to the problem and reevaluation
7. Identifying the best solution
8. Explaining the problem and its solution briefly
9. Evaluation and presentation of new learning

The practice process of problem-based learning has been given in six steps in the diagram below.

Diagram 1: Practice process of PBL

I. Meeting the problem: The tutor presents an ill-structured problem associated with real life to his students in small groups in a scenarized way. Students try to define the problem presented to them basing on their prior knowledge.

II. Planning learning: By exchanging views in groups, what is known about the problem is put into order and the points needed to be known are written down under the title “learning issues”. Following a debate on potential solutions, the hypotheses produced are noted down. It is determined, benefiting from the guidance of the tutor as well, which information gathering method and resources will be needed for the solution and how they will be accessed. Plannings are carried out on each learning issue with attention paid to division of labour.

III. Gathering information: Information is gathered in an effort to access resources of information (library, internet, personal resources, etc.) Data needed is obtained via measurements carried out by means of methods (observation, experiment, etc.) intended for the solution to the problem.

IV. Solution: The data obtained is shared and interpreted. Potential solutions to the problem are discussed in groups and the best solution is determined.

V. Presentation: The solution identified for the problem situation is presented as a suggestion and explained to the other groups briefly. Views and criticisms about the suggestion are written down.
VI. Evaluation: Students assess, from their points of view, the components of problem-based learning program and their performance during the process. Basing on learning products, the tutor carries out measurements and evaluations about the performance of his students.

The Role of the Tutor
The role of the tutor in problem-based learning approach is different from that of the traditional tutor. In problem-based learning, the tutor owns the role of a guide within the classroom and assists students in learning. He leads them about how to think and solve problems and directs their performance.

Roles of a tutor in problem-based learning can be listed like this:

1. The tutor is motivated to spare time for the practice of problem-based learning, that is, PBL activities, deal closely with the performance of students, make them understand better and show that he gets pleasure from PBL activities.
2. He prepares true-life and well-designed problems and presents students with the problem situation using the media such as written scenarios, drawings, computer animations, video and tape-recorder.
3. He checks the accessibility of the resources such as books, periodicals and web, to which students can be directed for the PBL practices, and how practical they are for the work to be carried out.
4. He clearly identifies the goals, acquisitions, strategy and techniques in order to assess the learnings.
5. In PBL sessions, inexperienced students tend to forward their questions and information directly to the tutor. For this reason, the tutor keeps the groups under supervision and directs them to share what they know and their questions, if they have any, with the members of the group.
6. He addresses them questions to increase their comprehension to higher levels and to enable them to make in-depth analysis of the problem presented.
7. In order to create an atmosphere in which students share their views without getting possessed by the fear of being ridiculed, he guesses the ones who intend to ask a question but abstain, supports them and values their opinions.
8. He summarizes to the groups the positions they have reached so as to help them to check their work processes and to go ahead. He behaves impartially as far as possible while making this summary.
9. In cases groups have come to a point where they cannot go any further or in the decision-making processes of the ones who are not yet accustomed to PBL, he suggests some alternatives.
10. He monitors the PBL process of the groups. This is important in terms of both his place and the places of the groups within the process.
11. He includes questions for which he will be able to get the impressions of the students about the process both individually and as a group.
12. He gets free of the role of a sage and undertakes the role of a guide and a facilitator.

The Role of the Student
Problem-based learning is a student-centered approach. Therefore, the most important task lies within the student. In problem-based learning, the tutor and the student interchange their roles. In this method, the responsibilities of students in learning increase. Students move from a passive position to an active one. Students are persons who think, know and solve problems. The situation is that of a student who has turned into a tutor and of a tutor who has turned into a student, so to speak.

In problem-based learning, students are asked to learn as soon as possible how to succeed in self-directed learning. In this approach, the role, which students undertake in learning, has completely changed. Students who structure information actively have replaced passive receivers. Students working in groups need to organize their prior knowledge and define problem situations. Students should be inquisitive about things they do not understand, the design of a problem-solving plan and how to identify the resources needed.

1. Analyzing the problem situation by comprehending the structure of the problem broadly.
2. Developing practical solutions to the problem.
3. Undertaking a decision-making role in debates within the group.
4. Cooperating with the tutor and friends and determining the learning goals, which need researching for the solution to the problem.
5. Identifying the resources and strategies, which will be able to convey to the learning goals.
6. Assessing the conclusions one draws from the data obtained, that is, the learning products.
7. Checking both the learning goals and the learning media.
8. Presenting his opinions in a clear and understandable way in which the other group members can conceive.
9. Evaluating different views impartially.
10. Being aware of his roles and responsibilities individually.
11. Exhibiting behaviour of a type, which defends new ideas and situations and gets them across to the other members.
12. Congratulating and appreciating the other group members on account of their convenient suggestions leading to the solution.
13. Developing the knowledge infrastructure for the solution to the problem
14. Being able to set certain targets, which may be useful in using suitable research procedures and directing the group.
15. Carrying out observations and practices taking into consideration the processes used by the implementers of the field or the discipline related to the problem.
16. Becoming the instructor of each other by teaching what they have learned to the other group members.
17. Being courageous in focusing on a new problem and on its potential solution.
18. Getting into contact with the external world and other people so as to discover concepts and to use his abilities.
19. Approaching problems and their solutions with new and original ideas.
20. Being inquisitive during the process.
21. Giving positive input to constructive criticisms.
22. Joining group work on time and on a regular basis.
23. Assessing his and his friends’ contribution to the group work in the course of it.
24. Finding out important resources for the solution to the problem and sharing them.
25. Turning the work into a report and presenting it to the class.

Problem situation
The use of problem situations constitutes an important part of the operation of problem-based learning process. Such problems are different from normal post-test problems and citations are made from daily life events during its preparation in order to attract students’ attention. As is known, traditional problems are presented after the students are given the necessary information about the target concept. The content of the problem is simple and the problem is of a kind, which can easily be solved by the use of the information given in the content. Conversely, in problem-based learning approach, the student should access the information himself. In consequence, the tutor does not convey the information about the concept or concepts directly to the student. Problem situations are used to ensure that the student accesses information. The student encountering the problem does a research to solve it. Within this research process, he accesses the information he needs himself with the guidance of the tutor and uses it for the solution to the problem. The superiority of problem-based learning approach arises at this point. Individuals working with this approach are able to access information themselves and use it.

The Characteristics of A Problem-based Learning Problem
The characteristics a PBL problem should involve can be listed as below:
1. A quality problem should be able to attract the student’s attention and stimulate all the students.
2. It should be reliable and there should be a relation between the problem situation and the real world.
It should be meaningful and suitable for student’s level of cognitive development and should provide an opportunity for interactions among students.

4. It should base on the student’s current knowledge.

5. It should be ill-structured, that is to say, it should have more than one way which will lead to the solution.

6. It should be authentic. In other words, problems should not be from outside of everyday life of students and exceedingly theoretic and should be selected from real world.

7. It should be ill defined, that is, questions should come to students’ mind in order to cognize it when the problem is first heard.

8. It should support lifelong and self-directed learning.

9. It should be convenient for students to state their decisions at each stage.

10. As some problems will be solved as a group, it should be convenient for cooperation. It should have a feature that the group members can reduce it to sub problems.

11. It should be open-ended and not single-answer.

12. It should be associated with student’s prior knowledge and be of a nature to support it. The problem should generate different points of view.

13. It should be able to motivate students to do researches so that they can have a more in-depth comprehension of the concepts they meet.

14. It should necessitate making judgements and decisions on the basis of knowledge and reason.

15. It should be complicated enough to necessitate the cooperation of all group members to work out a solution.

16. It should be debatable enough to draw all group members to a debate in the beginning.

17. It should cover the acquisitions of the lesson.

18. It should connect the students’ prior knowledge with new concepts.

19. It should associate the students’ new knowledge with the concepts in the other lessons or disciplines.

20. Students’ cognitive abilities should be promoted from Bloom’s lower cognitive level (knowledge and cognition) to a higher-level thinking (analysis, synthesis and evaluation).

Evaluation in Problem-based Learning

The concept of measurement and evaluation in problem-based learning approach is different from that of the traditional approach. Students are not only evaluated in proportion of the correct answers they have given to the questions in traditional measuring tools (written and oral examinations). Evaluation involves concluding about students’ success basing on observation of their behaviour in the classroom as well as (written and oral) examination results in traditional measurement tools.

Evaluation methods in PBL are divided into two, as process-centered and product-centered and these methods are as follows:

**Process-centered Evaluation Methods:**
1. Classifications of tutors and of students’ peers aimed at evaluating students
2. Students’ evaluation of themselves
3. Nonirritating measurements (library records, articles checked, pupil tracking sheets)
4. Oral examinations and interviews
5. Observations
6. Student reports
7. Evaluation of problems
8. Performance evaluations (visual, verbal, audial and written presentations, graphics, demonstrations, mathematical analyses and portfolios)

**Product-centered Evaluation Methods:**
1. Student reports
2. Evaluations conducted by students
3. Multiple-choice examinations
4. Short-answer and gap-filling examinations
5. Written examinations
6. Evaluations of portfolios

It is a key component in problem-based learning to give students the chance to evaluate their own learning and reflect it. With self-evaluating step, the students are enabled to compare their performances in achieving the goals they determine as a group when the problem begins. Self-evaluation enables students to develop their ability of monitoring their own learning outside the academic environment and helps them to achieve their goal to be life-long students as well.\(^\text{15}\)

In summary, in classes where a problem-based teaching strategy is applied, evaluations are carried out in the form of students’ solving problems by using the knowledge they have obtained from lessons and their life experiences instead of paper and pencil tests. Since the responsibility for learning belongs to the student in the strategy for problem-based teaching, he should be able to conduct self-evaluation and the tutor should only act as a pathfinder and a guide.

**Traditional Teaching Approach and Problem-based Learning**

There exist profound differences between traditional teaching approaches and problem-based learning in regard to objective, role of the tutor and of the student and acquisition of knowledge. Some of these differences have been listed in table 2.\(^\text{16}\)

| **Table 2: Differences between traditional approach and problem-based learning** |
|-----------------------------------|-----------------------------|-----------------------------|
| **Objective**                     | Enabling students to repeat the knowledge they have learned as it is when they are asked to. | Enabling students to construct their knowledge themselves to work out a solution to a problem situation. |
| **Tutor’s Role**                  | 1. The tutor gives information and directs their thinking.  
2. The tutor guides students into learning and evaluates them.  
3. Learning materials are prepared and presented by the tutor. | 1. The tutor, as a cognitive guide, exposes students to a problem situation.  
2. The tutor, as a resource person, asks students questions, relates to students’ world and directs their learning.  
3. The tutor identifies the learning situations and students select the problems and learning materials. |
| **Student’s Role**                | 1. The student is passive.  
2. As a follower, the student awaits the leadership and guidance of the tutor. | 1. As problem solvers, students work out various solutions to problems they meet making use of the resources available.  
2. As participants, students are active in the learning process and research the problem extensively. |
| **Information**                   | It is gathered, organized and presented to students by tutor. | Very little of the information is presented by the tutor. Most of it is gathered and constructed by students. |
ADVANTAGES OF PROBLEM-BASED LEARNING

1. **The lesson is student-centred rather than teacher-centred.** In a lesson grounded in a problem-based approach, the student determines what he knows or not about the existing problem. He continues learning by performing observations, experiments, practices, researches and analyses at the stage of acquiring new knowledge. The tutor guides his students into access to resources.

2. **It develops self-inspection of students.** During the process of problem-based learning, the student can develop his self-inspection. Self-inspection is the student's adoption of some rules and obeying or enforcing them by himself without the need for external warnings. In short, student is given the opportunity to gain the ability for self-direction in problem solving.

3. **It joins practice and theory.** The student gets the chance to transform the knowledge he has learned theoretically into practice with the help of PBL. Problem-based learning supports students in both joining their prior knowledge with new ones and developing their judgement skills in a certain disciplinary climate.

4. **It maintains life-long learning.** Life-long learning is defined as continuous analysis, investigation and behaviour of search for knowledge in one's own field of specialization or in other fields of interest. The individual gaining the skill for problem-based learning can do an activity of search for knowledge and problem solving in his field of interest in any phase of his life.

5. **It provides active learning.** It is aimed to gain students scientific processing skills such as making observations, classifications and measurements; using numbers; building up contact; making assumptions; collecting, recording and interpreting data; determining and controlling variables; making definitions; forming a hypothesis; making experiments and creating a model and using it at the end of the active learning process.

6. **It gains group-working skills.** PBL focuses on earning students the skills of working in teams and in small groups. Lessons involving learnings in small groups have a more positive effect on students’ academic successes, their pursuit of lessons and programs and their attitude to learning compared to traditional teaching.

7. **It gains problem-solving skills.** Problems awaiting the next generation professionals will be from different disciplines and will call for new approaches and skills of solving complicated problems. To gain or strengthen students’ skills of solving problems which are from their real world and which have a complicated nature is included within the aims PBL focuses on.

8. **It increases science literacy.** Science literacy consists of establishing a connection with scientific facts, knowledge of concepts and theories, scientific thinking habits of mind, understanding the nature of science, mathematics, technology, the influence of technology on people and its role on communities.

9. **It gains scientific process skills.** Most scientific programs, by excluding the most interesting application-oriented parts of the steps of scientific research process, focus on only a few steps. Yet, PBL has a nature motivating students to scientific thinking, which bears very close similarities to these steps.

The following are skills constituting main skills in scientific research process:

- Performing observations
- Making classifications
- Building up contact
- Making measurements
- Making predictions
- Drawing conclusions
- Identifying and controlling variables
- Forming hypotheses
- Interpreting data
- Producing definitions
- Making experiments
Forming models

10. It gains highly memorable knowledge. Though, in some resources, PBL is stated to gain less knowledge when compared to other methods, there exist studies stating just the opposite and asserting that the knowledge gained by PBL is even more memorable.

11. It gains metacognitive skills. Metacognitive skills mean students’ awareness of thinking and thinking processes of their own. Metacognitive skills, known to involve behaviour such as the ability to see an executive function in thinking, negotiating, expressing opinions about the problem situation, reviewing and recalling knowledge about the things told regarding the problem, forming hypotheses, determining what to observe, asking questions when necessary, questioning the meaning of the failures within the process by research and reviewing the new learning, are included within the goals students should achieve in PBL.

12. It gains self-directed learning skills. Self-directed learning is students’ direction and planning of their learning activities by themselves. PBL approach enables students to develop their self-directed learning skills in order to achieve the goal expressed as “learning how to learn”. Thus, students gain the attribute of carrying out their self-directed learning in the rest of their lives.

13. It gains critical thinking skills. Critical thinking is defined as identifying central topics and hypotheses in a debate, realizing important associations, drawing correct inferences, making conclusions from the data obtained, interpreting the conclusions, whether they are based on the data or not, and evaluating the prevailing opinions and evidence.

14. It gains cooperative learning skills. Cooperative learning is cooperation of students as a team for a common goal, in other words, each student’s learning what makes a cooperative learning activity valuable. PBL develops cooperative learning skills. By working in small groups, students compare their learnings with that of others.

15. It facilitates high motivation and positive attitude. In problem-based learning process, students are willing and enthusiastic about learning, because as they make personal investment in the results of their own researches, they go deeper in the learning job, which causes motivation to rise higher.

16. It gains communication skills. Speaking to group members directly, using words they can understand, presenting clearly, asking nonjudgmental and open-ended questions properly, identifying the misunderstandings among group members and trying to settle them, expressing his feelings, understanding verbal and nonverbal behaviour and responding to them are among the communication skills involved in PBL.

17. It gains higher-order thinking skills. The main goal of PBL aiming to develop the higher-order thinking skills is to motivate students so as to ensure that they learn at higher levels of learning such as analysis, synthesis and evaluation instead of simple levels such as knowledge, comprehension and application from Bloom’s levels of cognitive learning. In PBL, students are given the opportunity to gain higher-order thinking skills by means of well-designed problems.

18. It constitutes a model for teacher candidates. Lessons done through PBL approaches in which the student is active within the learning process and the tutor provides guidance instead of giving ready information, in this sense, have the quality of model applications which teacher candidates can take as examples.

19. It increases skills in using information resources. PBL, in addition to students’ skills in finding, evaluating and using suitable learning resources, increases their skills in consulting personal resources and getting information as well.

20. It develops decision-making ability. PBL, by enabling students to get rid of indecisiveness and timidity, helps with their individual development.

LIMITATIONS OF PROBLEM-BASED LEARNING AND DIFFICULTIES IN PRACTICE

Besides many benefits of problem-based learning, there also exist studies touching on the limitations seen in practice. Limitations of PBL have been given below:

1. The most important problem with problem-based learning is the formation of the problem. The problem may sometimes not include the topic, or sometimes involve different topics.
2. Direction of students who have continuously had lessons with the traditional approach to problem-based learning is likely to cause some problems.
3. It may take a long time to use such an approach in formal education. The length of time may cause the student to get bored or his motivation to lessen.
4. If the leadership skill of the tutor is poor, he may fall short in the direction of the class, which will cause the emergence of problems much more complicated than solving the problem.
5. It is quite difficult to evaluate learning in problem-based learning. It can also be difficult to evaluate all students in-group work objectively.
6. Teaching programs may not be suitable for problem-based learning, because the preparation of these programs has mostly been predicated on traditional teaching approach.
7. Students may be faced with resource constraints in problem-based learning, which prevents them from accessing information. What is more, it is almost impossible that the materials to be used should be developed by the student alone.  

The limitations of PBL can be stated in terms of tutor, student, nature of knowledge it earns, time and cost as well.

**Difficulties Tutors Experience**
Tutors, as they have moved from the role of a tutor transferring information in traditional environment to the role of a facilitating tutor who encourages his students, feel depreciated. Moreover, tutors who want to keep the control of the class in his hands and to do the lesson with students who are passive listeners feel uncomfortable with PBL environment. For tutors who have accustomed themselves to the role of transferring a body of knowledge to students, it is difficult to get used to their roles in PBL. While, in traditional system, tutors perceive themselves as experts in their fields, they feel unconfident and disappointed since they cannot answer questions out of their fields, and they see themselves as instructors who are not experts in the field in PBL. The fear of not knowing and being unable to get accustomed causes great anxiety. High anxiety leads to avoiding PBL and in consequence, to resistance and refusal. Furthermore, as tutors need confirmation for the things they tell about in the traditional system, they demand lecture-based teaching method. Consequently, tutors are likely to have difficulty with changing their styles. Besides, if the tutor’s leadership ability is inadequate, he may fall short in the management of the class, which will cause problems much more complicated than the solution to the problem.

**The Difficulties Students Experience**
A feeling of fear is likely to arise in students due to a different system. Because there is no stable curriculum and coursebook, they do not know (at least in the beginning) what they should learn. Additionally, the anxiety that each student will own different knowledge and skills prevails in them. They are confronted by a dilemma between their habits and the learning expected of them in PBL. Thinking and learning by means of problems is a situation they are not familiar with. Nevertheless, PBL may generally have some more disadvantages with students who are timid, lacking in self-confidence and exceedingly kind. In fact, students should ask questions continuously and do researches themselves to work out the answers for a successful PBL practice. Student-tutor relationships should be clearer and freer. Students should be free to criticize their tutors and make mistakes and learn owing to these mistakes.

**The Nature of the Knowledge It Gains**
It is stated, in some studies, that students gain less knowledge in PBL. Another criticism made is the emergence of a lack of gaining knowledge and focusing on problems, which make students, think of only limited subject content while students are aimed to gain higher order thinking skills in PBL. PBL students may not perform as well on multiple-choice tests as students taught by lecture-based method. However, researches carried out have brought to light that PBL students can keep knowledge in mind for a longer period of time.
**Time** One of the aspects of PBL, which is criticized most, is that such a practice needs much more time compared to the traditional lecture-based teaching.

**Cost** Another disadvantage of PBL is that it costs more in comparison to the traditional teaching based on lecture. Many factors are included in this cost calculation. Time spent by tutors and students, the personnel support required, rooms for the need of small groups for meetings and resources like library materials are among these factors. However, while a great number of students can be given lesson by one instructor only; there is a need for plenty of tutors for such a class in PBL. The support of teaching institutions regarding cost calculation is needed more in PBL compared to other teaching methods.

**IDENTIFICATION OF THE PROBLEM SITUATION AND WRITING A SCENARIO**

In problem-based learning, it is important to write scenarios relating to problems and to how they will be solved. After the topic to be dealt with is analyzed by students and tutors, the relevant problem, sub problems and scenarios associated with them are developed and researched. Students dwell on real life problems while preparing a problem on a topic related to lessons for science, math, social sciences, etc. The scenarios to be developed should involve real life examples. The aim of the problem or the scenarios dealt with is to get the student to the learning goals he is asked to obtain in certain periods of time.

After this stage, the thing to be done is write down the problem situation. The scenarios should be organized in a way to explain the problem, designed in line with real life, be interesting and it should be able to produce a solution to the problem at the end of the period. Students, when they make efforts to solve the problem with scenarios, should meet situations for which they can find resources and be motivated and which have a field of practice.

In writing a scenario suitable for the problem, the teaching program is benefited from as the starting point. With the subject in the program analyzed thoroughly, main concepts, the existing knowledge about the subject, the topics which need to be known and where, how and with which methods this information will be obtained are determined by students. In the preparation of the scenarios, the tutor should carry out the necessary orientations for help. Otherwise, students are likely to deal with the subject too broadly or too constrictedly. It is very important to fully present the problem, which will be determined. Students should be asked to present their scenarios with a concrete product. The aim of the product to be presented should be explained accurately and the products should be suitable for the level of students. The scenarios can be written, oral, audial and visual.

**Examples of Problems**

Some examples of problems, which can be used in science, mathematics and social sciences education, have been given below:

1. Suppose, one day, while you were driving on the highway with your father, you saw a warning sign, read the warning “Slippery When Wet” and your father slowed down immediately after he saw this warning. Why?
2. Suppose you were spending your holiday by the sea and when you went out one morning, you saw many dead fish and some people picking them up to eat. How would you behave? Why?
3. Recently, you see that, in the detergent commercials broadcast on TV, commercials for lemon detergent are frequently advertised. Why, in your opinion, is lemon specially emphasized in detergent commercials?
4. One day Ali was playing with a metal part he had found. He tried to compress the metal part in his hand to measure his strength against it, but did not succeed. His friend who was with him said that Ali would not be able to do this, as their teachers had mentioned solids was incompressible. Ali asserted that metal was compressible and decided to research this subject. Do you think solids can be compressed? Please explain.
5. Karagoz shadow puppet play will be shown in our school. There exist 12 rows of chairs in tandem and 16 rows of chairs side by side in the school conference hall. It is you who should prepare the tickets for this play. How will you number the tickets in a way to enable the guests to find their seats in the easiest way?

6. There exist cardboards with the dimensions 8 cm by 8 cm in the stock of a sugar factory and the factory staff wants to make open-top sugar boxes out of these cardboards. However, the boxes should have maximum volume so that they will be economic. How would you design this if it were you?

7. We know that chess was first played in 570 A.D. in India. Word has it that, the Brahmani priest who invented this wanted to give the Shah a lesson. He meant to say “However important a man you are, you avail nothing without your men, your viziers and your soldiers. You cannot do any important work.” The Shah seemed pleased with the situation.” “All right, I liked your lesson. Make your wish”, he said. Upon this, the priest, thinking that the Shah did not still learn his lesson that he was supposed to, said, “I want some wheat. I want you to give me one grain of wheat for the first square of the game I have invented, two grains for the second, four for the third. Thus, in each square, I want twice as many grains as I take in the previous square.” “Make a calculation and do not give him even one grain more than he has deserved,” the Shah told the people near him ironically. How, in your opinion, can we calculate the amount of wheat the priest will take?

8. Means of communication and especially mobile phones, of which use has recently grown rapidly, facilitate our lives. Technology, while it facilitates communication, on the other hand, exposes us to some unknowns. Base stations need to be made widespread for mobile phone coverage everywhere. The effects of base stations on our health have been among the unknowns for long, but these effects have now begun to be specified gradually. That this information is not positive is now a known fact. For instance, like the rise of the cases of cancer 7-10 years after the atomic bombing of Japan, health problems will break out all at once after years on people who live in places where base stations have been installed and also on those who use mobile phone so frequently. Base stations are devices which are generally white, box-shaped and four-meter high, installed on the roofs of buildings to expand the field of communication and which consist of two rod antennas and a dish antenna emitting microwave.

How have mobile phones affected communication recently? How can the increase in the use of mobile phones be evaluated? Which age has the use of mobile phones dropped to? Every how many metres do you think we can meet base stations on the roofs of apartment buildings?

Do the use of mobile phones and the increase in the number of base stations constitute a problem? If so, state the problem.

9. Although not known exactly, the invention of glass is thought to date back 4000 years ago. Though glass is simply defined as “an amorphous object” in dictionaries, it can be as bright as diamond, as feverish as opal, as colourful as a rainbow, as light and delicate as a spider web or as big as a mirror weighing 20 tons, as fragile as an eggshell or as hard as steel. To tell the truth, glass is an “unusual” material. Envisioning a world without glass is the same as envisioning a world where there is no science and civilization. At the present time, science is far ahead of using a sandglass to measure time or evil eye bead for protection from bad spirits or evil eyes, which are believed to cause illnesses. Glass has, in every step of the science voyage, accompanied it. The most important disadvantage of glass used in every field today is that it can easily be broken. What is the reason why glass is easily breakable (with low endurance) compared to other solids? Please explain.

10. Sione and his family were making a living by hunting. For years, Sione and his family had been maintaining their lives by catching bats and the fish in coral reefs and by eating vegetables. However, in the last few years, Sione and his family began to sell the bats they hunted to dealers. The dealers were taking the bats they bought to the island of Guam. Sione heard that there were no bats left since the people living in Guam had hunted them excessively. Consequently, the people living in Guam had to pay a large amount of money for Samoa bats. Sione and his family became greedy to earn a lot of money by selling bats. A reason for this was because they were unable to catch fish in their village anymore as fruitfully as they did before. The amount of the fish they caught was getting less gradually and some valuable species of fish seemed to disappear. Sione also knew that his family was worried about not selling enough fish in the
marketplace. Sione knew that selling bats would earn them a lot of money, and thus they would be able to buy the food and clothing they needed. A few weeks ago, Sione’s teacher had told the students in the class that many people hunted bats and that, for this reason, bats would become extinct. These words made Sione anxious as he always wished that there were enough bats for his family to hunt. Sione learned from his teachers that bats mattered for Samoa people from some other aspects too. Bats were drawing to the island the tourists spending plenty of money. They were playing an important role in the fertilization of many fruits Sione and his family ate. Sione went on hunting bats and selling them to dealers. However, one day, he saw that a signboard had been stuck up in the fruitful hunting ground, which said, "It is forbidden to hunt bats! If you kill or pick them up, you will be punished and dispossessed of them". Sione knew that the source of income for his family depended on bat hunting, but he also knew that he should not break the laws. Sione did not want the bats in Samoa to disappear as on the island of Guam. (Braus and Wood, 1993; 261-263)

Questions
1. Should Sione continue hunting bats?
2. Should he discuss the new law with his family?
3. What other ways can he try to bring money to his family?

REFERENCES
CHAPTER 12: REFLECTIVE THINKING AND TEACHING REFLECTIVE THINKING

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THE MEANING OF REFLECTIVE THINKING

Reflection is the concept on the basis of reflective thinking. Reflection, the most general sense, is the cognitive inquiry process that contains analyzing and finding ways which will lead to production of new knowledge and experiences in the context of previous knowledge and development of alternative ways.

In the early 20th century, J. Dewey proposed an approach that all people learn from their experiences in education and stated that life itself was training and development, and the real purpose of education was to make development explicit. He also indicated that the most important need of the society was students' learning to reflect to life what they have learned at school. Dewey defines the reflective thinking as active, persistent and careful consideration of knowledge structure supporting any belief or knowledge and results that it aims to reach. According to Dewey, in the process of reflective thinking, the following two main stages are available:
1. A doubt, confusion and hesitation status in which thinking occurred.
2. A research and questioning aimed at finding ways to clarify this doubt and to solve this confusion.

Dewey focuses on the importance of action and describes a reflective practitioner as an individual questioning his/her assumptions and practices as well as being active and determined. A reflective practitioner’s attitudes can be summarized as open-mindedness, whole-heartedness and responsibility.

Later, this concept is discussed in detail by Schön. Schön states that reflection contains an approach based on close examination of what practitioners do in reality. Reflection includes questioning the action: Did my practice work? Why did it work? Why didn’t it work? What else can be done? Considering in this context, reflection covers re-thinking and re-formatting on the practice. Schön, developing Dewey’s ideas, suggests two types of reflection as reflection-in-action and reflection-on-action. According to Schön, many experienced practitioners have knowledge by making reflection-in-action for their own practices. In reflection-on-action, the practitioner has the opportunity of making a more detailed reflection for a longer time about his/her experience since in this type of reflection, individual analyzes these practices by making reflection about his/her practices after action and reaches the conclusions. In short, practitioners, in both types of reflection, direct their future practices by questioning their own practices. While they form their works in reflection-in-action, in reflection-on-action they evaluate their practices by focusing on how knowledge about the practice reaches the unexpected conclusions after the study.

Considering the history of the reflection, we get the information that this concept is not new and it is primarily defined as Socratic questioning and dialogues in the philosophy of Plato. The method, which Socrates used to elicit what his students know, is regarded as the first of the studies for the development of thinking. In this method, questions rather than answers are given to students. The answer to each question is another question. In other words, each question's answer is a question to be answered. Aristotle emphasized the importance of practice in learning by criticizing people discussing the truth instead of behaving properly.
RELATIONSHIP BETWEEN REFLECTIVE THINKING AND OTHER THINKING SKILLS

At the end of the reflective thinking, the individual sometimes tends to think creatively. Organizing, reasoning, developing assumptions and predictive skills of critical thinking skills are within the scope of questioning and evaluation skills of reflective thinking. Like many other thinking skills, critical thinking is a broader concept, which includes reflective thinking. In short, while a person thinks critically, he/she thinks reflectively, too.

Reflective thinking has a very close relationship with metacognitive thinking. Metacognition is that individual inspects his/her thinking process and distinguishes his/her thinking behavior. In reflective thinking, the individual thinks about his/her thinking and learning styles. In addition, reflective and metacognitive thinking require establishing a connection with past experiences, to ask questions about the knowledge learned, and to ask questions himself/herself in learning process. Norton (1994) concluded that there was a positive relationship between creative and reflective thinking, and also stated that Dewey’s reflective thinking phases were similar to creative thinking phases. Additionally, reflective thinking is a skill which can be displayed in parallel with the development of individual’s self-regulation processes.

DEVELOPING REFLECTIVE THINKING

The basic thinking skills and a supportive environment are necessary for transferring the reflective thinking into education. In order to develop this style of thinking, studies like autobiographical writing, using imagination, group discussions, analyzing and developing teaching programs should be included. Some methods, which can be used to develop reflective thinking skills, are ordered below and then these methods are explained:

1. Writing Learning Texts
2. Keeping Reflective Diary
3. Preparing Portfolio
4. Constructing Concept Maps
5. Asking Question
6. Self-questioning
7. Joining Reflective Discussions
8. Negotiated Learning
9. Self-evaluation

1. Writing Learning Texts

Learning texts are known as reflective writings, too. They are materials in which individual saves his/her personal reactions, questions, feelings, changing views, thoughts, and information about learning processes and content. In these writings, experiences cannot only be described but explanation, analysis and reflections are also included. Previous texts written in this way will both serve development of writers’ cognitive processes and undertake the task of being a model to readers of these writings. Students gain the ability to reflect because they think of learning process while they are writing learning texts. Students learn more effectively in this process. Teachers can get feedbacks from students’ learning texts. Teachers can plan activities related to process more accurately. Like students, teachers can make reflections by writing texts related to their own practices, and they can develop themselves by this way. While students develop their thinking skills with learning texts, they operate their mental repetition processes in learning subject.

2. Keeping Reflective Diary

Students’ keeping reflective diary about processes of practice plays an important role in their reflective thinking. Through reflective diaries, students make reflection about their own learning processes by establishing a relationship between theory and practice at a higher level. The main purpose of using reflective diaries in education is to help students to gain awareness about what they do, how they do,
why they do and to develop useful problem-solving strategies. Thus, students will be aware of their strengths and weaknesses in the field of theoretical knowledge and practice. The effects of keeping diaries about reflective thinking on pre-service teachers are as follows:

- Being stimulant about starting to think questions and new issues,
- Helping to streamline thoughts,
- Having the opportunity to review learning material later,
- Being able to see changes in emotion and behavior,
- Preventing to repeat the same mistakes,
- Better self-monitoring.

A pre-service teacher who gets these skills, just like the students, will make reflection and evaluation about his/her teaching practice and he/she will plan to develop these practices and to overcome deficiencies of practices. Teachers’ keeping reflective diaries regularly will also help them to follow their own developments.

3. Preparing Portfolio
Like keeping diary, preparing portfolio is one of the instruments to develop reflective thinking skills. A portfolio is primarily created by the student; it allows students to select, to examine, to make reflections on completed projects and to review the old products; it includes knowledge which is meaningful for only student and help to plan his/her current and future requirements; it is collected to demonstrate the student’ progress towards his/her development goals. Through portfolios, students can evaluate their practices and develop their reflective thinking skills by questioning their practices.

4. Constructing Concept Maps
The concept map is a visual design, which exposes events, facts, ideas and explains relationships between them. The concept maps aim to establish relationships between concepts in the form of suggestions. While concepts are taught with visual ways by concept maps, the level of learning concepts can also be used for learning purposes. Concept maps prepared by students are also important in the evaluation process. Students must have knowledge about the subject to prepare a concept map.

Concept maps are taught to students at every stage of the educational process. These maps are increasing their ability to design and to express thoughts. In terms of reflective thinking, while preparing a concept map, students determine the key concepts first and then they list the important concepts by sorting from general to specific and show relations between concepts. Thus, students gain insight about their own learning by focusing on the relationships between concepts and make queries about how to learn these concepts.

5. Asking Question
Asking question has a very important role in the development of thinking skills. Open-ended questions posed to the students at teaching process will increase their awareness. Higher-order thinking questions of students and teachers develop reflective thinking. Questions developing reflective thinking should be prepared before the course, different questions for different purposes should be chosen and they should be prepared at different cognitive stages. In short, the activity of asking question should be carried out in a conscious way.

Teachers stimulate students’ reflective thinking by asking questions as the following:

- How did you carry out/do this task?
- What were you thinking when you do it?
- Why did you choose this approach/method etc.?
- Can you explain all the steps you followed in this task?
- What kind of changes do you make if you do it again? Why?
6. Self-questioning
Students evaluate the process with questions, which they ask themselves along their learning process. By these questions, students decide to what, when, why and how they have learned and will learn, and also complete their deficiencies. Primarily teacher should be a model for students by using the strategy of self-questioning aloud at the activities.

The following are examples of questions, which students can ask themselves:

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do I know about this subject?</td>
</tr>
<tr>
<td>What do I need to learn about this subject?</td>
</tr>
<tr>
<td>How much time will this subject take?</td>
</tr>
<tr>
<td>What should I do about the subject later?</td>
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<tr>
<td>Could I learn all the knowledge, which I need on this subject?</td>
</tr>
<tr>
<td>Could I reach my learning goals about this subject?</td>
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</tbody>
</table>

7. Joining Reflective Discussions
Reflective discussions are seen as a beneficial activity which students are aware of similarities and differences in their practices. In classroom discussions, students' constructive criticism about each other’s practices will gird for correcting their errors and consolidating right activities. In these discussions, providing an environment which develops to reflect and creating an atmosphere in which students can talk comfortably without trial of their applications will facilitate that they behave sincerely, in other words, they make higher level of reflections. For this purpose, large group discussion techniques, circle discussion technique and inner-outer circle activities can be used.

8. Negotiated Learning
Negotiated learning is students’ participation in decisions related to the learning process. The students involved in this process are more effective in the learning process. Agreements can be done with the whole class or groups. Signing an agreement is an example of negotiated learning. Learning contracts play a role in students’ responsibility for their own learning.

Negotiated learning can be applied as individual and group. Applied as individual, learning contract can be used as a tool for supporting negotiated learning. Diverse learning needs of different students can be specified at learning contract. When students practice their contracts, they study at different speeds, levels and tasks on common goals, and develop their learning and thinking skills.

<table>
<thead>
<tr>
<th>Learning Contract</th>
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<tbody>
<tr>
<td>Acquisition</td>
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</tr>
</tbody>
</table>

9. Self-evaluation
In order to develop reflective thinking, students should evaluate their friends and themselves within the process and at the end of process. Students develop and motivate themselves with this process. A student having self-evaluation skills will play an active role in the process of his/her own learning. He/she will have a critical perspective on his/her own learning and will gain responsibility about his/her development.

REFLECTIVE TEACHING

Henderson (1996) describes reflective teaching as creative problem-solving activities and an inquiry approach caring to constructivism at teaching and giving priority to give attention to the feelings of others. All teachers can benefit from reflective teaching. Teachers think about what they want to
accomplish in the classroom before the practice and they try to supply materials needed to achieve their purposes. These preparations relieve teachers before coming to class. So they can regularly reflect what happened in the past, what is happening now and what will happen in the future about subject. At reflective thinking practices, it is observed that students’ motivation, willingness to take risks, self-esteem and independence increase.

According to the model of reflective teacher education, pre-service teacher transfers his/her knowledge of theoretical and teaching experience into practice. He/she makes practices benefiting from his/her theoretical and teaching experience knowledge. He/she think about any problem at practice effectively, persistently, and systematically to solve the problem or to make the practice more effective. He/she uses new knowledge and skills, which he/she configures at the end of thinking process again at practice. The cycle continues in the same way. After performing reflective thinking and teaching, he/she gains professional qualification and becomes a teacher.

One of the important aspects of teacher education is reflective diary, which helps pre-service teachers to think and to reveal the practical problems, which they experienced at schools. Reflective diaries are used in studies for pre-service teachers’ understanding their practices and being understood by others. Such diaries help them to see their practical problems more systematically, carefully and persistently. These issues are the basis for teacher educators to understand how pre-service teachers’ experience.

CHARACTERISTICS OF TEACHER THINKING REFLECTIVE

Norton (1997) lists the characteristics of teachers adopting reflective thinking as follows:
- He/she always evaluates the teaching process, thinks for making changes or reflects his/her thoughts.
- Teachers are open-minded. They are always open to questions and reactions about their ideas and teaching practices, and produce alternative solutions.
- They feel responsible for students’ personal, educational and emotional needs. They control of each student’s development stages.
- Teachers thinking reflective are interested in science and art of teaching. They enjoy this attitude because it helps them to understand who they are.
- Reflective teachers foresee and they help their students to foresee.
- Reflective teachers not only make generalizations by identifying the problems but also they use it to change their professional development and understanding of practice.

Action of reflective thinking is characterized as continuous evaluation and willingness to development. According to this definition, a reflective practitioner or teacher evaluates the practices within the framework of a specific plan in accordance with the information obtained from a variety of data, makes reflection and questioning about his/her studies and develops these practices. The stages, which a teacher will follow in reflective teaching process, are as follows:

A reflective teacher thinks about his/her practices by looking at them again during the day: “Did my practice work? What could I do to help that student?”. Reflective thinking is an ongoing process that involves teacher’s questioning before school, at school and after school. Teacher constantly controls the development of each student and continues to reflect even if there is not any data obtained from students.

A teaching program to develop thinking skills, teachers whose reflections can be an example to students, curriculum which supports students’ reflective, critical and creative thinking skills, evaluation which reveals students’ multi-faceted development, method and materials will be effective for students to gain reflective thinking skills. Democratic and collaborative classroom environment in which scientific thinking is supported can also be effective to develop reflective thinking skill. Feedback is important at teaching process based on reflection and students need to make sense of
feedback presented by teacher and to implement this feedback to improve their performance in the future.

**THE ROLE OF STUDENT IN REFLECTIVE THINKING**

In a teaching process supporting reflective thinking, it should be provided that students are confronted with pre-determined problems and they transform their theoretical knowledge into practice. Students facing new problems and practices will be able to develop their reflective thinking skills which organize and query actions such as asking question, studying, discussing. Students’ associating the school learning with out-of-school life will greatly contribute to development of thinking.

**THE CHALLENGES AT TEACHING REFLECTIVE THINKING**

In general, teaching of thinking and reflective thinking will be time-consuming in parallel with the process of skill teaching. Exams of the existing educational structure may limit the time for teaching activities. As a result of this, families may react. Furthermore, in the present classes, the problems about performing the student activities, which are required for the teaching of thinking, arise. The deficiency of materials or budget problems in teaching process is one of the obstacles about the teaching of thinking. That teachers who will ensure the students’ development of reflective thinking do not have enough knowledge about teaching of thinking can be seen as a major obstacle for reflective teaching.
REFERENCES

5. Shön, D.A. Mentioned Source.
12. Ünver,G. Mentioned Source.
15. Ünver,G. Mentioned Source.
20. Yorulmaz, M. Mentioned Source.
22. Ekiz, D. Mentioned Source.
INTRODUCTION

It is clear to everyone that social progress depends on individual development in this day and age, which is called information age, therefore, the importance given to the education of an individual has reached its peaking point. When it is considered that the quantity of the information produced in the last ten years is equal to the quantity of information produced from the beginning of the history of humanity until the last ten years, that half life of information has become shorter to a great extent and even that younger people know more about some subjects than elder people nowadays; the aims of education are determined automatically. The unique means of having a productive and democratic social structure equipped with information and technology, which has become the main aim of today’s states, is to realize educational principles that can turn the individual into the expected form. What is necessary for a democratic society is an individual who asks, questions, investigates, listens and respects; who is open to communication and interaction besides changes and developments; who is not conducted, directed or deceived; who uses information for a productive society; who dances with information and who can explore new information. And to realize all above, individuals who have developed thinking abilities are needed.

The importance of thinking and teaching thinking will be clearer when “I think, therefore I am” is interpreted as “I will disappear if I do not think.” So, it is very important to teach high level thinking skills today. One of these skills is critical thinking.

WHAT IS CRITICAL THINKING?

It has been observed that concepts such as problem solving, decision making, deduction, informal logic, simple thinking, reflective thinking, high-level thinking skills (analysis, synthesis and evaluation) are deemed to have synonymous meanings with critical thinking among educators when critical thinking has not been put forth yet. Although these concepts are often used instead of critical thinking, critical thinking is described quite differently from them.

On the other hand, in our language, the word “criticism” is usually used in terms of mostly negative judgmental evaluation addressing to someone or something, or instead of disapproval as old people used to mean. Parallel to the meaning mentioned above, the word “critical” is usually perceived as something about criticism, depending on criticism, having qualities of criticism. Such a perception accompanies with a misconception about critical thinking, as well. Critical thinking is a disciplined and self-controlled way of thinking which brings out a perfect thinking related to a special domain or form of thinking.²

According to Doğanay and Ünal³, critical thinking comes from the word “reasoning” whose root is “reason” having Latin meaning “ratio”. The Latin meaning of this word is “balance”. In this context, critical thinking means coming to a balanced decision after studying the previous experiences,
information and thoughts. Critical thinking does not have a common meaning on which everyone agrees, as is the case in most of the other concepts having social content. The definitions of critical thinking differ in terms of the dimensions and scope it contains.

Critical thinking is generally the process of perceiving the facts objectively. However, the facts may not be what we see. So, critical thinking means coming to decision after analyzing the fact wholly with all positive and negative sides that are visible or invisible to us. Critical thinking is the process of reasoning depending on information. But, the process of getting information is a crucial one. During this process, it is necessary to question the source of information, cross-check the information by means of questioning it in different sources, determine the premises and prejudices. A person who thinks critically is aware of why and how s/he thinks. S/he is not only aware of his/her own thinking process but also considers others’ thinking processes. One of the important concepts that define critical thinking is independent and original thinking. A person who thinks critically does not accept others’ views and thoughts passively, but analyzes them and thus creates his/her own thought independently. This sort of independence liberate the mind, heart and actions of a person.5

In this context, the definition of critical thinking can be summarized as making a judgement after reasoning on a problem or a state (gathering information related to a current state, determining assumptions and evidences, discussing the previously-determined evidences, deducing and synthesizing individually)6.

If we would like to give a broader definition of critical thinking, we can say that critical thinking is to build an inter-disciplinary relation considering the reliability of information sources by means of grounding on independent and objective thinking, analyze and evaluate premises, understand the relationship between thoughts and feelings, refine generalizations and consider the future products of a generalization avoiding to disturb its meaning, compare similar states, notice contradictions, explore products and results, decide on logical deductions, predictions or interpretations, use socratic discussion and think perfectly on one’s own thinking while a person is analyzing a view, an interpretation, a belief or a theory.

WHY CRITICAL THINKING?

To determine the type of person needed today means determining how to build and implement teaching activities. Today, when information develops and changes very quickly, individuals need to adopt to new situations quickly and to find solutions for new problems immediately. Educational activitites play an important role in growing up such individuals. How information is gained and experiences of individuals who learn during this period are very important since individuals will use the information according to how they learn the information. When teaching mentality depends on transferring information, individuals get and accept the transferred information as it is, and remembers it the same when asked about it. As a result of this, individuals who do not question, who cannot adopt to recent developments and changes, who cannot find solutions for the problems, who takes and accepts what is presented in a dogmatic manner, who cannot detect mistakes and who cannot foresee possible facts about future are raised up. Such an individual has no chance of reaching the long-awaited level of civilization in today's world.

It is possible to eliminate the handicaps mentioned above by means of enabling individuals to gain skills to process, assess, defer the information and states they encounter, and thus adopt them to new situations. To do this, individuals have to examine the information presented to them instead of accepting it as it is, consider the fact that there is always a possibility for a state or information to change in the future instead of accepting everything as a fact, avoid giving up looking for a second way keeping in mind that there may always be a second way. An individual needs intense mental activities for all these processes. In short, individuals who think should be raised for all those mentioned above.
Thinking is a name attributed to organized and goal-oriented active mental processes aiming at understanding the current situation. Everything lies in thinking, is directed and produced by thinking. Thoughts are integrated through setting a balance between mind, body and soul. However, a screening process should be carried out among these thoughts in order to choose the effective ones. And this is possible with critical thinking. Creativeness gains importance while putting de facto, previously unthought ideas forth. Everything that makes up life is indeed the on-going creation of thoughts.

The momentum and dimensions of changes experienced in many fields that affect people’s lives deeply such as science, technology, economics, press, politics, social relations are much deeper and more comprehensive than known. It is possible to understand the effect of this transformation on society if we address the changes and developments just within the domain of information technology. The same is true for changes in the fields of economics and politics. It is possible to say that an average citizen has difficulty in following economical issues, perceiving attitudes and strategies of politicians.7

Today, the main purpose of curriculum is to develop thinking skills and to raise thinking individuals. Turkish education system is aware of the type of person that is needed. It has taken important steps in taking the necessary precautions in order to reach this type of person. However, the fact that such tendencies and implementations in this direction are new to our education system is accompanied by some uncertainties, complexities and deficiencies.

From this point of view, it is necessary to determine the ways of enabling individuals to gain thinking skills through educational experiences in today's conditions in Turkey.

THINKING PROCESS AND CRITICAL THINKING

Thinking means reasoning, racking brain, having a view, reconsidering, meditating on a subject; guessing, having in mind; remembering, calling back to mind, imagining, dreaming; worrying, mourning, getting anxious, saddening, being troubled; being interested in something, making tiny distinctions; designing, planning; holding a view, thinking in a (...) way; examining, evaluating; keeping all the details in mind, sticking; supposing, assuming; bringing to mind.8

As Demir (2006) cites from Ünalan (2006), here are some definitions of thinking:

Thinking is reflection of outer world on people's minds. Moreover, thinking means object and idea that are designed, shaped and imagined mentally.

Thinking is all the intentional mental behaviours in order to eliminate the situations that disturb the individual in terms of internal or external factors and that unbalance the individual physically and psychologically.9

Thinking is a process of symbolic mediation. "Mediation" means that thinking fills in the blank between the stimulant event and the behaviour of the individual for this event. In other words, thinking is to process the information about our surrounding.10

Thinking is generally acknowledged as a complex cognitive process that makes figuration possible while this kind of figuration necessitates information, skill and attitude, and is more effective than instinctive figuration.11 Thinking is used to describe states of mental process aiming at attracting attention, alerting, imaging, dreaming, looking up in mind, remembering and dreaming of wishes that reflect inner world; mental process that means believing in a certain thing or things, or belief; mental process addressing reasoning, problem solving and criticizing.12 Thinking is the disciplined form of conceptualisation, implementation, analysis and evaluation of information received through observation, experience, instinct, reasoning and other channels.13
Thinking is reaching something with the current information and transferring of the current information to the other one. It is using information in new situations by means of noticing the practicality of the previous information. It is a fact of logic.\(^\text{14}\)

Thinking is to review mental skills in order to shape the ideas and arriving at a decision: reasoning consisting of the logical series of idea is reaching to a certain conclusion through inference and starting from the point that is known or assumed: reflecting one's backward ideas on a subject or calling quietly-going-on thinking back to mind.\(^\text{15}\)

Thinking is one the most significant qualities of humanity. A person should behave consciously, not instinctively. A person can lead a peaceful life only if s/he develops thinking power. Humane sciences mention that thought is shaped after going through certain phases and that development is too insufficient in some environments. Education economists think that one is supposed to get his/her money’s worth which s/he paid for thinking education. Education philosophers think that one can realize oneself only if s/he can develop thinking skill, that s/he can perceive the meaning of the events in that way. Education sociologists believe that thinking training should be arranged keeping social conditions in mind. Thinking training during primary and secondary school years is a small but important part of this fact that prevails the various stages of life.\(^\text{16}\)

Swartz and Parks\(^\text{17}\) divide the basic thinking areas into three such as I) Critical Thinking, II) Creative Thinking and III) Explaining and understanding opinions; and divide thinking process into two such as I) Deciding and II) Problem solving. In Figure 1, the relationship between critical thinking, and other domains and processes of thought.

**MAP OF THINKING DOMAINS**

**Thinking Skills**

The concept of critical thinking has been tried to be explained taking the two main disciplines of philosophy and psychology as a basis. While philosophical approaches focus on the norms of thinking well, the concept of human thinking and mental skills necessary for a realistic, objective world view, psychological approaches focus on experimental studies which ground on thoughts and thinking, individual differences about learning complex views, and the concept of problem solving that is a part of critical thinking.

**The Relationship between Critical Thinking and Other Types of Thinking**

When books and articles are analyzed, it is clear that critical thinking is compared to many different types of thinking or is used instead of them. Many experts have tried to analyze the relationship between critical thinking, which is accepted to be high level thinking in books and articles, and other types of thinking.

The question related to what the difference is between low level and high level thinking is an important one among educators. As Mırioğlu\(^\text{18}\) cites from Newmann (1990), low level thinking requires routine and mechanical implementation of information in a simple way. The examples of low level thinking are memorization exercises such as completing a formula with numbers or listing the remembered information. On the other hand, high level thinking requires students to manipulate information when they come across a problem or question that is difficult to solve by means of interpretation, analysis or routine implementation of the previously-learnt information.

As Brunning, Schraw & Ronning\(^\text{19}\) cites, Perkins and others have determined four domains of thinking in one of their studies and they have explained the purposes and thinking skills of these domains in terms of product.\(^\text{20}\)
LEARNING AND TEACHING: THEORIES, APPROACHES AND MODELS

Figure 1: Thinking domains and the relationship between their processes
Source: Cited from Swartz, Robert J. and Sandra, Parks (1994:6)
Chart 2.1: The relationship between thinking skills

<table>
<thead>
<tr>
<th>Types of thinking</th>
<th>Purposes</th>
<th>Thinking Skills</th>
<th>Relations between them</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Thinking</td>
<td>Evaluating the opposite states or clarity of ideas</td>
<td>Defining states or ideas, analyzing opposite views, evaluating evidences</td>
<td>Critical thinking is needed for all thinking skills.</td>
</tr>
<tr>
<td>Creative Thinking</td>
<td>Producing new ideas and products</td>
<td>Determining ideas, re-structuring the problem, determining the possibilities</td>
<td>The newly-created product which has been produced through creative thinking is evaluated by means of critical thinking.</td>
</tr>
<tr>
<td>Making a Decision</td>
<td>Making an informed decision</td>
<td>Thinking the information, defining the alternatives and making a decision</td>
<td>Critical thinking is one of the basic processes necessary for making a decision.</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>Finding one or more solutions for a problem</td>
<td>Defining, explaining, choosing, implementing and evaluating a strategy</td>
<td>While problem solving starts with a problem, critical thinking encompasses evaluation of all information, ideas and events that one comes across.</td>
</tr>
</tbody>
</table>


Bittner and Tobin\(^{21}\) state that the process of critical thinking is multi-dimensional and compare critical thinking to an umbrella under which there are many different types of thinking depending on the situation. According to Skinner (1976), the concepts such as “scientific method,” “scientific thinking,” “reflective thinking,” “productive thinking” and “critical thinking” which are often used in books and articles have the same meaning although there are some tiny differences between them.\(^{22}\) Critical thinking cannot be equated with other types of thinking. Although it is a part of making a decision, it cannot be deemed to be just decision-making. It is also not only a brainstorm. According to Kazancı (1989), all types of thinking generally necessitate criticism to some extent. Almost none of the types of thinking can do without the help of mental activities used during criticism.\(^{23}\)

**THE QUALITIES OF TEACHING CRITICAL THINKING**

1. Teaching critical thinking can be achieved easily without needing much equipment in terms of technology and physical conditions.
2. Critical thinking can be implemented by all of the teachers having the principles and methods of it.
3. As it requires all the students to participate, teaching activities take much time.
4. The attitudes and tendencies of students at the beginning of teaching critical thinking are important. So, before teaching critical thinking, some activities that will enable students to gain positive attitudes in terms of critical thinking should be done first.
5. It depends on students’ activities. The students should definitely be active about learning.
6. Teaching should be carried out through intentional, goal-oriented and well-designed activities.
7. It can be taught at all ages and levels. The teacher should be careful about which critical thinking strategies and skills should be taught at which level and age.
8. All subjects are suitable for teaching critical thinking. However, critical thinking strategies and skills that are more suitable for each subject should be chosen carefully.
9. In teaching critical thinking, out-of-school contents can also be used as well as lesson contents.
10. In teaching critical thinking, teaching through research and study, strategy of collaborative learning, group discussion and problem solving activities can be used.
There are some qualities that differentiate critical thinking from other types of thinking. These qualities are very important in teaching critical thinking skills as well as determining and evaluating the form of thinking that the individual presents. The qualities of critical thinking can get clearer by means of thirty five critical thinking strategies which are divided into three main groups by Paul, Binker and Jensen. These strategies are listed in thirty five different dimensions as below:

### Strategies of Critical Thinking

#### Affective Strategies – Mental Habits
- S-1: Independent thinking
- S-2: Developing egocentric or socio-centric insights
- S-3: Realizing objective thinking
- S-4: Understanding the relationship between feelings and thoughts
- S-5: Developing mental modesty and delaying judgement
- S-6: Developing mental bravery
- S-7: Developing mental good faith and honesty
- S-8: Developing mental tenacity
- S-9: Developing trust in thinking skill

#### Cognitive Strategies – Macro Skills
- S-10: Clearing up generalizations and avoiding disturbing their meaning through simplifying
- S-11: Comparing similar states: Transferring insights into new contexts
- S-12: Developing the individual's perspective: Creating/Exploring beliefs, views, theories
- S-13: Clearing up problems, results or beliefs
- S-14: Clearing up and analyzing words or word phrases
- S-15: Developing standards for evaluation: Clearing up values and standards
- S-16: Evaluating the credibility of information sources
- S-17: Asking basic and important questions, ensuring the continuity of questions
- S-18: Analyzing or evaluating views, interpretations, beliefs, theories
- S-19: Producing solutions or evaluating solutions
- S-20: Analyzing or evaluating activities or policies
- S-21: Critical reading, clearing up or probing texts
- S-22: Critical listening
- S-23: Establishing relationships between disciplines
- S-24: Implementing socratic discussion
- S-25: Thinking in terms of dialogues
- S-26: Dialectical reasoning
Cognitive Strategies – Micro Skills
S-27: Comparing and differentiating real implementations and ideals
S-28: Thinking perfect about thinking: Using critical vocabulary
S-29: Paying attention to important similarities and differences
S-30: Probing and evaluating premises
S-31: Differentiating related events from unrelated ones
S-32: Creating rational inferences, estimates and remarks
S-33: Evaluating evidences and claimed events
S-34: Noticing contradictions
S-35: Exploring products and results

CRITICAL THINKING SKILLS

In teaching critical thinking, some skills should be taught besides critical thinking strategies. Although these skills are used together and within each other during thinking process, these skills can be addressed under separate titles in order to make it easier to teach these skills. According to Swartz and Park (1994), these skills are:

A. Reliability of Sources
B. Causal Explanation
C. Prediction
D. Generalization
E. Reasoning by Analogy
F. Conditional Reasoning

These skills can be taught in teaching lesson contents through the approach of integrating to the subject or through using contents apart from specific subject matters with a skill-based approach. Some of the educators who write and think on critical thinking perceive critical thinking as a skill. Paul (1984) accepts critical thinking as a set of integrated macro mental skills. Similarly, Facione (1990) accepts critical thinking as cognitive skills such as interpretation, analysis, evaluation, inference, explanation and self-discipline. Ennis (1991: 68-71) classifies the critical thinking skills as stated detailedly in Graph 4:

Chart 4: Critical Thinking Skills

<table>
<thead>
<tr>
<th>Clearing Up Skills</th>
<th>Supporting Skills</th>
<th>Inference Skills</th>
<th>High-level Clearing up Skills</th>
<th>Strategy and technical skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Focusing on a question</td>
<td>• Judging the reliability of a source</td>
<td>• Being able to make inferences from the current data</td>
<td>• Being able to define the terms and judge the definitions</td>
<td>• Deciding on a movement</td>
</tr>
<tr>
<td>• Analyzing discussions</td>
<td>• Judging observation reports</td>
<td>• Being able to think deductively</td>
<td>• Being able to determine the premises</td>
<td>• Interaction with others</td>
</tr>
<tr>
<td>• Asking various questions at various levels in order to clear up the states</td>
<td></td>
<td>• Being able to create value judgements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Özden states the significant qualities of critical thinking as below:
1. Evaluating prejudice and consistency,
2. Differentiating primary and secondary sources,
3. Evaluating inferences and their causes,
4. Differentiating premises, ideas and claims,
5. Noticing the deficiencies of the argument and uncertainties of explanations,
6. Evaluating the sufficiency of definitions and suitability of results.

Watson and Glaser address the critical thinking skills as defining a problem, determining the suitable alternatives or strong premises for the solution, inferring available results for the solution and evaluating them, and they explain these skills as below:

Inference: It can be defined as reasoning, getting a new information from the current state or information, deducing from the proposals that are known to be true.

Noticing premises: Premise is defined as “theoretical proposal that has to be confirmed practically” (Hançerlioğlu, 1994). Noticing premises is the skill of knowing structured and unstructured premises, deciding whether a premise inferred from a given state can really be inferred from that state.

Deduction: “Through deduction, new proposals that necessarily come from true proposals or proposals that are thought to be true are produced. If the initials are true in this process, the result is logically true.”

Interpretation: Evaluating the evidences related to a state, inferring valid result depending on these evidences or from the information related to the state, deciding whether the inferred results are true or false.

Evaluation of discussions: The power of determining the weaknesses or strengths of the necessary inferences or statements about this situation.

According to (Richetti and Tregoe 2001; Sternberg and Spear – Swerling 1996), effective thinking skills are as below:
1. Observing
2. Defining problems
3. Defining relations, premises, mistakes of reasoning, cause and effect relation, mistakes of logic, prejudices, charts
4. Classifying and developing standards
5. Comparing and contrasting
6. Making inferences and interpretations
7. Summarizing
8. Making analysis, synthesis and generalizations
9. Creating and imagining hypothesis
10. Differentiating related information from the unrelated one, verifiable information from unverifiable one.

**PREREQUISITE STRUCTURES NECESSARY FOR CRITICAL THINKING**

In order to develop critical thinking, critical thinking trainings should get started at early ages and the individual should be raised up as a critical thinker. If an individual doesn't receive critical thinking training, s/he will structure his/her own way of thinking, habits and attitudes related to thinking. Therefore, while giving critical thinking trainings to individuals who are in the mid of their education lives, they should be ensured to be ready for critical thinking training. The prerequisite structures necessary for a sound training of critical thinking are explained below.

One of the most important elements that one comes across while reading definitions of critical thinking is the dimension of attitude. Attitude is defined as a “tendency that is attributed to an individual and that shapes the thoughts, feelings and behaviours about a psychological object regularly.” If we put critical thinking instead of the psychological object in this definition, we can say
that it affects the feelings, thoughts and behaviours about and attitudes to critical thinking. Attitudes toward critical thinking affect both the attainment process of critical thinking skills and strategies and their tenure. In many of the definitions, the dimension of attitude is also considered besides skill, strategy, process and proceeding. For example, Scriven and Paul define critical thinking as “an intellectual process during which information attained through observation, experience, reflection, reasoning or communication is conceptualized, implemented, analyzed, synthesized and evaluated effectively and skillfully in order to guide our beliefs and actions.” According to Paul, critical thinking has two dimensions. The first one is the set of skills to shape and analyze information and beliefs while the second one is the habit of using these skills as a guide for behaviour.

Having the mind attain positive attitudes and habits makes it easier to use skills and strategies. For example, the fact that one has attitudes and habits such as being open to alternatives, empathizing and being open-minded will make him/her during the process of getting information to study different views, consider different opinions and look for different alternatives without being contented with the current alternatives.

Fisher (1995) mentions about three important attitudes about critical thinking. The first one of these is to be ready for and enthusiastic about reasoning. People should perceive the need of making sense of their experiences as a requirement. The second attitude is the desire to struggle. People should develop thinking habits by means of producing thoughts against their own ones. In other words, they should criticize their own thoughts. Moreover, they should desire to come to a conclusion through considering contrasting thoughts while they are shaping their own thoughts. In short, being open-minded is an important attitude in terms of critical thinking. Fisher explains how to be open-minded as below:

- Making decisions taking the evidences and evaluating evidences as the basis.
- Considering the thoughts that contrast with one’s own decisions and thoughts.
- Being open to others’ producing thoughts that contrast with one’s own thoughts.
- Always keeping in mind the possibility of being wrong.

The third attitude is the will to look for and find the truth. People should dedicate themselves to find and look for the truth. But people always want to be right during the process of looking for the truth. The approach that can be summarized in a few words such as “I am always right and true” is quite dangerous in terms of critical thinking. Instead of this, the approach that can be summarized as “I am not sure, let’s look for and find” is better.

At the beginning of trainings about teaching critical thinking, activities that enable one to develop enthusiasm and positive attitudes about critical thinking should be used. An intention in the direction of critical thinking should be shaped in the individual’s mind especially through activities that make the individual to feel that s/he can be mistaken within his/her own thinking system, that s/he need to think over and over about his/her thinking because of this reason, that s/he may not see all dimensions of an event, that the opinions of people around are also important to evaluate an event as a whole, that all the surrounding stimuli may not be the same as what it looks as first, that s/he need to question and think all the time in order to understand the future cases of a stimulus in all forms and shapes.

Before the trainings about teaching critical thinking, preparatory activities which make the individual to think that it is impossible to trust one’s own thinking forever, that individuals may think differently, that the views of people around us are also valuable, that our own eyes may also misguide us and because of this reason we need to analyze all kinds of information that we come across carefully can be carried out by means of using pictures that lead to illusions.

**CURRICULUM AND CRITICAL THINKING**

Depending on the scientific developments and also the changes in the aims of education, curriculum is quickly moving away from the past’s traditional understanding of transferring information to the
understanding of using information and transferring it into different fields. The increase in the amount of information received through different means makes it necessary to replace the understanding of reaching and transferring information by the understanding of using and processing information to produce a new one.

What should be the role of education in the light of these developments and changes? According to which skills and information should the student prepare herself/himself in this quickly-changing world? Of course, education is one of the leading fields that is affected by this transformation. Therefore, today’s education systems are examined and studied more than ever before while studies of reform and re-structuring are gaining a new and important impetus. Within this framework, new teaching models are tried and traditional teaching approaches are changed in the light of new transformations. Our children incur important losses as a result of a teaching approach that depends on transferring information and learning without understanding and internalizing. First and foremost, education is starting to lose its meaning for them. Because of the decreasing interest and motivation, especially for students of secondary education, schools are turning into boring places while education is perceived as experiences that students have to stand just because they have to. The approach that depends on transferring information takes the premise as basis that children can learn the information easily as separate and simple definitions, explanations, formula and units, and that what is learnt will be transformed into understanding and implementation later. But, it is impossible for students to learn the information thoroughly and meaningly through simple readings and explanations. Information can be used in different fields only when it is learnt thoroughly and meaningly.

The final purpose of education is to ensure the individual reach the truth. While gathering information for the sake of reaching the truth, it is possible to get and interpret the information safe and sound, and to produce new information only through thinking. While the common purpose of all education policies is especially to raise up individuals that have learnt to learn and think, this also makes up the real study field of curriculum.

Some of the reasons that can be listed in terms of teaching critical thinking skills are summarized as below:

- In order to raise up citizens that can make meaningful and logical decisions while they are participating in the management through democracy,
- In order to create a public opinion that knows critical thinking and that sees the “whole” while evaluating the social events wholesomely,
- In order to develop curriculum that enables individuals to learn depending on creative and critical thinking skills instead of inflexible behaviour and information based on memorization and compulsion, and to be able to be objective while thinking,
- In order to raise up individuals who can produce new information by means of using the information wholesomely in today’s world of information explosion,
- In order to raise up individuals who can make sound decisions despite of intentional and negative campaigns carried out by press, advertisements, propaganda and various steering centers,
- In order to raise up individuals who can develop multi-perspectives about solving problems and individual differences about learning mental skills and complex views necessary for an objective and realistic worldview.

Statements that exist in curriculum designed for different subject fields in Turkish national Education system and that emphasize the fact that critical thinking skills should be attained can be seen in the chapter where the general purposes of Turkish National Education System at National Education Fundamental Law are explained. The second of the general purposes clearly indicates the need to raise up individuals who think by means of education. According to this purpose:

"The goal of Turkish National Education is:
To raise all Turkish citizens as constructive, creative and productive persons who are physically, mentally, morally, spiritually and emotionally balanced, have a sound personality and character, with the ability to think freely and scientifically and have a broad worldview, that are respectful for human
rights, value personality and enterprise, and feel responsibility towards society. It will make great contribution to make use of critical thinking skills in order to achieve this goal.

Özden accepts critical thinking as a prerequisite for a sound democracy. Özden explains the contributions of individuals who think critically to democracy as below:

“If individuals attain critical thinking skill at school, they will be able to differentiate the opinions, assumptions and claims of the speaker they are listening to, they will be able to see the unclear points in the speech and the deficiencies of the argument, and they will be able to evaluate the sufficiency of the definitions and feasibility of the results. ... A majority that knows how to think critically and that sees the whole picture is an indispensable prerequisite for a sound democracy. Public opinion which is one of the most important elements of democracy is shaped by people who can think critically, who can understand what they read and listen to, who can evaluate the events and objects according to their point of view.”

According to Kazancı, in countries where pluralistic democracy exists, thinking and all dimensions of freedom of thought are studied in detail, and it is believed that especially to learn how to think critically is accepted to be the most important civic duty. As J. Dewey stated, no one can think over a subject that s/he has no experience. So, the leading duty of schools is to provide students with opportunities as much as possible, where possible and about subjects as various as possible and then to have students discuss these experiences freely.

Today is the first period in history when younger people know more than elder ones. The individuals of future must be ones who reach information, produce information out of information, play with information, dance with information. It is a must for such an individual to possess critical thinking skills.

TEACHING CRITICAL THINKING

Basic Approaches About Teaching Critical Thinking
While all educators agree on the importance of developing critical thinking skills within education system, there is no common view about how to teach these skills. Related body of literature mentions four basic approaches considering the discussions and programmes to develop critical thinking. These approaches are:

A. Subject-Based Educational Approach,
B. Integrating-to-the-Subject Approach,
C. General Approach (Skill-Based Approach),
D. Blended Learning Approach (Glasser, 1984; McPeck, 1981; Kruse and Prensesisen, 1987; Sternburğ and Bhana, 1986; Ennis, 1989; Perkins and Solomon, 1989; Akt; Mcknown, 1997).

A. Subject-Based Educational Approach: This approach defended by Glaser (1984) and McPeck (1981) envisages that critical thinking should be taught together with the content planned to be taught. According to this approach, the principles and rules of critical thinking are clearly presented to the students in parallel to content unit.

B. Integrating-to-the-Subject Approach (Content-Based Critical Thinking Teaching): Although this approach is similar to the first approach, it envisages integrating content unit and critical thinking principles and rules. However, these rules and principles are not presented explicitly. On the other hand, some thinkers and educators do not agree. McPeck has stated that all kinds of thinking are about an X, so there isn’t a set of critical thinking skills applicable to all subjects; therefore it is useless to teach critical thinking as a set of skills. According to Mc, since good reasoning is dependant upon the epistemological and logical norms of subject field, critical thinking may change from one field to another. It is more meaningful to teach critical thinking skills through integrating to the subject field instead of teaching independently from the field. Resnick (1987), Pauker (1987), Vincent Ryan Ruggiero (1988), Paul (2001) and Elder (2001) who are some of educators who study
on critical thinking also claim that critical thinking should be taught with an approach that envisages integrating to the subject.

Paul and Elder state that the elements of critical thinking guide us about this. The elements of critical thinking and how these elements guide learning are explained as below:

- All thinkings have a goal.
- All thinkings focus on at least one question.
- All thinkings require information.
- All thinkings require concepts.
- All thinkings include inferences.
- All thinkings include some premises.
- All thinkings include perspectives.
- All thinkings include a point of view.

There are some changes in the steps to be followed according to the approach adopted about teaching critical thinking. Below are seen the steps of preparing activities to be followed in teaching content-based critical thinking in Social Sciences.

**Determining the educational attainment to be studied about Social Sciences**

1. Determining the attainments that can be realized through to-be-studied attainment and stating them as student’s behaviour by means of critical thinking strategies.
2. Determining which one to use among thinking skills (determining the reliability of sources, guess, reasoning through analogy, etc.) that can be attained to the students while studying this behaviour.
3. Completing introductory (preliminary) information and determining warm-up activities.
4. Determining the best approach/strategy/method/way in order to realize these behaviours.
5. Determining activities for the best thinking skill (specifying standards in the study below).
6. Determining the necessary course materials.
7. Determining questions that will lead students to produce their slogans.
8. Determining thinking activities (analysis and synthesis, finding cause and effect relations, guessing, comparison, inference, etc.)
10. Determining complementary activities.
11. Making lesson plans out of activities that will enable the determined studies to be carried out in class.

**Content-based critical thinking teaching organization diagram**

<table>
<thead>
<tr>
<th>Student Behaviour Depending on Critical Thinking Strategies That Will Be Studied Together With Attainment</th>
<th>RESEARCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-14: Exemplifying the state of our town in terms of natural and historical antiques</td>
<td>1. Researching the natural entities of our own&lt;br&gt;2. Researching the historical places and structures in our town&lt;br&gt;3. Researching the significant historical places in Turkey&lt;br&gt;4. Researching the significant natural beauties in Turkey&lt;br&gt;5. What can be done depending on the historical and natural beauties in our town?</td>
</tr>
<tr>
<td>S-15: Determining the standards necessary for a place/structure or object to be accepted as natural beauty</td>
<td>Completing Preliminary Information&lt;br&gt;Explaining the related concepts: Historical structure, Natural beauty, Source of Information</td>
</tr>
<tr>
<td>S-16: Questioning the accuracy of the sources from which information is received while learning the qualities of natural/historical places around</td>
<td>Thinking Skill&lt;br&gt;Reliability of Sources, Generalization, Guess, Reasoning, etc.</td>
</tr>
</tbody>
</table>

**Warm-up Activities**

The game called "What does s/he have?"
The student knows the natural entities, historical places, objects and structures around him/her and in various places of our country.

**MATERIAL**
- Introductory film about our town
- Clip of “Memleketim”
- CD of “Türkiyem”
- Website of the Ministry of Tourism

**Slogan of the Day**
Bad according to what? Good according to what? Ugly according to what, beautiful according to what? According to what! Of course, according to standard.

**According to standard! Standard…**

**Complementary Activities**
Collect information about life during the period when these monuments were built starting from the historical structures in our town.

**Thinking Activities**

**Synthesis:** Are there similarities between the historical artifacts in our town and today’s lifestyle?

**Cause-Effect:** What are the causes and effects of the fact that there are a lot of historical artifacts in our town?

**Comparison:** Specify similarities and differences between the life today and in the past in the light of historical artifacts.

**Truth and Opinion:** What do you think of the saying that “Our town is rich in terms of historical artifacts”?

**SCALES**
- Scale of determining historical building
- Scale of determining Natural Beauties
- Scale of evaluating one’s own way of thinking

Method/Strategy: (Methods and strategies to be used during the activity will be specified in this part.) Discussion, Small Group Study, Teaching Through Research and Study, etc.

C. **Skill-Based Teaching (General Approach):** It is structured completely different from subject-based teaching. Critical thinking skills have the characteristics of a skill-based programme
which has been developed depending on a non-school context apart from the contents presented at school. Kruse and Prenssesisen (1987) and Sternburg and Bhana are advocators of this approach.

Ennis (1991), one of the pioneers of critical thinking, states that there are twelve dimensions of critical thinking, and that these are teachable and transferrable skills. Critical thinking should be taught through a skill-based approach. When critical thinking is taught through a skill-based approach, repetitions of basic disciplines within the subject are avoided while it gets easier to apply the attained cognitive skills to other lessons and to support these skills by these lessons.45

One of educators who claim that critical thinking should be taught through a skill-based approach is Lipman. According to Lipman (cited from Fisher, 1995), thinking is made up of individual skills and one should start to teach critical thinking with these skills. According to Lipman, when critical thinking is taught with a content-based approach, subjects get attention and critical thinking skills are ignored during the lesson. Thus, the development of such critical thinking skills of the students are limited. Lipman lists more than thirty skills as critical thinking skills. One and the first of these skills is “to specify concepts clearly and neatly.” To define a concept clearly requires to define the examples within and out of the border of this concept. Lipman states that it is suitable to do this through discussion. Although the programme offered by Lipman is designed for elementary school students, it can be adapted to all levels. Lipman thinks that the use of the skills listed below should be developed;
1. Concepts and thoughts
2. The skill of generalization
3. Being able to understand the cause and effect relations
4. The skill of inferring logically
5. Noticing the consistency and contradictions
6. Being able to make analogies
7. Being able to understand meronymy
8. Being able to formulate problems
9. Being able to reverse and re-state logical statements
10. Being able to apply rules to the real-life conditions

There are various methods that can be followed in teaching skill-based critical thinking. Here is the graph designed by Swartz and Parks (1994) and used in activities:

<table>
<thead>
<tr>
<th>SKILL-BASED CRITICAL THINKING LESSON PLAN GRAPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL (Thinking Skill or Process)</td>
</tr>
<tr>
<td>Defining the thinking skills or processes that</td>
</tr>
<tr>
<td>the students are going to learn</td>
</tr>
<tr>
<td>METHODS AND MATERIALS (Using Teaching Methods</td>
</tr>
<tr>
<td>in order to Teach Thinking Process Effectively)</td>
</tr>
<tr>
<td>• Strategy of structured questioning</td>
</tr>
<tr>
<td>• Tables of organizing data</td>
</tr>
<tr>
<td>• Collaborative learning comprising small</td>
</tr>
<tr>
<td>group works</td>
</tr>
<tr>
<td>• Explaining the thinking process directly</td>
</tr>
<tr>
<td>or inductively</td>
</tr>
<tr>
<td>• Cognitive maps (Picture or drawing)</td>
</tr>
<tr>
<td>produced by students</td>
</tr>
<tr>
<td>LESSON (Explaining the To-Be-Studied</td>
</tr>
<tr>
<td>Thinking Skill or Process and its Importance</td>
</tr>
<tr>
<td>to Students)</td>
</tr>
<tr>
<td>The explanation should activate the</td>
</tr>
<tr>
<td>preliminary information and experience of</td>
</tr>
<tr>
<td>students about thinking skills by means of</td>
</tr>
<tr>
<td>revealing thinking skills and processes,</td>
</tr>
<tr>
<td>reviewing thinking skills and processes, and</td>
</tr>
<tr>
<td>showing the importance and helps of skillful</td>
</tr>
<tr>
<td>thinking.</td>
</tr>
<tr>
<td>ACTIVE THINKING PROCESS (Active thinking</td>
</tr>
<tr>
<td>includes verbal messages and graphic maps</td>
</tr>
<tr>
<td>(tables of organizing data)</td>
</tr>
<tr>
<td>Students should be helped with thinking</td>
</tr>
<tr>
<td>activities through verbal messages and tables</td>
</tr>
<tr>
<td>of data).</td>
</tr>
</tbody>
</table>
organizing data.

**Thinking Activities About Thinking Process That Helps Students To Notice Thinking Ways**
Students are directly asked questions to explain their own way of thinking. The prepared cognitive maps guide the formation of questions that will be asked to the students. Students explain which way of thinking they use, how they do this and how they can display (reflect) this thinking skill.

**APPLYING THINKING TO OTHER FIELDS AND DAILY LIFE**
These are activities which envisage students to transfer the learnt skill.
Activities of transferring can be divided into two:

1. **Instant transferring**
   a) *Immediate transfers*: Applying the skill that is addressed during the lesson to a similar situation at the same level
   b) *Distant Transfer*: Applying the skill that is addressed during the lesson to different situations and subjects at the same level

2. **Transferring for strengthening the next structure**: Applying the skill that is addressed during the lesson to the future days of education or to daily life.
   Statements and activities of teachers should be diminished while students’ activities are increased in both kinds of transfers.

**ACTIVITIES TO ENLARGE THE SKILL (At will)**
*(Can be carried out at any time during the lesson)*

- **Strengthening other thinking skills and processes**: While a skill is being taught, other skills that have been learnt before and that can be presented together with this skill are used.
- **Studies of enlarging**: Gathering extra information useful for enriching the conclusion or interpretation found at this lesson.
- **Using specific exercises and homeworks in order to strengthen thinking**: Homeworks given in the form of written, verbal or Project work in order to make skill to be learnt better

**EVALUATION OF STUDENTS’ THINKINGS**
Evaluating the effective use of thinking skills and processes through performance work, written or verbal presentations

Source: Prepared with the help of Swartz, Robert J. and Parks, Sandra (1994:505)

**D. Blended Approach**: This approach adopted also by Ennis (1989) and Perkins and Solomon (1989) sets forth that both subject-based approach and general approach be used together.

**THE ROLE OF TEACHING IN TEACHING CRITICAL THINKING**

One of the most important things that a teacher can do in class is to make students able to notice their own operating cognitive processes which means that students can form their own learning regardless of the subject and level of the class. The students should be able to try thinking, classifying and comparing, defining the wrong things about their thinking and correcting their own mistakes by themselves. So, teachers should have the students attain the skills of learning how to learn and think.

Teachers need a deep and comprehensive content knowledge and educational methods knowledge in order to improve students’ critical thinking skills. However, the teachers’ own perceptions about their being a good teacher and their attitudes towards critical thinking are also very important.

Teachers are both planners of learning-teaching activities and organizer of the classroom environment. Oppressive and authoritative environments prevent learning to think in class. Over-oppression, fear and excitement cause some hormones to be excreted more in the brain, and this causes mental processes to slow down.

Demirel and Şahinel explain the role of teaching in teaching critical thinking as below:
LEARNING AND TEACHING : THEORIES, APPROACHES AND MODELS

Missions of teachers in democratic education systems:
- Accepting the value and importance of all the teenagers as an individual.
- Believing in the soundness of agreed decisions.
- Believing in teenagers’ abilities to face and solve their own problems.
- Being patient about the seeming slowness of democratic processes.

In the light of these understandings, a teacher;
- should let students participate in determining the classroom activities and even their goals through discussion and preference.
- should let students ground their own ways of behaving on their own decisions in a gradually increasing manner and should prepare opportunities for them.
- should display some certain ways of behaviours to the students through examples, criticism and explanations or have the students do them instead of repeating the necessity of these behaviours, should give students chance of revealing, improving and making use of their abilities as an individual.
- should work with students in a nice environment collaboratively through encouraging student participation and individual initiative.

Lipman explains the goals of teachers in order to have teachers help the students with moving from usual thinking to critical thinking:
- A teacher should arrange educational activities that go;
  1. from assuming to guessing
  2. from preferring to evaluating
  3. from grouping to classifying
  4. from believing to supposing
  5. from mere deducing to logical deducing
  6. from remembering concepts to perceiving principles
  7. from giving importance to relations to giving importance to relations between relations
  8. from presuming to hypothesizing
  9. from suggesting without thinking to presenting an opinion after thinking
  10. from judging without evaluating with standards to judging through evaluating with standards.

Gürkaynak, Üstel and Gülgoz expect a teacher who facilitates critical thinking to do the things listed below:
- A mental transformation that will help avoid that famous “role of teacher” who tells, who asks close-ended questions, who asks for what s/he tells, who expects quietness, good behaviour, obedience and submission, who sometimes shouts and reprimands, who knows everything and all the time.
- Being able to go beyond course books and course plans.
- Transforming the atmosphere of the class in a manner that is fair, dependent upon human rights, far away from violence and force.
- Carrying out all educational activities considering human rights, respecting students and their opinions (not in a so-called manner, in act: For example, giving students time to think, decide, express their opinions).
- Using interactive methods understanding and believing in the students’ contribution to the critical thinking skills.
- Correlating information and life.
- Not being “objective” but “participating in the discussion in class without directing.”
- Having facilitating skills
- Not humiliating students by means of using age, status and position of being a teacher (in other words, not misusing power).
- Being aware of the fact that one can force his/her own opinion involuntarily.
- Not salving one’s conscience by means of “carrying out a so-called discussion”, not behaving in a manner that the class have come to a conclusion after a “so-called discussion”, namely, not
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trying to make a reconciliation/agreement that has not agreed upon yet or not trying to quicken this process.

- Thinking reflectively about the day in question – the attitude in class, the atmosphere s/he has created in class, goals that have been reached or not reached, etc. – every night, or making a reflective dialogue with one of the colleagues about these subjects.
- Creating a free atmosphere suitable for interaction in class.

THE ROLE OF THE STUDENT IN TEACHING CRITICAL THINKING

1. The students should start the education with a positive attitude. Their beliefs and tendencies about critical thinking affect education directly.
2. Students should directly participate in teaching activities. Especially when group work is in question, each student should actively participate in works in group and then in class.
3. Students should also critically evaluate their own opinions.
4. All students should contribute to creating a democratic atmosphere in class.
5. The students who come to the front in terms of leadership skills and other qualities in class should not hinder the creation of circumstances that will let other students display their opinions and studies in class.

THE ADVANTAGES OF TEACHING CRITICAL THINKING

1. It ensures the subjects to be learnt thoroughly.
2. Learning thoroughly creates interest in and motivation about the subject in the student.
3. It increases the level of active participation of students to a great extent.
4. It facilitates transferring of the learnt skills and subjects to other lessons and life.
5. In-class communication and interaction increases as a result of attaining skills.
6. Teaching critical thinking skills contributes to creating a democratic atmosphere in class.
7. It contributes to the socialization of students.
8. It helps the students to develop self-evaluation skills.
9. Especially in skill-based teaching, choosing extracurricular subjects helps students to be more active in class.

DIFFICULTIES OF TEACHING CRITICAL THINKING

1. As learning styles of students who haven’t received critical thinking teaching in the first years of education life are shaped, an orientation period is needed to pass to teaching critical thinking.
2. The teachers should be well-trained about teaching critical thinking skills.
3. It requires a good planning. This planning should be composed of a yearly plan that covers a whole educational year and daily plans that show how to get students attain the critical thinking skill in each lesson. These plans may require to be prepared by people having specialized in critical thinking especially in our country until teaching critical thinking becomes widespread.
4. Stationery expense is more than usual activities.
5. Critical thinking activities take longer time.
6. Teaching critical thinking should be spread over a long period of time. Teaching critical thinking should be planned with a spiral sense that is distributed to all levels of education starting from pre-school period instead of teaching in one or a few years.

REFERENCES


CHAPTER 14: COMPUTER ASSISTED EDUCATION

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(INTRODUCTION

“The partnership for 21st century skills” has published a report on what characteristics an individual should have in 21st century. According to this report, an individual should improve some skills. These are as follows:

- Global awareness
- Financial, economic, business and entrepreneurial literacy
- Civic literacy
- Environmental literacy
- Learning and innovation skills
- Creativity and innovation
- Critical thinking and problem solving
- Communication and collaboration
- Information, media and technology skills
- Information literacy
- Media literacy
- ICT (Information, communication and technology) literacy
- Life and career skills
- Flexibility and adaptability
- Initiative and self-direction
- Social and cross-cultural skills
- Productivity and accountability
- Leadership and responsibility

It will not be wrong to say that all of these skills are based on the awareness, literacy and skills of ICT. In short, it will become more feasible to bring up individuals who are ready for real life by emphasizing these skills in our education system. In many countries, the ministries of education try to use the technology by shifting the paradigm in the education systems. Especially since the 1990s, with the acceptance of computers as an effective learning tool, technology integration has become a stress factor in education. So, in many countries, computer-assisted education has been included even in pre-school curricula.

Information, communication and technology are recognized briefly as ICT in the literature. We can consider the computer-assisted education, teaching or learning as the ancestor of ICT. Being so popular for all these reasons, the usage of computers in education will be discussed in this part.
**Basic Terms**

In this part, how computer-assisted education takes place in the literature and some other terms related to education will be studied.

**The Learning and Teaching of Computer and the Learning and Teaching With Computer**

When the use of computer is mentioned, it may be its use in different areas such as education, production and communication. Theorists discuss the use of computer under two titles; education for computer and computer for education. The relationship between education and computer can be examined in Figure 1.

![Computer-Education Relationship](image)

Figure 1: Computer- Education Relationship

*Education for computer* includes computer literacy and software and hardware training. These titles do not need explaining as they express themselves. When it comes to *computer for education*, it differs from the other one with the statements “supervised”, “based” and “supported”. The processes of learning and teaching are carried out and managed through a computer and it can be described as “supervised”. Using computer as a teaching resource can be described as “based”. And using computer as a complement system in education can be described as “supported”.

The integration of information and communication technologies in education requires teachers to take part in this process. Naturally, in order to shorten this process, it would be more appropriate for teachers to learn computer/technology during undergraduate education before meeting with students during their service. Kay investigated 68 studies examining the integrating teachers with technology in undergraduate education (in other words, examining the use of computer and similar technologies in lessons). As a result, he found out two approaches. In the first approach (%44), a separate lesson in which basic computer skills are taught is not given. The main advantage of this approach is that teachers learn to use computers in context. The second approach reflects the situation of our country better. %29 of the studies examined by Kay prefer this approach. This approach includes the discussion of basic computer skills in a lesson and the main advantage of this approach can be summarized as increasing self-sufficiency in the use of computer, strengthening technology skills and developing a positive perspective on the use of technology in education. However, the disadvantage
of this strategy is that it is detached from the context. The ideal approach in teacher training is a blend of both strategies. Moreover, this strategy should be not only in teacher training but also in primary schools.

Computer-assisted instruction is the use of computer software developed by experts in teaching a subject, concept or behavior to the students or reinforcing the previously acquired knowledge or behavior.

In order to qualify the materials presented in a computer environment for educational purposes must include learning materials and activities which are including a- learning objectives, b- teaching strategies (properties necessary for the selection and ranking of activities and events in the learning environment), c- student assessment and/or feedback. It is recommended that teachers, parents or students at a certain age should pay attention to the value and teaching aims, contents, formal compliance, software-user interaction, usefulness and technical specifications of the educational software while evaluating this kind of software.

Computer managed instruction can be defined as the use of computer systems in planning, organizing and programming the education, measuring the students’ learning levels, recording and re-using of data related to the students and making statistical analysis based on these data, in short it can be defined as the use of computer systems in managing all kinds of educational activities. The most appropriate example for this concept is Learning Management Systems being used nowadays by institutions to monitor the functioning of training programs conducted on the Internet.

Considering that the computer is a communication tool, it can be seen that social media have embraced the education. With the blessings provided by the internet, people can reach the files they want instantly on the internet, chat, share audio, visual and video: create whiteboard applications, send text messages and notice the changes in news sources. People can transfer all of these applications into education.

There are many benefits of computer-assisted education to interact with students:

a. Easy to use
b. The ability to conduct research and to provide supportive information
c. Question-and-answer interaction
d. Progress in accordance with the individual characteristics
e. Games for educational purposes
f. Different assistive equipment for different disciplines
g. Free test environments
h. Evaluation

Computers can also be used in teacher-parent communication and sharing assignments tasks or other information. The use of computers is much more effective and immediate than phone calls and at the same time it can prevent unnecessary communication or misunderstandings.

The impact of computer as a tool of production is felt more today. The students of this generation do not experience the problems faced by the teachers in the past. Today, while studying or doing their homework, students benefit form computers more than their teachers do. For instance, word-processing and presentation programs are considered obsolete. Today's students are able to use desktop publishing, visual, audio and video processing programs easily at least at the level of arrangement.

**The Definition of Computer Assisted Education**

Computer assisted teaching/learning is a system of teaching, evaluation and rules which is online direct and interactive. It is also referred as computer-assisted education in the literature. Fine distinctions between terms are ignored in the literature and have been used interchangeably.
Students benefit most from computers in the use of word-processing. In addition database, spreadsheet, drawing/painting/graphics/photo processing, presentation, writing, concept mapping and planning activities follow it. Students use a web browser, CD source of reference and communication as Internet/research software; direct teaching, team teaching, collaborative teaching and individual teaching in orienting the teaching; high-level feedback, integration of subject areas, project-based learning, high-level questioning strategies, teachers working as a facilitator and an assistant and family/community involvement as a teaching strategy; independent study, experiential learning, systematic individual teaching, uninterrupted text/composition, uninterrupted reading, independent questioning/research and debate as student activity.

Today, in the distribution of many teaching materials presented in text, CD Rom or the internet is preferred most. For example, many open universities in Asia follow this method in the distribution of course materials.

**Individual? Collaborative?**
The word, computer, is widely known by the acronym PC (Personal Computer) in English. Indeed, computers are initially aimed at the world of education and the personal use of students. Then, with the reflection of globalization to the computer world, personal computers gave a start of beginning of interpersonal communication. The effect of this socialization was felt in education in a short time.

**Multimedia, hypertext and Hypermedia**
The three terms have to be discussed in CAE. These three terms are described briefly below:

Multimedia is a computer-assisted, interactive presentation including at least two of text, audio, static or active images and animations.

Hypertext began to be discussed in 1945 by Vannevar Bush and invented in the 1960s by Ted Nelson. Texts, whether printed or displayed on the computer, follow a linear sequence and they are read from the first page. Considering that the information presented in a group of texts is a node, hypertext is the connections of these nodes linked to each other. Hypertext is not linear. In hypertext, there is not only a way to read the texts, the reader decides on the order while reading.

With the installation of multimedia features such as graphics, audio, video to the plain text by the developing technologies, hypertext has become hypermedia. However it will not be proper to describe each multimedia as hypermedia. Hypermedia, linking the nodes with different environments, is the natural supporter of multimedia interfaces. In this case, in distinguishing between multimedia and hypermedia, the key point is the connection of nodes to each other. If a teacher opens videos, plays music on the computer to his students and brings some visual materials to the class, it shows that he benefits from multimedia. If the teacher reflects a webpage using projector, opens a video by clicking a link on this webpage and then accesses the visuals and a song by clicking another link on the same page and if he has a chance to jump from this media to another, it shows that he benefits from hypermedia with which he has supported with multimedia.

Adaptive hypermedia is a system as a result of the combination of hypermedia and user modeling. This system puts forward a model in accordance with the each user's goals, preferences and knowledge and it adapts with this model according to the needs of the user as it interacts with the user. These systems will be the apple of the eye at today's distance education.

**The Use of CAE in Different Branches**
CAE, since the 1960s, have been used in preschool, higher education, in-service training at different levels in different disciplines. For instance

- Mathematics
- Trigonometry
- Science
- Physics
- Chemistry
- Social studies
- Articulation
- Environment
Since the 1970s, computers have been used in educational assessment and evaluation. Many researches on computer-assisted assessment can be found in the literature. Factors affecting the use of computers in educational assessment and evaluation are computer experience, socio-cultural factors, race, ethnic origin, sex, screen quality, network quality and student preferences.

**Computer Use in Preschool Education**

The reason why this title is discussed separately from the others is that it is about the lowest age level. It is observed that there is a dilemma in using computer in preschool education. While there are supporters thinking that computer use in preschool education is positive in terms of social skills, cognitive and problem-solving skills, creativity, language development literacy skills, motor and hand-eye coordination and motivation, there are supporters of the view that computers are not belong to preschool classes. According to this view, computers deprive children of activities made with hands and sensory experiences.

**A Journey in the History of Computer Assisted Learning**

The beginning of the digital era dates back to 1623, Wilhelm Schickard’s calculating machine. There are some cornerstones in the history of computer development; in 1679 Gottfried Leibniz with 1 and 0’s, in 1810 Joseph-Maire Jacquard with punched cards, in 1830 Charles Babbage with analytical engine, 1941 Conrad Zuse with Z3 and in 1945 John Mauchley and Presper Eckert with ENIAC. The idea of computer-assisted education appeared first at the end of the 1950s. Considering that mechanical teaching machines as a start, computer assisted education have reached today since the 1950’s. These effects were observed in North America, some parts of Western Europe and the Soviet Union. In 1953, designed by Gordon Pask to perform a single education task, SAKI (Solartron Adaptive Keyboard Instructor) is one of the first examples. Another example is a computer-controlled teaching machine known as Mentor, which was designed by the Thompson, Ramo, Woolridge Corporation. Mentor was able to teach in different subjects.

Most authorities trace CAE back to Skinner, 1954, who defined the learning as behavioral changes. Programmed instruction has appeared as an extension of this theory. Programmed instruction is the basis of computer-assisted education and it is an individual and self-learning technique. In programmed instruction, learning materials are presented from a machine or computer. This presentation can be considered as the advancement of paragraphs in series on separate screens. The advancement, like turning the page, happens with the student’s approval of passing to the next screen. There are two basic models: linear and branching. Small steps, active engagement, immediate correction, proceed at student’s own pace, correct answers are the basic principles of it.

When Skinner developed the teaching machine in the 1950s, he did not have the idea of computer system but in the same years IBM converted Skinner’s behaviorism into IBM Model 650 computer. The first steps of the feedback appeared in computer assisted education system. In 1961, IBM experimented another computer assisted instruction study with IBM Model 7010. The Authoring language called the Coursewriter was developed in 1964. IBM went on developing such products with researchers such as Atkinson and Suppes at Stanford University. IBM 1500, developed by the Division of Instructional Systems Development in 18 months, was one these products. Then, IBM 1500 appeared with new versions with additional features such as CRT screen, qwerty keyboard, light pen; visual projector, student stations (expanded to 32 students in time), audio adaptor, hub, authoring languages (Coursewrite II, APL, MAT).
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Picture 1: PLATO Screenshot (1975)
Reference: http://www.computerhistory.org/revolution/the-web/20/377/2154
Picture 2: PLATO V
It is considered that the first version of the first well-known systems in this field, PLATO, completed by Donald L. Bitzer, reached approximately 1000 terminals worldwide. PLATO system was developed in Illinois University in 1960 and served for 40 years to the students. In the first version, PLATO was connected to the TV. In the second version, it gave the first signs of socializing in the digital environment by providing the time-share between two students. PLATO III (1963-66) was able to accommodate up to 20 terminals. Flexibility in education was ensured with the first authoring language TUTOR in PLATO III, so people without computer programming skills had the chance to develop computer assisted education materials. By the 1970s, online chat and bulletin board was available long before the Internet and a 720-hour course content was developed with PLATO in those years.

Picture 1 and 2 are the examples of the different versions of PLATO. When the last product of PLATO was closed in 2006, it had some features such as forum, message board, online testing, e-mail, chat rooms, symbolic languages, instant messaging, remote desktop sharing and multi-player games.

Seymour Papert is a scientist who believes that it is important for children to discuss with and talk to him. According to him, the interaction between the facts they learned at the course and their own ideas are also important. At this point, they can utilize computers. With these thoughts in 1967, Papert and his colleagues developed a computer system called “Turtle” in Massachusetts Institute of Technology Artificial Intelligence Labs. LOGO, the adaptation of Lisp artificial intelligence programming language, is used in Turtle. In Picture 3 and 4, the Papert’s Turtle is shown. LOGO has a simple language that can be learned from a very young age. Also, LOGO allows for the solution of many complex geometry problems. Students are able to move the Turtle with commands of forward, backward, left and right by using the computer. Papert says that they received the best compliance results with 12 year olds. “Floor Turtle” was moved to screen in time and it was used in teaching diverse age groups in different areas. Although it has been a long time, studies based on the LOGO principle still continue.

One of the important systems in computer-assisted education is TICCIT (Time-shared Interactive Computer-controlled Information Television) which is designed in 1977 (METAGEM, 1991). TICCIT was developed with the cooperation of Brigham Young Universtiy and Mitre Corporation. The software of TICCIT was developed at the university and the theory of instruction strategies was developed by David Merrill. This theory consisted of the components of the strategy and this theory has been the basis of theory-based computer assisted instruction.

It can be seen that the studies of CAE started in the 1960s in European countries such as United Kingdom and Germany and they became widespread in Europe in the 1980s. upon looking to the east, we can see that the studies of CAE started in Russia, as mentioned before, in the 1950s, in countries like Egypt and Jordan in the 1980s, in China and Japan in the 1980s.

**Computer Assisted Education in Turkey**
The computer use for educational purposes and its survival have occurred with a series of firsts in Turkey. These are as follows:
- The establishment of the first computer in Turkish Republic Highways in October 1960.
The evaluation of the exams conducted by the Ministry of Education in the 1960s.
The computer use for the first time in universities in 1964 at Istanbul Technical University and then at Istanbul University.
The beginning of computer engineering and computer programming education in 1967.
All the processes from the preparation of questions of university entrance exam to the evaluation of them began to be carried out by Student Selection and Placement Center in 1977.
The opening of the computer division at Ankara Bahçeşehir Vocational High School in the 1978-1979 academic year.
The use of computer and IT terms in “the IT Glossary”, prepared by Prof. Dr. Aydın KÖKSAL, in 1981.
The formation of “Secondary School Computer Education Specialized Commission” in the Ministry of Education in 1984 (the first attempt to use computers in education)
With the proposal of “Secondary School Computer Education Specialized Commission”, it was planned to teach elective “computer course” in the computer labs established in 100 pilot secondary schools in the 1985-1986 academic year.
The execution of the computer lesson for high school seniors’ 3-hour courses per week.
The computer lesson was “elective” in secondary and high school and it was “required” in Vocational High School for Girls and Electrical Electronics Division of Industrial Vocational High Schools in the 1987-1988 academic year.
The development of TÜBİTAK Education Microcomputer which was a prototype compatible with IBM PC-XT in Ankara Electronics Research and Development Institute in 1987.
37 in-service training provided by the Ministry of National Education within the Computer Assisted Education Project between 1985 and 1989.
The National Education Project was signed between the Ministry of National Education and the World Bank in March, 1990.
The opening of the Department of Computer Education and Instructional Technologies within the Faculties of Education.
The development of computer course curriculum in primary education in 2006.
The beginning of elective “Information Technology” course from 1st to 8th grades in primary school programs (within the studies of development educational programs by the Ministry of Education, the Board of Education and Discipline).
Discussing the requirement of “Information Technology” course in 2010 and what kind of a lesson it should be? Elective or required?
With Fatih Project, scheduled to be implemented in the near future, the objectives –Information and communication technologies must be one of the main devices in educational process and students and teachers will use these technologies effectively- emphasized in Information Society Strategy which is prepared by State Planning Organization are desired to reach. To be able to reach these objectives, requirements are as follows;
- completion of the infrastructure of information and communication technology in formal and non-normal education institutions.
- teaching students to use information and communication technologies in these places.
- the development of education programs assisted by information and communication technology. It is being planned to install laptop, interactive LCD Panel Board and internet network infrastructure in classes of preschool, primary school and high school in order to appeal to more senses in the process of teaching by using Information Technology devices effectively. In order to ensure the efficient use of IT equipment installed in classrooms in the process of learning teaching, it is being planned to provide in-service training for teachers. In the meantime, the creation of educational e-content is being studied to adapt educational programs to IT-assisted education.

CAE SOFTWARE

Computer assisted education system strategies are tutorials, practices, simulations, problem solving, process software and Socratic inquiry. Some of these will be discussed briefly.
**Tutorials**
Tutorials, which can be described as tutor software, are programs to teach a particular subject or concept and they are the most common type of CAE software.

**Practice Software**
Practice software is the program developed to reinforce previously taught subjects or concepts. It is used in definitions, history facts, the solution of math programs, scientific principles or concepts, language teaching and so on.

**Simulation**
The simulation is the tendency to imitate a real or imaginary environment or system. In general, it serves to the purposes of education, science and entertainment. It is needed due to the cost, unavailability, danger or time. Simulations must be compatible with the student’s previous knowledge and experience.

**Micro-worlds**
A micro-world is a small but complete version of a certain part of a certain area of interest. Individuals do not work but “live” in Micro-world. It is like learning the language by living in the country where it is spoken as a native language instead of attending a language course. Micro-worlds can be in real life and it can also be created artificially. Besides LOGO, Geometer’s Sketchpad and Interactive Physic are the examples of commonly known micro-worlds. Micro-worlds are different from simulations in two ways. The first one is that the micro-world represents the student with the presentation of a simple micro-area, thus the student discovers the micro-world on his own. The second one is that micro-worlds match the student’s cognitive and sensory status; in other words, the student already knows what to do with the micro-world.

**Virtual Reality**
Virtual Reality is a system offering an impressive and interactive computer experience in 3D in the real time. Another definition is that it is a high-level interactive computer simulation changing or increasing the feedback for the user’s movement by sensing the user’s position. Nintendo Wii, one of the today’s popular applications, is an example for this system.

**Other Components to Use in Computer Assisted Education Software**
In this title, Educational Computer Games and illustrations will be discussed.

**Educational Computer Games**
Educational Computer Games provide effective and efficient computer assisted instruction to the students of all ages. The main objective of computers for educational purposes facilitate the player’s learning by using high level thinking skills in line with the characteristics of game play without using only the hidden practice activities. Games are based on the competition. There is a specific goal and games have rules. They want players to cope with difficulties. Students have right to make choices. They are also fantastic.

**Illustrations**
Illustrations should be able to appeal to the eye. They should draw attention; motivate the student; be a part of the presentation and be explanatory. Physical properties, such as color, pixel depth, degree of reflecting the size and the fact, are very important in preparing the illustrations.

**The Use of Computer-Based Devices in Education**
In this title, the expression, “the use of computer based devices in education” is preferred rather than the expression “the use of computer in education”. The underlying reason is that there are major changes in the studying and learning strategies of today’s students. It is possible to come across a child on the bus studying with a speech record or video of his friend, teacher or an expert on his
smart phone. Video games, word processors, spreadsheet tools, statistical tools, etc. have already become obsolete.

**Digital Textbooks**: When these books first appeared, paper-based content was converted to digital format and they were used as a "support material" for students to help learning and teaching of discovery, construction, implementation and sharing of knowledge. Today, digital textbooks have many supportive features such as note taking, reminder messages, writing and highlighting tools, chat and discussion boards, navigation tools (e.g. bookmark, page search/scroll and course selection) screen capture capabilities, textbook display options and search tools. These textbooks support also multimedia like interactive games, video, audio, animation and 3D screenings. Students can write a textbook using these features. In short, they support students to learn at their own pace and at suitable time for them by accessing the course content at home or school in line with their own interests and abilities.

**Handheld Devices**: Today’s computer assisted education is moved from computers to handheld devices. Personal Digital Assistants, PDA, mobile phones, smart phones, mp3 players and tablet computers that are slightly larger than the palm are examples of these devices. These devices can fit into the palm but they do not contain only audio, image, video playback, individual and group communication with the help of small speakers or headphones by exporting the voice and voice recording but also note-taking, calculation, map, weather forecast, address book, word processing, spreadsheets, etc.

**A Geographic information system, GIS**, is one of the widely used information and communication technologies in education. It is a computer-based system used for storage, re-finding, processing, analysis, presentation, creation, interpretation, and visualization of geographic or spatial data. This system is also used to learn/teach geography and solves the problems of geographical issues. Geography teachers can easily use these systems in their classes. It is estimated that these systems were used first by Rober Tinker. In addition, the first GIS software for educational purposes is thought to be AEGIS. With the use of GIS, The ways of students’ acquisition and interpretation of geographic information may change.

**Learning Theories and CAE**
As shown in Figure 2, there are three components of computer-assisted education: software, hardware and pedagogical infrastructure. The third dimension affects the students’ mental connection to the subject and especially the development of computer assisted learning materials. Therefore, theoretical approach is of key importance in CAE.

![Figure 2: Components of Computer Assisted Education](image)

**Behaviorism and CAE**
Technology-based primary curriculum is, as mentioned before, behaviorism oriented programmed instruction. These programs are task-based and they operate the principle of stimulus-response of
behaviorism. In this approach, feedback is naturally important. However, beyond the existence of feedback, its quality is also important. Except for reporting to the student whether his answer is right or wrong, it should be informative, timely and descriptive. Today, adaptive hypermedia environments can serve this purpose. Behaviorist computer assisted learning environments can be successful especially in low-skilled learners but more flexible structures may be required for students with higher-level skills. Behaviorist CAE can be used for the teaching of factual information such as the capital of Turkey is Ankara.

**Cognitivism and CAE**

Changes in thoughts about teaching and learning in time have begun to show itself in CAE in the transition process from behaviorism to cognitivism. When the Internet first began to become widespread, the effects of cognitivism were felt. Tutorials, games and simulations can be considered as an example of learning methods.

When the computer assisted education is mentioned, multi-media learning often comes to mind and when multimedia learning is mentioned, Mayer comes to mind. Mayer revealed seven principles in the design of learning environments according to the theory of multimedia learning:

<table>
<thead>
<tr>
<th>Number</th>
<th>Principle</th>
<th>Students in their learning environments</th>
<th>When compared to</th>
<th>Learn better</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multi-media</td>
<td>-</td>
<td>presenting only words</td>
<td>presenting words and pictures together</td>
</tr>
<tr>
<td>2</td>
<td>Spatial Contiguity</td>
<td>corresponding words and pictures on a page or screen</td>
<td>far from each other</td>
<td>close to each other</td>
</tr>
<tr>
<td>3</td>
<td>Temporal Contiguity</td>
<td>corresponding words and pictures</td>
<td>presenting successively</td>
<td>presenting simultaneously</td>
</tr>
<tr>
<td>4</td>
<td>Coherence</td>
<td>extraneous words, pictures and sounds</td>
<td>-</td>
<td>Not existing</td>
</tr>
<tr>
<td>5</td>
<td>Modality</td>
<td>On the screen</td>
<td>Presenting animation and onscreen text together</td>
<td>Presenting animation and narration together</td>
</tr>
<tr>
<td>6</td>
<td>Redundancy</td>
<td>On the screen</td>
<td>Presenting animation, narration and onscreen text together</td>
<td>Presenting animation and narration together</td>
</tr>
<tr>
<td>7</td>
<td>Individual Differences</td>
<td>Design effects are stronger for High knowledge learners and low spatial learners</td>
<td>Low-knowledge learners and high spatial learners</td>
<td></td>
</tr>
</tbody>
</table>

Carefully designed multimedia having interaction components provides visibility in learning. The user:

- “sees” the action, whenever he makes a choice
- gets immediate feedback for the action he choose.
- gets timely and understandable information about the results of the action.

There are five types of multimedia interaction: dialogue, control, manipulation, search and navigation. The dialogue is that the student asks questions and receives answers or answers the questions and
gets feedback about his answer on multimedia. Control can be explained as the student’s decision on the learning pace or order. Manipulation is the student’s control over the presentation. In other words, it is the changing parameters such as moving, enlarging, reducing the objects on the screen. The existence of facilities similar to the search options on the internet can be described as the interaction of multimedia search. Navigation can be expressed as making selection from a variety of sources like clicking on a menu item.

Intelligent Tutoring Systems are also considered in cognitive CAE environments. Skinner’s opinion of “there is no need to point out the student’s mistakes in linear programs” has affected CAE in a negative way. The criticisms to the Behaviorist CAE were its weaknesses in feedback and failure in individualization. Therefore, Intelligent Tutoring Systems seem to be a solution to these complaints. It is possible to define Intelligent Tutoring Systems as the pedagogical software that knows to whom, what and how to teach. It includes four elements: student model, teacher, subject area, expert and user interface. SCHOLAR, SOPHIE, GUIDON are some examples of well known ITS. Brown developed an experimental mechanism named SOPHIE based on the Pask’s conversation theory. This mechanism can be regarded as an interpretation of Pressey’s teaching mechanism, which takes individual differences into consideration.

**Constructivism and CAE**

As is known, there is a fact and the individual tries to reach it according to the objectivist- (behaviorist and cognitivist) based approaches. However, in constructivism, the individual reaches to the truth through his own experiences. Database Management Systems, simulations and virtual reality can guide individuals to find their own truths.

LOGO was developed in order to support constructivist-learning environments named “micro-worlds”. Papert hoped children to learn by self-correcting in the natural learning process. This idea, in fact, reflects the constructivist principle of constructing the knowledge himself. In constructivism, learning with the LOGO turtle is a typical example of discovery learning. Micro-worlds can be used to create self-managed learning environments.

In Social Constructivist Approach, it is very important for students to benefit from feedbacks in constructing their own knowledge. We can define this situation by talking about the child’s learning process of his mother tongue. In the process of learning a language, a child is approved and corrected by speakers using that language better. Those speakers learn something about the language form the child, too. Skinner also expresses another analogy about the subject. Scientists need to share their studies through articles, proceedings, workshops, etc. so that their studies are checked and approved by other scientists. Social Constructivist Approach reflects in today's computer assisted learning environments with e-chat. Students get the chance to access the feedback of their truths and errors from their peers, teaching staff and experts in connection with social constructivism.

Constructivist computer-based education applications such as based on the situation, situated cognition, coupled teaching, problem-based learning, cooperative learning, distributed cognition and open-ended learning environments can be carried out with the opportunities provided by medias like blogs, wikis, social bookmarking, social communities and virtual worlds.

**Future and CAE**

What awaits us in the field of CAE in the future? Children from preschool age will be able to transfer the world into the screens of their devices at school. Students will experience “Alice in Wonderland” in multi-user virtual environment interfaces. It is expected that experiences of students, who can access to computer from anywhere at any time, will deepen with the “augmentedreality interfaces”.
SUMMARY

✓ Computer controlled education is the management of teaching-learning processes on computer.
✓ Computer based education is the use of computer as an instructional source.
✓ Computer assisted learning can be expressed as the use of the computer as a complementary system in education.
✓ In order to qualify the materials presented in a computer environment for educational purposes must include learning materials and activities which are including a- learning objectives, b- teaching strategies (properties necessary for the selection and ranking of activities and events in the learning environment), c- student assessment and/or feedback.
✓ Multimedia is a computer-assisted, interactive presentation including at least two of text, audio, static or active images and animations.
✓ Considering that the information presented in a group of texts is a node, hypertext is the connections of these nodes linked to each other.
✓ With the installation of multimedia features such as graphics, audio, video to the plain text by the developing technologies, hypertext has become hypermedia.
✓ The idea of computer assisted education appeared first at the end of the 1950s.
✓ Programmed instruction is the basis of computer assisted education and it is an individual and self-learning technique.
✓ The use of computer for educational purposes in Turkey started with the evaluation of the exams conducted by the Ministry of Education in the 1960s.
✓ Tutorials which can be described as tutor software are programs to teach a particular subject or concept.
✓ Practice software is the program developed to reinforce previously taught subjects or concepts.
✓ The simulation is the tendency to imitate a real or imaginary environment or system.
✓ A micro-world is a small but complete version of a certain part of a certain area of interest.
✓ Virtual Reality is a system offering an impressive and interactive computer experience in 3D in the real time.

REFERENCES


INTRODUCTION

Looking as if appearing as an effort of prevailing missionary and shaped as an application of postal tuition, distance education has leaned to meet the educational needs of the people in various environments afterwards whether or not they share the same time, and has been successful at this as well. However, in time, the meaning attributed to "distance" has become the interpersonal cultural, sociological or mental differences including teaching staff, students and the rest personnel in the system beyond the environment and time (maybe experienced in conventional classrooms). This phenomenon has been the most fundamental issue of the theorists and researchers dealing with distance education. Today although the programs of the most institutions offering distance education are prominently different from each other, they are basically depend on the present technology they have or the cheapest technology. All of these programs depend on the principle of existing in the education system though the geographical distance, physical exceptions, financial problems or other individual problems. In this chapter, on one hand, distance education will be explained briefly in the context of its basic concepts, history, positive and negative aspects, theories and relationship with instructional technology within the lack of being a chapter of this book.

BASIC CONCEPTS

It is going to be proper to deal with the title of basic concepts as terminology and distance education types.

The Definition of Distance Education

Distance education as a concept started to be used in 1970s and was first put into words officially in International Postal Tuition Council in 1982. Distance education is a distinct education type which cannot be regarded as an alternative of conventional face to face education due to embracing adults who are working or have constraints because of their family, face to face interviews, classrooms and freedom of general place and time, the combination of mass media and individuation, the potentials regarding student’s freedom and peculiar administration.

When having a look at the definitions of distance education, it could be seen that there are four components of it, which are the institutional foundation, the difference between teachers and students, the share of video, sound and data (teaching experiences) and interactive telecommunication. In other words it is possible to bring together the definitions under four titles.

In the definitions of distance education theorists, it might be seen that during the early years the time and place differences between teachers and students were obligatory, and this obligatory was attributed to one of them in time. That the technology provided the flexibility in the definitions can be seen. Today we can define distance education as realizing the mass education in a certain quality under the authority of an institution. Both students and teaching staff make self-sacrifice for
the freedom of environment and time in distance education. It puts the most suitable examples of recent technology into service for the techniques, methods and strategies of instruction and it does not ignore the needs of students, and prioritizes the social sharing not only between students and teaching staff but also with each other.

**Open Education**

The most crucial quality of open education is that it includes quite a few acceptance requirements. To give an example, when Open University of England was first established, it did not ask from its students any diplomas or exam scores, but required a condition to be at the age of 21. These requirements and flexibilities may change from one institution to another. Today Open Universities are very well accepted in various countries that the number of their students has exceeded millions. The universities the number of the students of which exceeds 100.000 are called as mega universities. Self-learning/teaching materials, effective student support services, logistics, management supports and web systems play an important role in the success of the Open Universities’. Some of these universities can be seen as follows:

- Allama Iqbal Open University, Pakistan
- Anadolu University, Turkey
- Athabasca University, Canada
- Bangladesh Open University, Bangladesh
- Centre National d’enseignement à distance, France
- China Central Radio and TV University, China
- City College of San Francisco, the USA
- Dr. B.R. Ambedkar Open University, India
- Indira Ghandi National Open University, India
- Korea National Open University, South Korea
- Madhya Pradesh Bhoj Open University, India
- Netaji Subhash Open University, India
- Open University, England
- Payame Noor University, Iran
- Shanghai TV University, China
- Sukhothai Thammathirat Open University, Thailand
- Universidad Nacional de Educacion a Distancia, Spain
- Terbuka University, Indonesia
- Maryland University, the USA
- Phoenix University, the USA
- South Africa University, South Africa
- Yashwantrao Chavan Maharashtra Open University, India

**Online e- and m-Learning**

Online e- and m-learning concepts refer to the application of electronic communication in distance education. E-learning means that distance education needs computers which are in a fixed place, while m-learning needs mobile wireless utensils. The distinctive characteristic of e-learning is that the interaction with the virtual people is not crucial in learning atmosphere according to Paulsen this is acceptable for m-learning, too. However, as regards to online learning Holmberg interprets this definition with Keegan’s popular definition of distance education: “It is presenting the learning content through computers and utilizing the computer web for bilateral communication of students to make use of the communication with one another, teaching staff and the other personnel. Another definition is that “It is an open and distributed environment where pedagogical tools are supported by the Internet and web-based technologies and learning and creating data are provided by meaningful activities and interactions.” On the other hand, Ally defines it as using the internet for accessing the learning materials, interacting with the content, teaching staff and the other students, getting support during the learning process, obtaining information, constituting the knowledge of oneself and acquiring learning experiences.
Whereas mobile learning is to offer the education via palm devices, smart and mobile phones, mini tablets and laptops, these devices, which are used in mobile learning, are mobile, user-friendly, personal, cheap and easy to use. It can be realized that these devices are not bought for educational purposes but are used for education, as well\textsuperscript{17}.

**Blended Learning**

This concept was first used as “hybrid learning” in literature, yet those dealing with distance learning felt uncomfortable themselves since the hybrid was a concept in relation with biology; hence “blended learning” started to be used commonly. In our culture as the concept of blended is associated with agriculture it was uneasy to adopt this concept and co-education was suggested. However, in Turkish education system this concept refers that girls and boys or from 1\textsuperscript{st} to 5\textsuperscript{th} grade students study together. So, it is a concept upon which is not agreed. Burns describes blended learning as blending face to face and online learning together provided that online learning has a rate of 30\%-79\% \textsuperscript{18}.

**Blended Learning Models:** These models are as followed for primary and secondary levels\textsuperscript{19}. The one in which face to face education is dominant and the teacher teaches in the classroom but presents the course material and resources online; the rotation model in which students study the face to face and online components of the course with the same teacher alternately; the flexible model in which most parts of the course are presented by the internet but studied with the teacher in the classroom environment flexibly, supported with individual or small group works and the teacher gives some explanations if necessary; the online laboratory model in which course assistants teach in the classroom and online teacher teaches through the computers in the classroom; the self-blended model in which students get the course material distanty and online, but at the same time conventional methods continue in the classroom; and finally the online platform model in which teaching and materials are all presented distantly and online but some controls are made through weekly face to face meetings. These models are also valid for higher education.

**What is Interaction?**

Interaction is “a bilateral developed action which necessitates at least two objects and two actions. Interaction may occur when these objects and actions interact with each other bilaterally\textsuperscript{20}.” The interaction in distance education has been equal to mental involvement in time. Providing students with the mental involvement to education by interaction may be possible only by making them willing and enthusiastic learners in education. In this case the simplest interaction is that students do something. This “something” must be further than pressing a button or writing something on a somewhere. The interaction in education can be described with the characteristics of pace, elaboration, approval, roaming and questioning\textsuperscript{21}.

Moore is the best known person regarding the interaction in distance education. Moore described 3 types of interaction\textsuperscript{22}: The Interaction of Teaching Staff- Student, Student- Student, and Student- Content. Anderson and Garrison improved these interactions by adding those three dimensions\textsuperscript{23}: Teaching Staff-Teaching Staff, Content-Content, and Teaching Staff-Content. Except from these, some distance education scholars have described various interaction types. These are: the interaction of Student-Interface\textsuperscript{24}, Vicarious Interaction, and Student-Environment.

**Teaching Staff-Student Interaction:** The importance of the interaction between teacher and students has been stated since Plato and Dewey. This importance is also effective in distance education. If a high-quality interaction between teaching staff and students is desired, it can only be ensured by a correct choice of the learning activities developed as part of teaching programme and a proper teaching design\textsuperscript{27}.

**Student-Student Interaction:** Communication enabled by computer increases the interaction between one another and it also facilitates the collaborative learning\textsuperscript{3}.

**Student-Content Interaction:** Students spend a great deal of time engaging in pedagogical content especially in adult distance education. Current technology facilitates to present this content
provided by teaching staff through various media\textsuperscript{27}. Touvinen classifies these media under five headings as sound, text, graphics, video and virtual reality\textsuperscript{28}. What kind of interaction may be between the contents presented by these media and students? The answer of the question could be the interaction taxonomy\textsuperscript{28, 29}. In this taxonomical interaction types can be classified as objects, linear, support, updating, configuration, reflective, simulation, hyperlink, stimulus and not stimulus\textsuperscript{27}. It is notable to say that referring to the known argumentation of Clark and Kozma, both the media in which the contents are presented and the method which answers the question how to present the content are crucial.

**Teaching Staff-Content Interaction:** Current technology gives the opportunity of preparing learning objects and integrating them into the courses to teaching staff. Teaching staff can interact with the content through adaptable search engine, so he can interact with the teaching staff that will study or has studied on the same subjects. In this case, the role of this interaction focuses on the process of teaching design.

**Teaching Staff-Teaching Staff Interaction:** Under this interaction heading, sharing needs of teaching staff with one another in terms of both their own disciplines, distance education which includes technical, technological, sociological aspects and pedagogical and androgoia are emphasized. These needs can be met through forums they will not pay fees, web diaries and portals\textsuperscript{27}.

**Content-Content Interaction:** It can be described as the interaction of interdisciplinary learning objects by being benefited from the modern technology. This new generation content is to be programmed by renewing the other automatic data sources themselves and interacting with updating and the other contents in order to gain new abilities\textsuperscript{31}.

**Student-Interface Interaction:** It refers to treating the tools when succeeding a task by focusing on access, skills and qualities to have a successful interaction. In short, it itself is not an interaction type but a component of other interaction types\textsuperscript{27}.

**Vicarious Interaction:** All students may not prefer to join the discussion atmosphere in distance education, in a conversation or asynchronous interaction. It is a fact that these students learn something in such an atmosphere by just watching the conversation passively\textsuperscript{3}. Indirect interaction is virtually an interaction type, which we can see in a face-to-face classroom education, the student himself is seen as a passive one but benefits from the interaction between teaching staff, students and his peers\textsuperscript{27}.

**Student-Environment Interaction:** It is an interaction type considering that student has a circle except from his peers and teaching staff; he has a business life and community of which he is a member, and learning occurs around them. Social norms and expectations such as age and race play roles in this interaction\textsuperscript{27}. We can call it as the social context.

**Social Interaction:** It can be called as the interaction between the people\textsuperscript{32}. We can consider teaching staff-student, student-student, teaching staff-teaching staff, vicarious and students-environment interactions in this framework.

**Control**
It is one of the topic titles that is emphasized and should be emphasized in distance education. The most important quality of distance education student is that he should assume the learning responsibility, in other words, he is an individual who has learnt learning, can develop learning and studying strategies in order to learn in distance education, knows what he wants and also knows where and from whom he should ask for help. Therefore, the institutional structure should be stretched out in such way that the students would keep some controls in his hand.
Social Context
IRC, ICQ, AOL which new generation does not know what they are when seeing can be accepted as the ancestors of the present social media. Social surroundings are the web applications in which simple essays and publishing techniques are used at micro level and with a point of view of keeping diary in order to users interact and communicate. Twitter, Facebook and Orkut that bears a Turkish’s signature can be given as examples. Social presence theories, which are not virtually new concepts, have started to attract attention of theorists with the fact that social webs have become widespread in distance education. Social presence is described as people in online media are perceived as virtual people and reflect themselves as virtual people, individuals show themselves in these media and attendants feel one another, the feeling of existing in a social media with other people, the degree of awareness between the individuals interacting with each other in these media, the student’s perceiving himself as a part of online course.

Accreditation
Accreditation means ensuring the quality and effectiveness of higher education institutions and programmes and it is also important for distance education institutions to be accredited. Accreditation, in other words, can be considered as recognisability. In our country the Council of Higher Education (YOK) gives the accreditation to the higher education institutions.

The Taxonomy of Distance Education Institutions
Moore and Kearsley suggest taxonomy for distance education institutions. It is summarized on Diagram 1.

Diagram 1: The Taxonomy of Distance Education Institutions

Dual-purposeful institutions are those, which start their education history with traditional education and then start to give distant education on one hand. The opposite one is rarely seen. The first example was seen in Australia. Single purposeful institutions are those, which are opened and served just for distance education. Some institutions conducting traditional education may offer only some of their courses by distance education. For example, the course of Introduction to Computing can be offered by distance education in institution-wide. In addition, the institution can organize some courses in order to train its staff or to broaden new horizons of its students within the context of in-service training. These courses, for instance, may be self-improvement courses. The institutions may organize some certificate programmes such as Language Certificate Programme within the same concept. In addition to those, blended learning or distance education, known as blended learning, applications can be seen with distance education applications which support both in-campus face-to-face education and are supported by the internet and other technologies in dual and single purpose institutions.
THE HISTORY OF DISTANCE EDUCATION

The start of correspondence education dates back to the invention of writing unless we consider distance education within the institutional context\(^3\). The first distance education effort within the institutional context announced on Boston Newspaper on March, 20 1728 that with the advertisement called “Calep Philips, the teacher of stenography”\(^1\) which is a new method it could teach this method through letters in a few weeks to the people living in Boston.

In 1883 the possibility of studying “learning through mail” was mentioned on the advertisement of the 30\(^{th}\) number of the magazine called Lunds Weckoblad, which is weekly published in Sweden\(^2\). The newly founded mail institution allowed Isaac Pitman for stenography education through correspondence. There is no information about what happened after the advertisement was published in 1883, nonetheless, three years later Sir Isaac Pitman Correspondence Education High School was officially founded thanks to the effort of Isaac Pitman and the support of the Association of Phonographic Correspondence Education. The first institutional language school of correspondence education was opened in Germany, 1856 by Charles Toussaint and Gustav Langenscheidt\(^3\). Langenscheidt Dictionaries, which have blue L on yellow cover, have been unforgettable symbols for the users of foreign language dictionaries.

The first appearing of Turkish distance education as an idea\(^38\) was in 1860s when Ottoman University, Daru\(Ý\)-fünum, offered courses for the public; the content was published on the page of “Kısm-ı Ilmi” of the newspaper called Takvim-ı Vak\(Ý\)ayi in case there were people missing the courses\(^39, 40\). It is also known that at the end of 1800s teachers and students from different regions at American Chicago University\(^1\) conducted some courses. Distance education was put into effect in Illinois Veslin University in 1874 in the USA\(^41\). Before this date, only men from upper crust could get education in pre-industrial period in Europe. On those days when the insight of today’s education was shaped, the students used to listen to the intellectual person as a course in a proper time and place.

1. A method of quick writing that uses symbols in place of letters, words and phrases. As a concept, William Rainey Harper first suggested correspondence education, which we welcome with smile even today and we have some suspicious about how it works, in 1890\(^1\). The education through radio of Wisconsin Open Education in 1920s enlarged the boundary of the school upon the boundary of the state.

Then television and computer started to be used as well as radio and public schools, high schools, military, business and industrial circles made use of those ways of teaching presentation\(^1\). It is known that the educational institutions in the USA during those years established at least 176 radio stations. In the early of 1930s television teaching programs were prepared for trial purposes in Iowa University, Purdue University and Kansas State School. The courses with credits started to be offered through television broadcast in 1950s. From 1957 to 1982 CBS Channel broadcasted courses in higher education level under the name of Sunrise Season offered by New York University\(^7\). The Institute of Banking and Commerce Law of Ankara University\(^4\) initiated the first application of distance education in Turkey in 1956. In 1975 Ankara Correspondence Education Centre prepared letters for the Correspondence Education Institutes of Higher Education. For example, Tuncel Özkan told the 1\(^{st}\) year students of Painting Department about saws, the types of saws and how to use them at the 3\(^{rd}\) one of the letters prepared for woodwork\(^42\).

Correspondence education, once used to be ridiculed, gained its prestige when one of the pioneers of distance education, Charles Wedemeyer used multimedia in a modern way at England Open University in 1970s and at Wisconsin University in 1986\(^1\). England Open University founded in 1971 started a new era among the distance education institutions giving diploma. Fern Universität, Germany, Open Universiteit, Holland, Universidad Nacional de Educacon a Distancia, Spain, Open University of Israel, Israel, Athabasca University and Universidad Nacional Abierta de Venezuela, Venezuela and Anadolu
University, Turkey could be regarded as the close followers of England Open University, which is a pioneer with its detailed and elaborate lessons, new contexts and systematic courses.

In 1982 International Council for Correspondence Education changed its name into International Council for Distance Education in order to reflect the developments of its field\(^1\). The current name of it is International Council for Open and Distance Education.

Satellite technology developed in 1960s; however it was cheap enough to be used in 1980s. The first satellite system for educational purposes, Learn was presented in Alaska; 1980\(^5\). The widespread use of computer webs in 1990s caused the start of a new period in distance education\(^4\). The use of live, bi-directional and high quality sound and videos were started be make use of in education when fibre optics communication systems became widespread in the late 1980s and early 1990s\(^5\). Today scores of Turkish Universities add interaction to the educational programmes with live courses by using the infrastructure of fibre optics.

The fact that more adults as students exist in the system is a more predictable situation for distance education. However it is impossible to exclude the new generation called as digital citizen\(^2\) from distance education. Correspondence education is accepted as the First Generation as long as the parallel development of distance education to the development of technology is taken into consideration. Then it proceeds like TV-movie production, interactional technologies: web 2.0 or smart databases created by semantic web etc. respectively. Nevertheless, the quality of these technologies is that the previous one does not completely disappear when a new one appears\(^2\). For example, correspondence education still exists like e-mail by changing its ways.

Keegan described six basic components of distance education in 1980s. It is inevitable today that these components have transformed\(^4\). On table 1 this transformation is outlined.

<table>
<thead>
<tr>
<th>The Key Components of Distance Education Described by Keegan</th>
<th>The Key Components of Distance Education Adapted to Present Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>The difference between teaching staff and student</td>
<td>Swerving from the freedom of time and place when required</td>
</tr>
<tr>
<td></td>
<td>Minimizing the cultural, social or mental differences between teaching staff and student</td>
</tr>
<tr>
<td>The effect of education institution</td>
<td>Flexible institution structure centring around the student</td>
</tr>
<tr>
<td>Using the media to unite teaching staff and student</td>
<td>Benefiting from teaching technology as well as media to unite teaching staff and student</td>
</tr>
<tr>
<td>Bidirectional communication</td>
<td>Bidirectional communication</td>
</tr>
<tr>
<td>Individualized education instead of group education</td>
<td>Collaborative education taking into consideration the individual differences</td>
</tr>
<tr>
<td>Industrialized teaching staff</td>
<td>A transformation from the teaching staff fulfilling his responsibilities to the one having the interdisciplinary working skills</td>
</tr>
</tbody>
</table>

**Table 1: The Up-to-date Transformation of the Key Words of Distance Education**

2. Digital Citizen; Generation Z, is a name used for the **cohort of people** born from the early 2000s to the present day who are distinct from the preceding **Millennial Generation**.

3. **PROVIDING STUDENTS WITH DISTANCE EDUCATION**

A great number of technological products are used in order to provide students with distance education. They are widely ranging from printed materials to Internet technologies. Some of the more up-to-date of these tools/technologies are mentioned below:
Printed Materials: They can be regarded as the types of the presentation of distance education, starting its adventure with correspondence education, which have not lost their currency. Printed materials are those which are very successful at the independence of student and providing the student control as well as easy to prepare, use and carry and highlight and known by everyone.\textsuperscript{18,45} The disadvantageous quality of them is that people are reluctant to read the texts when they are too long. The use of them may be far more difficult especially in the societies who are prone to speaking. It may also be problematic for the target group who have some constraints like partially sighted, visually handicapped or dyslexia.\textsuperscript{18} Today the printed or paper media, which the text is offered, has been moved into CD-ROM, online education, e-reader (e.g. Kindle), tablet computer (e.g. iPad), or digital media etc.\textsuperscript{18}

Chat Media: They are the systems, which enable the users to communicate online at the same time in terms of the messages they send each other.\textsuperscript{4} In addition to the advantages of chat media, making students sit in front of the computer for a certain while can be regarded as a constraint. However, taking into consideration their qualities can ignore this constraint. For example, they do not delay the interaction, interaction often takes place and they enable empathy.

Podcast: Educational purposed Podcast is an audio file, which has .mpg extension. They are the courses which are recorded earlier and include only one concept generally include just audio files, yet occasionally supported with the visuals which are static or mobile.\textsuperscript{47} These audio files can be the combination of an event, a song, a talk or various sounds. The audio file is uploaded into a web site or a web diary site after it is recorded. The target group of this audio file follow this file through a technology called RSS 2.0, and they can download directly these files to their PC, smart mobile phones or mp3 through an audio management program. They can listen to them whenever and wherever they wish afterwards.

Today podcast are varied as enriched podcast (having the multimedia knowledge containing slide, picture, visuals, photograph, short video and part), video podcast or vodcast (video content).\textsuperscript{95} New Oxford American Dictionary has accepted the word of Podcast as the word of year of 2005. Podcast is not a new idea but the continuation of Sony Walkman.\textsuperscript{5} The qualities of effective Podcast are as follow:

- The length of it ranges between 3-10 minutes.
- It is the independent cases series related with one another.
- It is the learning object, which can be reached through Mpeg3 (mp3).
- It is kept in a web site or another Internet platform in an easily accessible way.
- The current state of the Podcast can continuously be changed and updated.

4. Dyslexia is a very broad term defining a learning disability that impairs a person’s fluency or comprehension accuracy in being able to read.
5. RSS (Rich Site Summary) is a family of web feed formats used to publish frequently updated works such as blog entries, news headlines, audio, and video in a standardized format.

Webinar: It is also known as virtual seminar, online conference, live meeting, web meeting. It may be offered through web conference systems or synchronous live platforms. Adobe Connect, Big Blue Button, even Skype can be given as examples to these platforms.\textsuperscript{18}

Streaming Media: The biggest advantage of the streaming media is that users do not have to wait to download the complete file to their own computers. As soon as the users access the file, one hand the file is downloaded; on the other hand the users can start to play the file. As the bandwidth increases, the possibility of watching the video in high quality or full screen increases as well. The most crucial point here is to divide into the parts of the format, which will be distributed via Internet. The user’s computer gets aware of the fact that it is a streaming media and deal with both downloading and being watched. Streaming sound is the first example of this type multimedia. Steamimg media’s becoming available has contributed a lot to the education.\textsuperscript{50}
Desktop Video Teleconference: Desktop Video Teleconference is a technology, which turned up when web, PC and digital video were melted in a pot. Education can make use of this technology while offering real time materials, making up groups and also inter-group interaction.

White Board Applications: It may be also considered as a type of graphics conference. Through white board application both teaching staff and students can synchronically write, draw on the white board, and intervene with the writings, review or update them concerning course content or discussion. They can use mouse, electronic stylus or smart board that is used in the classroom, and also they can cut, paste, click or drag and drop. The users can keep the contents they created and use them again for the next times.

Mobile Applications: That Shaffer heralded that next generation computers would be in the palm was actually the messenger of the mobile computers. Phones, tablet computers and e-book readers are some of the mobile devices of the present day. These technological devices do not only connect to the Internet but also enable its user to use a lot of applications such as electronic spreadsheets, mnemonic, calendar etc. Therefore, it means that lost homework, forgotten texts, thick and expensive books appear to have come to an end.

Learning Objects: e learning describes learning objects, which are inevitable for content design as digital information resources, which help learning and can be reused. Learning objects which were produced as a solution for the needs, which developed course materials should be accessible, reusable and have some standards, are widely used today.

Classifying the Distance Education Tools
Dabbagh suggests a theory-based design structure for e-learning. One extent of this structure is made up by teaching strategies (e.g. collaboration, bringing together, reflection, role-playing, exploring, problem-solving), another extent is made up by pedagogical models or structures (e.g. open/flexible learning, distributed learning, information configuration communities) and the third extent is made up by learning technologies (e.g. asynchronous and synchronous communication means, hyper and multimedia tools, web authoring tools, course management system). The classifying of the tools to be used in distance education is shown on Table 2:

<table>
<thead>
<tr>
<th>Task</th>
<th>Type</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing</td>
<td>Course Authoring Tools</td>
<td>Authorware, ToolBook</td>
</tr>
<tr>
<td></td>
<td>Website Authoring Tools</td>
<td>Dreamweaver</td>
</tr>
<tr>
<td></td>
<td>Test and Evaluation Tools</td>
<td>Hot Potatoes, Articulate Quiz Maker</td>
</tr>
<tr>
<td></td>
<td>Media Editors</td>
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<td>Articulate Presenter, Adobe Presenter, Impatica, Adobe Acrobat</td>
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### LEARNING AND TEACHING: THEORIES, APPROACHES AND MODELS

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Source: Adapted from Horton and Horton[^5].

### THE ADVANTAGES AND FACILITIES OF DISTANCE EDUCATION

The advantages and facilities of distance education could be reflected as follow:

![Diagram 2: The Advantages of Distance Education](image)

The advantages of distance education since the Internet technologies started to be used for the distance education service can be reflected as follow[^4,^5]:

- If anybody from anywhere in the world can access to the internet, he can access to the course content and online course materials from home, school, office or public places.
- The user can access to the asynchronic course contents whenever he is available round-the-clock.
- Students can study at their own speed.

### THE ADVANTAGES AND FACILITIES OF DISTANCE EDUCATION

The advantages of distance education since the Internet technologies started to be used for the distance education service can be reflected as follow[^4,^5]:

[^4]: Reference 4
[^5]: Reference 5
LEARNING AND TEACHING: THEORIES, APPROACHES AND MODELS

- If anybody from anywhere in the world can access to the internet, he can access to the course content and online course materials from home, school, office or public places.
- The user can access to the asynchronic course contents whenever he is available round-the-clock.
- Students can study at their own speed.
- The course materials and activities accessed from the web are independent from the computer platforms (Windows, Macintosh, Linux etc.)
- The use of the technologies used is easy to use for students.
- It is easy to update the developed course materials.
- It facilitates the training of the large mass of people.
- It is easy to enable the interaction via the Internet for the students.
- It provides the equality of opportunity for the students.
- Online courses providing learning experiences, which would support the different learning styles, can be designed.
- All the students are equal in terms of origin, gender, appearance, and handicap except from individual differences.

THE CONSTRAINTS OF DISTANCE EDUCATION
The disadvantages and constraints of distance education can be reflected as follow:\textsuperscript{4, 54}:
- Increasing the responsibility regarding time
- High tuition costs for registration to the programs of distance education
- The resistance of the institution for change
- Not having a common vision of the institution regarding distance education
- Lack of staff to develop courses
- Lack of strategic plan regarding distance education
- Slow progress of the application
- The wages/encouragement awards of teaching staff
- The difficulties in keeping up with technological changes
- The lack of classrooms, laboratory and infrastructure supported by technology
- Dependence on communication technologies
- Detention of socialization
- The constraints of the distance education applications offered via the internet technologies\textsuperscript{4, 5}
- Unfortunately the access and skills of computer and the internet of the rural and low-socio-economic regions are limited, which is called digital division
- It may emphasize technology much more than online courses, content and learning facilities
- It could be challenging to provide work load, time and staff for well-designed internet based courses
- It could be challenging for some teaching staff to teach in a student-centred way in the internet media
- No matter how well the students are as technology literate today, a small number of them still may have technophobia
- It could be problem to reserve the copyrights of the websites which do not ask password
- Even today it may not be proper to offer some contents via the internet
- It could be problem to offer graphics, multimedia and video with big-sized files
- Online courses require students to assume their own learning responsibilities
- The answers to be given to the questions of the students may take hours or days
- The technical support given to the teaching staff and students may be limited

SUCCESS CRITERIA OF DISTANCE EDUCATION
The quality indicators of distance education can be put in order as following: the interaction between teaching staff and students, effective learning techniques, immediate feedback, various ways of learning, respect, student support services, teaching staffs support services, program evaluation and assessment, powerful reason for distance education in relation with the mission of the institution, true analysis of target group, proper tools and media, the reliability of the technology, institutional support
and institutional resources, guide for the development of course content, review of teaching materials.

THEORIES AND DISTANCE EDUCATION

The leadership of distance education requires a significant competitive capacity and theories will be crucial means to fulfill the needs of the distance education institutions and students. Before moving on to the theories of distance education it will be useful to describe the theory itself. Turkish Language Society describes the theory as “1. The abstract information dealt with independently from the applications. 2. The body of ideas and thoughts on a given issue. 3. The body of rules and laws, which is the base of the science and explain a lot of circumstances regulated in a systematic way.”

When theories provide a generalization they could decrease the complicatedness. We may encounter with theories in various ways: It attracts attention that framework and model, which are ones of the important concepts of the theory, are used as synonym of the theory especially in international literature. It is pointed out that while theoretical framework offers the assumptions of the components of the theory in a broad framework regardless of the details of an extensive theory, model is more outlined compared to theory and represents the structural relationship between the basic concepts. The theory of distance education must reflect not only self-assembled but also the purposeful nature of the educational experiences.

Keegan who has an important role in the theoretical history of distance education classifies the distance education theories into three groups:

1. **Theory of Autonomy and Independence**
2. **Theory of Industrialization**
3. **Theory of Interaction and Communication**

The brief description of these theories is as follow:

**Theory of Independent Study**

It is a theory put forward by Charles A. Wedemeyer in 1973. The concept of independence study includes the various forms of teaching-learning arrangements in which teaching staffs and students perform important tasks and responsibilities individually and interact with each other in various ways. The concept of “independent study” of Wedemeyer includes the two forms of education: “independent study for internally controlled students” and “independent study for externally controlled students”. Students do not have to attend a class in independent study for internally controlled students. They maintain their education freely by means of their individual study programs.

Wedemeyer assumes that distance or independent system which has the ability of processing in everywhere, in which students or a single student exists, has six special features whether or not teaching staff and students are at the same place or time:

1. Teacher and students are independent.
2. The regular procedures of teaching and learning are maintained through writing or some other media.
3. Learning must be individualized.
4. Learning takes place within the student’s activities.
5. Learning is practiced in accordance with the student’s own circle
6. Students assume their own responsibilities of improvement by having the independence of starting, stopping at any time and progressing at their own speed.

**Theory of Independence**

Another scholar who has burst into prominence is Moore among those studying on independence study. Moore developed a theory related to the variables of “autonomy” and “distance” in 1983. Moore’s point of view is completely out of the school environment and according to him school environment is the place where teaching activities take place through classroom, course or seminars.
and learning activities. According to Moore, distance education is an education system in which students are independent and they are far from the teaching staff in terms of time and place. In this theory the system of distance education has three sub-systems: Student, teaching staff, communication way. All these sub-systems have much more distinctive features than other education systems.

Moore emphasizes that teaching has two stages: “Pre-event” and “Interaction”. In pre-event stage the teacher chooses the objectives and develops teaching syllabus and strategies. In interaction stage, he faces with students, provides oral stimulants, makes some explanations, ask questions, and guides for students. According to this, teaching takes place in the classroom atmosphere during the school period.

**Distance Concept:** Moore uses the concept of distance as the meaning of students and teaching staff are apart from each other. In this way, Moore tries to classify the distance education programs depending upon distance concept. There are two criteria he uses for this: Dialogue (D), mutual communication must be ensured, and Structure (S), the program must meet the students’ individual needs.

**Autonomy Concept:** Michael Moore was impressed by Charles Wedemeyer, Carl Rogers, Allan Tough, and Malcom Knowles in creating the autonomy concept in relation with independent student. University students rely on teaching staff for explanation, guides, and questions. Moore states that the authority of decision-making is given to teaching staff and this approach does not comply with theories of adult education.

Moore points out that all teaching-learning processes have these components given below:

- **Preparation activities**, in which objectives and strategies are set,
- **Application activities**, in which information, datum and ideas are actualized,
- **Evaluation activities**, in which a judgement is made on the efficiency of reaching the objectives of teaching processes.

According to Moore, independent study is an education program in which learning program is different from teaching program in terms of time and place. Students have an effect as much as teaching staff upon learning objectives, resources, and determining the evaluation.

Holmberg outlines the student’s autonomy in distance education applications as following:

1. Free course selection and voluntary study
2. Independent study depending upon the curriculum designed beforehand
3. Making a free choice out of options as a part of an independence study depending upon the second item
4. Adding some units from other curricula to the curriculum and removing some units from the current curriculum depending upon the second item
5. Making a free choice out of learning objectives, course units and other optional support materials which will match up with independence study
6. Independence study guided by teaching staff
7. Independent project study

**Theory of Industrialization**

Otto Peters conducted most of the early studies on distance education in the early 1960s. Peters states that he developed a theoretical structure related to the field when completing the analysis of analytic and comparative systems of distance education. He puts forward that developing a system for distance education must be quite different from conventional, verbal education. The teaching ways which are indirect and cannot be described as distance education suggested by Peters are those; correspondence education, printed learning materials, audio-visual education, educational radio and television, programmed learning, computer-based training, independence study, special studying, learning through teaching materials.
The relationship between theory of industrialization and distance education has been compared under these titles:

- **Rationalization**: It is the characteristics of distance education in which teacher conveys his knowledge and abilities theoretically to the unlimited number of students in a stable quality.
- **Division of Labour**: Provided that the number of the students registering for distance education is very high, the other academicians apart from the teachers preparing the distance education perform performance evaluation.
- **Mechanization**: In distance education, mechanization changes the nature of teaching-learning process.
- **Accumulation Point**: Teaching responsibility changes its place at given points while teaching staff do not.
- **Mass Production**: Mass education is the subject in distance education.
- **Planning and Organization**: It requires extensive programming just like in industry.
- **Standardization**: It requires much more standardization compared to traditional education.
- **Functional Change and Objectivity**: The role of the teacher is divided into three ways: The one presenting information (Distant Unit Author), the one assessing the knowledge and improvement (teaching staff), and advisor (advisor of subject program).
- **Monopolization**: There is a trend of monopolization of the institutions of distance education for the education of a given region or area. Localization and centralization are the basic characteristics of the management of distance education systems.

**Theory of Interaction and Communication**

It is assumed that directed communication, the sense of belonging, and collaboration have a crucial educational value in distance education. According to Holmberg, the communication between teaching staff and student is the keystone of learning. To join this communication helps students to have pleasure from learning and be motivated. The importance of Holmberg's theory is because of the fact that it identifies a process peculiar to distance education systems. Individual efficiency comes to the forefront in Holmberg's distance education understanding.

According to this theory, the essence of teaching is the interaction between teaching and learning; this may occur by the way of resembling the interaction in the presentations about the courses of subject area prepared beforehand and making the students taking into consideration the various point of views, approaches and solutions by interacting with the course.

Holmberg explains the basics of the approach, which he calls guided didactic chat as follows:

1. The feelings resulted from the personal relationship in teaching and learning promotes the motivation and pleasure of studying.
2. These feelings can be fostered through well-developed self-learning materials and bidirectional distant communication.
3. Mental satisfaction and motivation for studying could be possible by the way of using the acquisitions from studying objectives and using the proper studying procedures and methods.
4. Using a friendly language and an atmosphere, where the rules exist, reveal the feelings resulted from the personal relationship, which will enable the first item to occur.
5. The messages sent and received as the way of chatting are easy to understand and remember.
6. The media that distance education make possible can use the concept of chat.
7. Planning the work and providing guidance whether by institutions or students is necessary for a study which is designed based upon the explicit or implicit target understanding.

**A Synthesis of Theories**

The distance education theory of Perraton points out the originality of distance education systems. This theory consists of the theories regarding current communication and spread and education philosophy theories. It is based on the assumptions that distance education can enable any types of sources to be used for education, remove quite a few constraints caused by formal education systems, reduce the cost, extend the service, and develop the education purposeful communication. This
theory is explained with different situations which put forth the distance education methods that could be used to universalize the education (e.g. you can use any media to teach anything); remark the need for increasing the dialogue (e.g. distance education can be organized in a way that dialogue exists in); are with regard to the methods (e.g. feedback is an essential part of the distance education system).

**Transactional Distance**

It is known that Moore structured the theory of transactional distance over the theory of independence study he developed earlier. The concept of “transaction” shows the special nature between teaching staff and student in a distance education process. This relationship occurs during the process of the interaction between students and teaching staff in which students get experiences and meanings individually. In the process of getting experience and meaning students, teaching staff and content play an ever-changing dynamic role.

Students who will interpret and give the meaning to the learning process will advance on the structure and dialogue in process. Each transaction, which students will perform, will depend on student’s mental potentials, status and experiences. According to Moore, geographical and conditional distance is not more important than perceptive distance between students and teaching staff.

Michael Moore, a theorist of distance education, firstly expressed his ideas on the theory of “Transactional Distance” in 1972 and suggested the concept of “Transactional Distance” in 1980s. The concept of transaction of Moore in this theory is based on the ideas of Dewey: “The environment must meet the needs of individuals to get experience whatever the circumstances are.” Condition and experience are two parts, which cannot be separated from each other. Depending upon these theories Moore described the transactional distance as a function of dialogue, structure and autonomy within the context of transaction in a curriculum in 1993. Accordingly transactional distance has two extents. The first extent consists of dialogue and structure components, the second extent consist of autonomy of individual or in other words his independence.

Theory of transactional distance offers a theoretical framework to syllabus designers to design effective learning environment. Teaching staff and syllabus designers realizing the essential points of the theory of transactional distance will be able to prepare the education systems in which the balance between dialogue and structure established to reach the program objectives. The theory of Moore offers a method by which various levels of the interaction between teaching staff and students can be illustrated and made up. This interaction control will help syllabus designers to design more effective learning environment. This theory also contributes to develop new teaching models.

**Equivalency Theory**

This theory took its place in the history of education theories in 1999. When virtual learning is thought to be a subfield of distance education; theory of equivalency in distance education comes out. Some supporters of distance education ignore in a wrong way where and when the students learn and they try to organize the learning environment in the same way for all students. This is because it is thought that all students have the similar opportunities in learning. According to Simon the reason why the distance education applications have been successful in the USA is that the learning experiences and output of the students of distance education and traditional education are tried to be equalized rather than likening or equalizing the environments.

Each student can use various teaching strategies, change his learning resources or designate new activities individually. If the courses of distance education are designed effectively and ensured equal learning experiences, students can accomplish the objectives of the course.

The key point of this approach is the equality between the students of distance education and traditional education. The students of distance education and traditional education are not equal in terms of environment but the point is that they must be equal in terms of learning. According to this
theory, even if the experiences of those students are apart from each other, the thing is that they must have the same learning output for each student.

Another key point is the context in which learning experiences are obtained. Various students may ask for various learning contexts with their various learning backgrounds at various environments at various times. Some of them may prefer to make more observations and some of them may also prefer to practice more. At this point the purpose of planning the education is to offer these experiences to every single student equally. The principle of syllabus is to struggle to offer the substantial proper learning environments and experiences for all students or given students.

All the theories suggested before describe the classical distance education. These traditional theories distinguish distance education from traditional education. The approaches except from the theory of equivalency regard the physical and time autonomy of teaching staff and students in the application of distance education as inevitable. On the other hand, equivalency theory emphasizes that it is possible to make concessions partly to time autonomy. As the reason of this, it is asserted that it is necessary to call upon the educational potentials of sychronic applications to get equal experiences to face to face learning experiences. However; the potential of recent technologies decreases this distance.

The Theory of Cooperative Freedom
The theory of cooperative freedom of Paulsen can be classified as the theory autonomy and freedom. This theory was inspired by the theory of "adult education" of Knowles. It is suggested that adult students consider themselves as self-administered individuals and describe themselves from the point of their personal achievements and experiences. The theory of cooperative freedom provides both adult and young students with the opportunity to be the students, who are motivated, self-administered and want to check their learning output. By expressing the freedom of motivational tendency, the theory of cooperative freedom asserts that distance education students need cooperation at least as much as freedom.

Cooperation: Learning accompanies with the interaction between individuals. Even it enables just students to get help and courage from other students by guiding them in their programs without the help of a teaching staff. In a social atmosphere those who are the part of an educational activity have to cooperate with each other both in planning and performing. In the extreme point a student needs a group that does everything together they agree upon. In another extreme point when a good number of people come together to listen to a lecturer, sharing could be confidential.

Freedom: Cooperative freedom is more related to limited freedom than unlimited one. It is said that students should have the rights of making choices rather than being limited by a strict distance education program. It is pointed out that freedom is highly important in distance education. The need for continuing education and life-long learning is increasing for a lot of people. Most of today's students have full-time jobs and they have to care about their families. If distance education makes most of them leave their very well going family lives or jobs performances, those people are reluctant to maintain it. They need flexible education; education enables job, family and education to be combined in an administrative way. Freedom is a complex structure. It has a lot faces and features. The theory of cooperative freedom claims that the features reflecting the special importance of distance education are time, location, speed, media, access, and curriculum. None of them can be thought to be separate from one another; each of them should be comprehended as a piece of a puzzle. On diagram 2 the faces of the hexagon of Cooperative Freedom can be seen.

Paulsen states that cooperative freedom is a made-up concept. At first glance, it seems as if it is in contradiction with itself. “Cooperation” shows the group interaction, yet “Freedom” indicates the individual freedom. If a distance education system combining the group cooperation with the freedom for individuals is developed, a distance education system which has the cooperation freedom is achieved.
MAIN LEARNING THEORIES AND DISTANCE EDUCATION

Besides the theories of distance education, syllabus models and main learning theories also directly affect distance education. New terminology has been noticed in the literature of the field under the effect of these theories: cognitive, social and teaching readiness. The cognitive readiness refers that the students structure and verify new information in learning atmosphere. In cognitive behaviourist model, the students must be informed about teaching objectives in the system offered to the students by applying teaching systems syllabus models. Distance education applications, which have broken new ground with new technologies, mention about another concept, social readiness, which distinguishes itself among the other cognitive behaviourist models.

In the applications of cognitive behaviourist distance education, teaching readiness has undergone a change. In the age of correspondence education teaching staff used to have only the words he transferred into written paper in his hand. In our age he added sounds and gestures into his power by means of synchronous technologies. However, the discussion is still going on whether the recorded videos have the same effect when shared asynchronously.

Socio-constructivist theories have effects on distance education. Numerous theorists agree upon the fact that learning is not something the individual makes up in his mind, but it occurs within its own context and relations. The role of teaching staff in socio constructivism has changed from focus of control into guidance, organizing activities and designing a structure in which these activities will take part. In this regard, cognitive readiness requires presenting the real life experiences to the students by going out of the traditional classrooms. Constructivists think that cognitive readiness could be achieved through the ways such as role-playing, imitation, and questioning depends based on dialogue. In socio constructivism distance education, social readiness comes up with quality interaction. Gestures, intonation and body language support this. Teaching readiness consists of choosing, preparing, teaching and teaching directly of educational applications when needed. But it may lead to problems in crowded classes.

The third generation of distance education pedagogy is the connectivism. This concept is offered as the new learning theory of digital age, which has four key principles such as autonomy, connectivism, variety, and explicitness. Connectivism assumes the access to the web technologies from anywhere. The fact that a great deal of information exists and the role of students does not mean memorising or understanding all of them is accepted by connectivism. However, it is known that students have the capacity of finding and using this information in case of need.

Holberg mentions that by choosing some traditional learning theories (behaviour management model of Skinner, written instruction model of Rothkopf, organizers model and cognitive communication model of Ausubel, discovery learning model of Bruner, experiential learning model and formalized learning model of Rogers) he made a systematic research and they all were likely to be applied in distance education. Laurillard states that those could be used in online learning media: Experiential learning theory of Dewey, stage theory of cognitive development of Piaget, social development theory of Vygotsky, discovery learning model of Bruner, conversation theory of Pask, problem-based learning theory of Schank, deep learning theory of Marton, and socio-cultural learning theory of Lave. On the other hand, Holmberg underlines that the variance of target group should be taken into consideration based upon the view of Keegan which asserts that distance education is a whole system rather than a method of teaching.

INSTRUCTIONAL DESIGN AND DISTANCE EDUCATION

We can approach to the instructional design in distance education with various points of views. These points of view are those: ADDIE Model, the technology to be used interaction types, student autonomy, and student's control or financial issues.
Instruction systems design models such as ADDIE, Algo-Heuristic, Dick and Carey Model, Instruction Systems of Robert Gagne, Kemp, Morrison and Ross Instruction Systems Model, Rapid Prototyping and Emphatic Teaching Design, could be applied to distance education environments. Just prototyping model is going to be mentioned as an example out of instructional design models considering the limits of this book.

**Rapid Prototyping**

The design model of rapid prototyping instruction systems chooses the most crucial steps of ADDIE. It identifies the most urgent needs of education and enables the teaching design to come out with the help of template tools, the minimum budget, and a professional team of 1-3 persons as the shortest time as possible (fewer than 3 weeks). Rapid prototyping is actually a design methodology of software engineering, and also its software design is similar to instructional design. Rapid prototyping has a lot of positive aspects: it allows and supports the students to join the design process; those who joining to this design process must let their mentality change; target group has the conscious that they cannot get aware of their needs without joining the application process; mistakes are recognized earlier; prototyping promotes the creativity since it gives feedback instantly; it accelerate the cycle of instruction development.

**Design Models for Asynchronously Offered Web-Based Courses**

Traditionally there are 4 model suggestions for the instruction design of asynchronously offered web-based courses:
1. Linear designed instruction: It is similar and consecutive to linear programmed teaching. Students get the course units, modules, subjects, assessments, and test at the same time.
2. Branched designed instruction: It is different from linear designed instruction in terms of evaluation. If the students get successful, it can remove some subjects or add some additional subjects if necessary or review the previous chapters in the case of failure.
3. Instruction designed considering hyper content: It makes possible to roam among the hyper contexts like a website or assessments under the control of students. The instruction designer has a very little role in roaming in instruction in beforehand.
4. Student-managed designed instruction: It is the design type in which students are the most flexible. In this instruction type, students can choose the subjects they want to study if necessary. Line or order is not established by the designer. Students make up their own teaching strategy or design by themselves.

The common trait of these four models is that courses are divided into units, units are divided into modules, and modules are divided into subjects. If it is a 14-week course content, it is going to be divided into 14 weeks. If the course content is for in-service training, it is going to be divided into the hours of the training.

**The Qualities of a Good Instruction Design in Distance Education**

According to Burns, the qualities of a good instruction design are those as follow:
- Comprehending the teaching process
- Comprehending the students (adults or not) needs
- The relationship between theory and practice
- Reaching a compromise on the differences of learning styles of target group
- Flexible design
- Flexible presentation
- Access facilities

**SUMMARY**

- Distance education as a concept started to be used in 1970s and was first put into words officially in International Postal Tuition Council in 1982.
Distance education is a distinct education type which cannot be regarded as an alternative of conventional face to face education due to embracing adults who are working or have constraints because of their family, face to face interviews, classrooms and freedom of general place and time, the combination of mass media and individuation, the potentials regarding student’s freedom and peculiar administration.

Presenting the learning content through computers and utilizing the computer web for bilateral communication of students to make use of the communication with one another, teaching staff and the other personnel is called “online learning”.

Offering the education via palm devices, smart and mobile phones, mini tablets and laptops is called “mobile learning”.

The method by which online and face to face learning are implemented at the same time is called “blended learning”. In this method from 30% to %79 of the content is offered in an online way.

Interaction is “a bilateral developed action which necessitates at least two objects and two actions”. Interaction may occur when these objects and actions interact with each other bilaterally.

Social surroundings are the web applications in which at simple essays and publishing techniques are used at micro level and with a point of view of keeping diary in order to users interact and communicate. The application such as Twitter and Facebook can be given as examples for this.

The first distance learning effort within the institutional context started with the advertisement given by Calep Philips to the Boston Newspaper in 1728.

The first appearing of Turkish distance learning as an idea was in 1860 when Ottoman University, Daru‘ı-fünun, offered courses for the public; the content was published on the page of “Kısm-i İlim” of the newspaper called Takvim-i Vak’ayi,

The Institute of Banking and Commerce Law of Ankara University initiated the first application of distance learning in Turkey in 1956.

The advantages of distance education can be reflected as follow: facilitating the training of the large mass of people, providing the equality of opportunity, enabling students to study at their own speed, enabling anybody from anywhere in the world to access to the course content and online course materials whenever he likes if he has the access to the internet and computer.

The disadvantages and constraints of distance education can be reflected as follow: depending on communication technologies, detention of socialization, the difficulties in keeping up with technological changes, lack of staff to develop courses, insufficient technical support, and high cost of content development.

The theories of distance education could be classified into three groups, they are: theory of autonomy and independence, theory of industrialization, and theory of interaction and communication.

We can approach to the instructional design in distance education with various points of views. These points of view are those: ADDIE Model, the technology to be used interaction types, student autonomy, and student’s control or financial issues.

REFERENCES


2. Garrison, R. (2000). Th eoretical Challenges for Distance Education in the 21st Century: A Shift from Structural to Transactional Issues. Th e International Review of Research in Open and Distance Learning, 1(1),1-16.


27. Anderson, T. (2003). Modes of Interaction in Distance Education: Recent Developments and Research Questions. In M. Moore and G. Anderson (Eds.), Handbook of Distance Education. (pp. 129-144) NJ: Erlbaum.
42. Stein, J. (2001), Th e magnocellular theory of developmental dyslexia. Dyslexia, 7(1), 12-36.
64. Simonson, M ve Schlosser, C. (2002). Distance education: Definition and glossary of terms. Nova Southeastern University Fischler School of Education and Human Services