HOW STUDENTS' MULTIPLE INTELLIGENCES DIFFER IN TERMS OF GRADE LEVEL AND GENDER

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ABSTRACT

HOW STUDENTS' MULTIPLE INTELLIGENCES DIFFER
IN TERM OF GRADE LEVEL AND GENDER

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The purpose of the study was to investigate the students' multiple intelligences according to their preferences and how students' multiple intelligences differ in terms of grade level (first, third fifth and eighth) and gender.

This research was conducted at Middle East Technical University Development Foundation School in the spring of the 2001-2002 academic-year with three classes from each level namely first grade, third grade, fifth grade and eight grade. In this study, Pictorial Teele Inventory for Multiple Intelligences was applied on 321 students and the results were analyzed. In order to examine the effect of the gender and grade level on students' Multiple Intelligences mean, standard deviation and MANOVA were used.

Results showed that students multiple intelligences showed variety according to their grade levels. For example, the students at the first grade level demonstrated

strong preference for linguistic intelligence and logical-mathematical intelligence in the first grade and the two intelligences were followed by spatial intelligence, and bodily kinesthetic intelligence. While the third grade students' most dominant intelligences preferences were interpersonal, spatial, logical-mathematical, and linguistic intelligence the fifth and eight grade students' preferences were interpersonal intelligence bodily-kinesthetic intelligence, musical intelligence, and spatial intelligence.

When results are eximined in terms of gender, it can be said that the male students' logical-mathematical and bodily kinesthetic intelligence mean scores were higher than female students' whereas the female students' musical intelligence mean score was higher than male students'.

Keywords: Multiple Intelligences, pirimary education grade level, gender.

ÖZ

SINIF DÜZEYİ VE CİNSİYET FAKTÖRLERİ AÇISINDAN ÖĞRENCİLERİN ÇOKLU ZEKA ALANLARI

GÖĞEBAKAN, Derya

Eğitim Bilimleri Bölümü

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Bu çalışmada, öğrencilerin çoklu zeka alanları ve çoklu zeka alanlarının birinci, üçüncü, beşinci ve sekizinci sınıf seviyelerine ve cinsiyete göre nasıl faklılaştığı araştırılmıştır.

Bu araştırma Orta Doğu Teknik Üniversitesi, Geliştirme Vakfı Okulunda 2001-2002 eğitim öğretim yılında birinci, üçüncü, beşinci ve sekizinci sınıflardan seçilen 321 öğrenci ile yapılmıştır. Araştırmada Teele Çoklu Zeka Envanteri kullanılmış ve sonuçlar analiz edilmiştir. Sınıf düzeyleri ve cinsiyetin çoklu zeka alanlarına etkisi araştırmak amacıyla ortalama, standart sapma hesaplamaları ve MANOVA kullanılmıştır.

Araştırma sonuçları, öğrencilerin çoklu zekalarının sınıf düzeylerine göre farklılaştığını göstermiştir. Örneğin, birinci sınıf öğrencilerinin çoklu zeka

tercihlerinin sözel, matematik-mantıksal, görsel ve bedensel üçüncü sınıf öğrencilerinin tercihlerinin kişiler arası, görsel, matematik-mantıksal ve sözel, beşinci ve sekizinci sınıf öğrencilerinin tercihlerinin kişiler arası, bedensel, müzikal ve görsel alanlarda yoğunlaştığı görülmüştür.

Sonuçlar cinsiyet açısından incelendiğinde, erkek öğrencilerin Teele Çoklu Zeka Envanterinden aldıkları matematik-mantıksal ve bedensel zeka puanlarının ortalamasının kızların ortalamalarından anlamlı bir şekilde daha yüksek olduğu diğer taraftan kızların müzikal zeka puan ortalamalarının erkeklerin müzikal zeka puanlarından anlamlı bir şekilde daha yüksek olduğu gözlenmiştir.

Anahtar Kelimeler: Çoklu Zeka, ilk öğretim, sınıf düzeyi, cinsiyet.

To My Family

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Date: 05-09-2003 Signature:

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CHAPTER I

INTRODUCTION

1.1 Background to the Study

Instructional approach has changed considerably from 1900 to 2000 and also some educational concepts such as learning and intelligence. For instance, learning used to be defined as forming connections between stimulus and response and also a continuous change in observable behavior. Today, however learning is accepted as a more complex process.

Teele (2000) defined learning as both a socially settled event and a biological happening. The ways people learn could differ some are better at certain subjects than the others. Learning depends on what is already known and on the neural structures that affect learning. Psychological, biological, social and environmental factors may all contribute to guiding the learning process.

As a concept intelligence has also changed. Intelligence is an abstract concept, which has been studied on for many years. The first usage of the term goes back to Aristotle. Cicero was the first person who used the Latin word "intelligence", which was in the scientific literature and Aristotle's term "dia-noesis" with an almost one-to-one translation. In contrast to the dynamic process, this term was used as a two-folded classification, including intellectual and cognitive characteristics of mental features in Aristotle's scholastic philosophy. Afterwards, the studies related to this subject gained speed (19th century), many new ideas

aroused, different classifications were made and their effects have entered into our lives intensively (Bumin, 2002).

Until today, researchers have put forward some ideas about intelligence by observing the mental structures and the behaviors of the individuals. According to this, intelligence has sometimes been considered to be the point got from a test, adaptation to the environment, and problem-solving skills. In these theories, some abilities such as language, mathematics and mechanics, and the ability of solving a new problem have been usually taken as a criterion (Bumin, 2002).

The following paragraphs include some descriptions of intelligence mentioned in the literature.

Binet and Simon (1916) (as cited Plucker, 2002) said that in intelligence there was a basic faculty and lack of it was very important for daily life. It was called judgment or good practical sense the faculty of adapting oneself to the situation. A person may be a moron or an imbecile if he is lacking in judgment; but with good judgment he can never be either. Indeed the rest of the intellectual faculties seem of little importance in comparison with judgment.

Wechsler (Plucker, 1998) defined intelligence as "the global capacity to act purposefully, to think rationally, and to deal effectively with his environment" this definition in other words meant that intelligence was not a single ability but a multifaceted aggregate.

As Spearman (Plucker, 1998a) claimed intelligence could be understood as intelligence (g factor) and specific factors (s factors). g factor included a wide range of mental abilities such as reasoning and problem solving while s factor only consisted of narrow, single mental ability tests, for example mathematical computations.

According to Francis Galton (as cited Sternberg, 1990) intelligence was a question of neurological efficiency. Thus, he claimed that it could be tested by measuring reaction time and sensory acuity.

Crystallized intelligence and fluid intelligence were two branches of mental abilities according to Cattell R,B.(1983) (as cited Plucker, 2001) "Fluid intelligence is involved in tests that have very little cultural content, whereas crystallized intelligence loads abilities that have obviously been acquired, such as verbal and numerical ability, mechanical aptitude, social skills, and so on. The age curve of these two abilities is quite different. They both increase up to the age of about 15 or 16, and slightly thereafter, to the early 20s perhaps. But thereafter fluid intelligence steadily declines whereas crystallized intelligence stays high".

To Starddat (1943) (as cited Başbay, 2000), if the individual had the capacity of doing difficult, complex, economic mental activities which were proper for the aim and had social values if, under these conditions, he could focus his energy on the activities by resisting the excitement, this meant that he/she was intelligent.

Vygotsky (1978) (as cited Plucker, 1998b) thought that social origin determined all intellectual abilities. Parents teach language and thought and teachers and mentors continued that development process.

In 1921, the writers of Journal of Educational Psychology asked the experts what intelligence was but they received non-coinciding answers. Two of these answers were: 1. Intelligence was the capacity to continue abstract thinking 2. Intelligence was the capacity to gain knowledge.(Oklan, 2000)

Thorndike E.L. (as cited Plucker, 2002a) claimed that there was an important difference among three big groups of intellectual functioning. Only “abstract intelligence” could be measured by standard intelligence tests. “Mechanical

intelligence –the ability to visualize relationships among objects and understand how the physical world worked" and "social intelligence –the ability to function successfully in interpersonal situations" were also important.

According to L.L. Thurstone's theory (as cited Plucker, 1998c) intelligence consisted of a lot of primary mental abilities rather than a general and several specific factors. He proposed that a person could be intelligent in many ways. In his multiple-factors theory, these seven mental abilities were:

1. Verbal Comprehension
2. Word Fluency
3. Number Facility
4. Spatial Visualization
5. Associative Memory
6. Perceptual Speed
7. Reasoning

To J.P. Guilford (1967) "intelligence is learning ability and that it is a universal ability, regardless of the thing being learned, has definitely been exploded by a number of experiments" (p. 65).

Sternberg,R.J. (1985), in his Triarchic Intelligence Theory, described intelligence including the practical knowledge. According to Sternberg intelligence involved:

a) mental skills, componential aspect; ability to acquire new knowledge; to solve problems effectively,

b) insight/creative adaptability, experiential aspect; ability to adapt creatively in new situations; to use insight,

c) environmental responsiveness, contextual aspect; ability to select contexts in which to excel, to shape the environment to fit one's strengths

To Howard Gardner (1983) intelligence up to then was defined too narrow. He claimed that intelligence was more than 1. solving problems 2. fashioning products in a context rich and naturalistic setting.

After these definitions of intelligence, the traditional and contemporary intelligences can be compared like in the following (Saban, 2001):

Table 1.1 Comparing the Traditional and Contemporary Intelligences

The Traditional Intelligence Understanding	The Contemporary Intelligence Understanding
• Intelligence is constant. • Intelligence can be measured in quantity. • There is 'one' intelligence in general. • Intelligence is measured by isolating it from real life. • Intelligence is used to classify students and predict their possible success.	• Intelligence can be developed. • Intelligence is not estimated with numerical values displayed in any performance or problem-solving process. • Intelligence can be exhibited in many ways. • Intelligence is measured in real-life situations. • Intelligence is used to understand the potential strengths of individuals and the areas that they will be successful.

According to Teele (2000) there were several different approaches to intelligence. Achieving a better concept of what it meant to provide effective learning environments for students needs a clear understanding of these approaches. Teele proposed four different approaches: *the psychometric approach, developmental progressions, psychobiological approach and multiple forms of intelligence.*

1.1.1 Psychometric Approach

The psychometric approach had a single, unitary, quantitative concept of intelligence. Some examples of psychometric measurement instruments were: Binet's test Stanford-Binet scale, Wechsler scales. Binet's test measured motor development, cognitive abilities, memory tests, and divergent-productive thinking abilities and introduced a single score for measurement. Recognizing the multiple aspects of intelligence began with Wechsler. His test, composed of two categories, verbal and performance, contributed to the intellectual evaluation of individuals from preschool age to adults (Teele, 2000).

The psychometric approach concentrated mainly on two methods to learn; linguistic and logical-mathematical. It was quantifiable, measurable and comparable in standardized way. The current movement in the education tends to a psychometric approach in education because this approach can be used to compare one student to another or one school or district to another. However, there is a danger; it becomes the only means to measure student achievement, since it shows only one or two methods students learn (Teele, 2000).

1.1.2 Developmental Progressions

Developmental progression is another approach to intelligence. In that approach four psychologists, Bruner, Piaget, Vygotsky and Feuerstein's, theories and opinions are discussed.

According to a major theme in Bruner's theory, learners built new ideas or concepts based on their current/past knowledge by means of learning, which was an active process. The learner selected and transformed information, constructed hypotheses, and made decisions, relying on a cognitive structure to do so. Cognitive

structure let the individual "go beyond the information given" by providing meaning and organization to experiences.

When it comes to instruction, students should be encouraged to find out principles by themselves and it is the instructor who should try and do this. The instructor and student should engage in an active dialog such as Socratic learning. The duty of the instructor is to transform information to be learned in appropriate format, considering the learner's current state of understanding. Curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned (Teele, 2000).

According to Bruner (1996) an instruction theory should provide answers to four major aspects; 1. predisposition towards learning 2. the methods in which a body of knowledge can be constructed so that the learner can grasp it 3. the most effective sequences which as material can be presented 4. the nature and posing of rewards and punishments. Simplifying, generating new propositions and increasing the manipulation of information should result from a suitable method for constructing knowledge.

Another name in that approach is Piaget. For more than sixty years, understanding of child development has been considerably affected by Jean Piaget's (TIP Database 2003a) naturalistic research. Because he was interested in the question of how knowledge developed in human beings, Piaget named his general theory as "genetic epistemology". Biology and philosophy in which he had a background and concepts of these two disciplines affected his theories and research of child development.

The center of his theory was the concept of cognitive structure. In Piaget's opinion, there were four primary cognitive structures, developmental stages;

sensorimotor, preoperations, concrete operations and *formal operations.* Between 0 and 2 years, in other words in the sensorimotor stage intelligence took the form of motor actions. The nature of intelligence was intuitive in preoperation period (3-7 years) During the concrete operational stage (8-11 years) the cognitive structure was reasonable but depended on concrete references. Thinking included abstractions in the last stage of formal operations (12-15 years).

According to his theory, during the processes of adaptation cognitive structures differed. These adaptation processes were *assimilation* and *accommodation*. Assimilation involved the explanation of events as regards to existing cognitive structure; on the other hand, accommodation refered to altering the cognitive structure to understand the environment. Cognitive development was made up of a continuous effort to adapt to the environment in terms of assimilation and accommodation. In this respect, Piaget's theory looked like other constructivist perspectives of learning in nature.

Although the stages of cognitive development that were defined by Piaget were related to characteristic age periods, they differ from one person to another. In addition to this, every stage had many detailed forms of structure. To illustrate, the concrete operational period had more than forty different structures including classification and relations, spatial relationships, time, movement, chance, number, conservation and measurement.

The application of Piaget's theory led to specific recommendations for a given stage. For sensorimotor stage children, teachers should try to provide a rich and motivating environment with abundant toys. However, in the concrete operational stage learning activities might present some problems such as

classification ordering, location, and conservation using concrete objects (TIP Database 2003a).

Another name is Vygotsky in that approach. The main subject of Vygotsky's (1978) theory was that social interaction had an important role in the development of cognition. Vygotsky claimed "every function in the child's cultural development appears twice; first, on the social level, and later, on the individual level; first between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals" (p. 57)

Vygotsky's theory had another aspect and it was the idea that the potential for cognitive development was restricted with a certain time span that he named as "zone of proximal development". What was more, full development during this period depended on full social interaction. A child could develop a range of skills with adult guidance or pair work and this with adult the ones that he could achieve by himself.

In Vygotsky's (1978) theory, consciousness was explained as the last product of socialization. For instance, while learning a new language, in the beginning we use words or sentences by aiming communication but when we master the language, they become clear in our thoughts or minds and let us have "inner speech".

Vygotsky (1978) gave an example of pointing a finger. First, this behavior started a meaningless movement, but as people gave reactions to it, it became a meaningful one. In particular this gesture illustrates an interpersonal relation between people.

According to Vygotsky (1978) a function of activity that was mediated by material and psychological tools and contact with other people was called intelligence. As he said emotional contact was the child's main activity during infancy. When a child was 2 years old it was important to manipulate the objects. Role-play and symbolic activity appeared between 3 and 7years. During the following four years, until the age of 11 development of formal study at school was emphasized. Adolescence was a period in which the mixture of interpersonal relation and exploration of careers started.

To Feuerstein (1981) (as cited Teele, 2000), intelligence was due to experience and our cognitive ability could be changed. The theory of structural cognitive modifiability of him suggested that, in order to enable someone to learn better, learning could be transformed. Past successes made a base for new learning experiences and there was a gradual development between the two. The experience at school provided alternative educational methods, which maximize one's potential so that it could change and improve the ways individuals learn. This was an important side of multiple intelligences theory. Different teaching methods were needed to encourage students to learn from their dominant ways of processing and build on previous successful experiences.

1.1.3 Psychobiological Approach

Psychobiological Approach, which mainly focuses on brain and ecology in order to explain development of intelligence, is the third approach. Brain has been studied from a biological point of view by several researches and the objective of all those studies is to find out new ideas about the definition of intelligence and ways to measure it (Ceci, 1990; Reed and Jensen, 1993; Sylwester, 1995) (as cited Teele,

2000). According to Cecil's bio ecological theory of intelligence there was not only one cognitive potential, but also their multiple potentials. He claimed that knowledge and aptitude were whole and with body of intelligence one could find environmental, biological, metacognitive and motivational variables.

Ceci (Selçuk et. al., 2002) supported the bio-ecologic approach and opposed the concept of one intelligence, which was defined as the general intelligence or the "g" factor. He viewed intelligence as having a biological basis, multi-cognitive, potential, and complete in terms of context and knowledge.

Instead of a single factor theory a multifaceted view of intelligence was supported by a psychobiological perspective of intelligence. It added the awareness of gender differences in some cognitive activities. In multiple, specific parts of brain cognitive functions appeared and they were affected by mixture of genetics, personal life experiences and situations (Selçuk et. al, 2002).

Emotions played a considerable part in learning according to Le Doux (1996) (as cited Teele, 2000) and Goleman (1995) (as cited Teele, 2000) they tried to understand how the emotional and cognitive centers of the brain continuously interacted and interplayed. The emotional centers of the brain could impede the important role that emotions play in learning. This vital organ remained flexible and evolved during a person's life. Life experiences, situations and circumstances changed it.

1.1.4 Multiple Forms of Intelligence

Teele (2000) stated, "substantial research supports the fact that individuals process in multiple, interactive and complex ways. This leads directly to the fourth approach, multiple forms of intelligence." (pp. 12-13)

Supporters of this approach are Sternberg at Yale University and Gardner at Harward University. Sternberg's triarchic (TIP database 2003-b) theory of intelligence was made up of three sub theories: (i) the componential sub-theory: this sub theory summarized the structures and mechanisms which lied beneath intelligent behaviour classified as metacognitive, performance or knowledge acquisition components. (ii) the experiental sub-theory : Intelligent behaviour could be explained thorough an experience that started from novel went to highly familiar duties according to this sub theory. (iii) the contextual sub-theory: As this sub theory specifies, intelligent behaviour was explained by the socio cultural context where it took place and included environmental adaptation selection of better environments and forming the present environment.

Sternberg (TIP database 2003b) suggested that these three sub-theories interact and this forms a complete explanation of intelligence. The potential set of mental processes which explain behaviour was specified by componential sub-theory, on the other hand, according to contextual sub-theory intelligence was related to the external world in terms of the definition of intelligent behaviour and the situation in which this behaviour took place. The relationship between the behaviour in a given situation and the amount of the individuals' experience in that situation was taken into account in the experiental sub-theory.

The most improved side of triarchic theory was the compenential sub-theory and Sternberg (1977) (as cited Teele 2000) presented an information processing perspective for abilities with this sub-theory. Metacognition or "executive" processes control the strategies used in intelligent behaviour and according to Sternberg's study they were the most basic components.

Each person had a number of different forms of intelligence in different levels according to the theory of multiple intelligences. Gardner (1983) suggested seven basic forms: linguistic, musical, logical-mathematical spatial, body-kinesthetic, intrapersonal (eg. insight metacognition), interpersonal (eg. Social skills), and later he added naturalistic intelligence.

In Gardner's (TIP database 2003c) opinion, the theory suggested that intelligences of every person should be taken care of in learning/teaching. For example a person with strong spatial or musical intelligences should be encouraged to improve those particular capacities. Gardner claimed that the different intelligences represent both different content areas and learning modalities. Another suggestion of the theory, all forms of intelligence (not just linguistic and logical-mathematical) should be measured by assessment of abilities.

Cultural context of abilities was also emphasized by Gardner. Each culture had particular intelligences. For example Gardner (TIP database 2003c) refer to the Puluwat people of the Caroline island who had high spatial abilities as they used these abilities to navigate their canoes. He also discussed Japanese people's balances of personal intelligences. Lastly he stated the principles of the Multiple Intelligence Theory:

1.Individuals should be motivated to use their preferred intelligences in learning.

2. Instructional activities should request different forms of intelligence.

3. Assessment of learning should measure multiple forms of intelligence

Sternberg's (1985-1988) (as cited Teele, 2000) Triarchic Theory and Gardner's (1983-1993) (as cited Teele 2000) Multiple Intelligences Theory were far ahead of the traditional definition of intelligence. These two theories concentrated on personal differences among students (Teele, 2000).

In the following paragraphs Gardners' Multiple Intelligences Theory and intelligence areas will be discussed. Before explaining Multiple Intelligences Theory, it is worth while mention about human brain.

1.2 Human Brain and Multiple Intelligences

Number of researcher have examine the relationship between learning and brain structure. Over the years, various models of our brain's architecture have been proposed, but they've tended to become more reductionist. Thus, the earlieridea of a holistic brain gave way to an intense cultural interest in the two cerebral hemispheres, which gave way to Paul MacLean's (1978) (as cited Sylwester, 1995) model of a triune brain, a three-layer, hierarchical brain that evolved to process survival, emotional, and rational functions. Howard Gardner, (1983) investigated the neuropsychological roots of the multiple intelligence theory. And Gardner (1983) (as cited Sylwester; 1995) has suggested that our conscious brain functions through seven forms of intelligence processed in different areas.

The brain works through a constantly changing interaction of *the brainstem, the limbic system, and the cerebral cortex* (Teele, 2000).

The lower extension of the brain where it connects to the spinal cord is the brainstem. Neurological functions located in the brainstem include those necessary for survival (breathing, digestion, heart rate, blood pressure) and for arousal (being awake and alert) (Sylwester; 1995).

The limbic system is folded around the brainstem and is the connection to the cerebral cortex. The limbic system acts as a gatekeeper for the different parts of the brain and controls the relationship between emotions and learning.

All the learning achieved in formal education occurs in the cerebral cortex. Language, symbols, and abstract thinking reside in this part of the brain. The cortex is composed of two cerebral hemispheres, which are largely mirror images. Each side has different functions that enable individuals to utilize all of the different multiple intelligences. The hemispheres are linked together by the corpus callosum, which is a thick bundle of nerves (Teele, 2000).

The left hemisphere processes information sequentially and is described as analytical because it specializes in recognizing parts which make a whole. Although it is most efficient at processing verbal information language should not be considered as being 'in' the left hemisphere. This hemisphere is able to recognize that one stimulus comes before another and verbal perception and generation depends on the awareness of the sequence in which sounds occur (Teele, 2000).

The left hemisphere separates out parts that make a whole the right hemisphere specialists in combining the parts to produce a whole. Unlike the left, the right hemisphere organizes simultaneously. It specializes in a method that perceives and constructs patterns. It is most efficient at visual and spatial processing and it is thought that non verbal stimuli are processed primarily in the Right Hemisphere (Teele, 2000).

Table 1.2. The Two Hemispheres of the Brain

Left Hemisphere	Right Hemisphere
Right hand touch & movement	Right hand touch & movement
Speech	Spatial construction
Language and writing	Face recognition
Linear thinking	Music processing
Analysis	Nonverbal matters

Both hemispheres work in collaboration. Some gifted individuals, such as Leonardo da Vinci and Albert Einstein, may have been able to connect several areas of their brains together, which allowed them to see new vision and to solve problems no one had accomplished before (Teele, 2000).

The cerebral cortex is divided into two hemispheres and each hemisphere is divided into four lobes: temporal, parietal, occipital and frontal.

Temporal lobe is located above and behind the ears. It is area that processes hearing and speech. Understanding language, auditory processing and perception, and non-speech auditory perception such as music all take place in this lobe.

The parietal lobe is located at the top of the head. It responds to sensations of touch and motor control. It combines sensory information and memory. It recognizes objects and their uses. Spatial functions such as a geometry, map reading, and mathematical reasoning operate in this lobe (Teele, 2000).

Occipital Lobe - Region in the back of the brain processes visual information. Not only is the occipital lobe mainly responsible for visual reception, it also contains association areas that help in the visual recognition of shapes and colors. Damage to this lobe can cause visual deficits (Sylwester, 1995).

Frontal Lobe - Front part of the brain; involved in planning, organizing, problem solving, selective attention, personality and a variety of "higher cognitive functions" includes behaviour and emotions (Sylwester, 1995).

The frontal lobe is responsible for about one-half the volume of the brain. It is located close to the forehead. It sends messages to muscles and glands and is responsible for voluntary movement. It is the area of goal-directed behaviour, long-term planning, problem solving, critical thinking, and decision-making. The frontal lobe regulates emotional states and judgment. Humans are the only known from of life that have prefrontal lobes. Synthesis and evaluation can take place in this part of the brain (Teele, 2000).

According to Sylwester (1995), the brain consists of tens of billions of cortical neurons that regulate cognitive thinking activities and even more glial cells that support and feed the neurons come in many sizes and shapes. A bundle of neurons is called a nerve.

Neurons like trees and have branches that are called dendrites. Dendrites are tubular extensions that receive and carry messages to from other neurons and will grow when stimulated.

When dendrites branch abstract thinking increases. As the dendrites spread, they allow individuals to think more clearly and in more complex ways. Thinking is a dynamic process. If the brain is not used, the dendrites do not branches can grow on the brain when it is stimulated.

1.3 Gardner's Multiple Intelligence Theory:

Frames of Mind: The Theory of Multiple Intelligences, which was published by Howard Gardner in 1983, suggested that all individuals had seven independent

intelligences, These "intelligences" were: linguistic and logical-mathematical, musical, spatial, bodily kinesthetic, interpersonal, intrapersonal intelligence. He recently have added one new intelligence, naturalist intelligence. This idea was against the traditional approach, which used to take intelligence as a single capacity.

Gardner identified these intelligences by making a study on the development of cognitive skills of normal children, breakdown of cognitive abilities in stroke patients and other brain damaged ones and made a review of literature on psychological testing.(Krechevsky & Kornhaber, 2003)

Then Gardner (1999) looked for the best word about his discoveries. At the beginning he thought to use the venerable scholarly term human faculties; psychologists' terms like skills or capacities; or lay terms like gifts, talents, or abilities. "However, I realized that each of these words harbored pitfalls. I finally elected to take the bold step of appropriating a from psychology and stretching it in new ways- that word was intelligence. I began by defining an intelligence as the ability to solve problem problems or to create products that are valued within one or more cultural setting." (p. 33) This is the definition that he used in the 1983 book that grew out of the Van Leer project: Frames of Mind: The Theory of Multiple Intelligences. However, now in Intelligence Reframed (Gardner, 1999) intelligence is defined " as a biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture. This modest change in wording is important because it suggests that intelligences are not things that can be seen or counted. Instead, they are potentials - presumably, neural ones – that will or not will be activated, depending upon the values of a particular culture, the opportunities available in that culture, and the

personal decisions made by individuals and /or their families, schoolteachers, and others" (pp. 34-35)

Gardner used 8 different criteria to understand if capacity could be thought as intelligence. Gardner (1999) made group them in terms of their disciplinary roots. From the biological sciences came two criteria:

1. Potential isolation by brain damage: "I was particularly interested in evidence that one candidate intelligence could be dissociated from others. Either patients exist who have this intelligence spared despite other damaged faculties, or there are patients in whom this faculty has been impaired while others have been speared. Either pattern increases the likelihood that an intelligence has been discovered. Thus, both the separation of language from other faculties and its essential similarity in oral, aural, written, and sign forms point to a separate linguistic intelligence".

2. An evolutionary history and an evolutionary plausibility: When the contemporary mind and brain are studied most of the evidence came from either inferences about Homo sapience and its predecessors or information about contemporary species. "These studies give new plausibility to evolutionary accounts of such faculties as the intelligence that scrutinizes the world of plants and animals, or the intelligence that scrutinizes the world of plants and animals, or the intelligence that computes the movies of other members of the species" (p. 36).

Two other criteria emanate from logical analysis:

*3 .An identifiable core operation or set of operations: T*here is an identifiable set of procedures and practices which are unique to each true intelligence. For instance linguistic intelligence includes core operation of phonemic discriminations

command of syntax, sensivity to the pragmatic uses of language, and acquisition of word meanings

4 .Susceptibility to encoding from a symbol system: Humans have developed many kinds of symbol systems over time for varied disciplines such as spoken and written language, mathematical systems, charts drawing logical equations and so on.

Two of the criteria came from developmental psychology:

5 .A distinctive developmental history with a definite set of "end state" performances: A clear pattern of developmental history is being documented of the human mind. Its mean, intelligences have their own developmental histories. Thus, people who want to be mathematicians must develop their logical-mathematical abilities in certain ways.

*6. The existence of idiot, savants, prodigies and other exceptional people: "*Nature provides one other bounty to the student of multiple intelligeces: people who, without any documented signs of brain injury, have unusual profiles of intelligence. One example is the savant, who exhibits an area of stunning strength along with other ordinary abilities or even marked deficits. Researcher have recently proposed that autistic people-like individuals who suffer significant damage to the right hemisphere- may have an impairment in the brain area that governs the ability to understand other people's intentions" (p. 39).

The final two criteria are drawn from traditional psychological research:

7. Support of experimental and psychological tasks: Psychologists can identify sets of tasks for different domains of human behavior. A true intelligence can be identified by specific tasks which can be carried out, observed and measured.

8.Support from psychometric findings: The use of psychometric instruments to measure intelligence (such as I.Q. tests) have traditionally been used to measure only specific types of ability. However, these tests can be designed and used to identify and quantify true unique intelligences. The Multiple Intelligence theory does not reject psychometric testing for specific scientific study.

1.3.1 Linguistic Intelligence

Linguistic intelligence involves sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals. This intelligence includes the ability to effectively use language to express oneself rhetorically or poetically; and language as a means to remember information. Writers, poets, lawyers and speakers are among those that Howard Gardner sees as having high linguistic intelligence (Gardner, 1999).

Students who have linguistic intelligence show brilliant auditory abilities, they are usually fond of reading, writing, playing word games. They also are good at remembering names, dates and places and they prefer doing word processing on a computer. They may have a bright, developed vocabulary and can speak fluently, accurately and phonetically (Teele, 2000).

Lesson plans for linguistic intelligence may include several activities, as follows.

- reading and writing about famous artists and art history.
- writing a short fictional story about an artist or group of artists in the past, present or future.

- interviewing students in pairs regarding their involvement and thoughts about a specific event, concert, production, exhibition, including who, what, when, why, where, and how was it produced.

- writing a script or narrative for a program, speech, or host for a major arts event.

1.3.2 Logical-Mathematical Intelligence

Logical-mathematical intelligence consists of the capacity to analyze problems logically, carry out mathematical operations, and investigate issues scientifically. In Howard Gardner's words, in entails the ability to detect patterns, reason deductively and think logically. This intelligence is most often associated with scientific and mathematical thinking (Gardner, 1999).

The ones who are able to explore patterns and relationships and make connections are the students with logical mathematical ability. They are keen on mathematical problems, experiments, problem solutions and they enjoy reasoning logically, clearly and scientifically. They need a systematic and logical information to learn best. This group of students enjoy working with data bases and spread sheds on computer (Teele, 2000).

Lesson plans for *Logical-Mathematical* intelligence may include several activities, as follows.

- constructing graphic organizers to compare, contrast, and observe relationships and patterns among and between the arts, artists, cultures, or artistic products.

- graphing, collecting, or analyzing data on audiences, attendance at arts events, or attitude surveys.
- establishing time lines for artistic inventions, composers, artistic movements, or dance history.
- creating a financial plan for a major production, exhibition, or concert, including all costs for transportation, theatre rental,
- costumes, sets, rental fees, etc.

1.3.3 Spatial Intelligence

Spatial intelligence involves the potential to recognize and use the patterns of wide space and more confined areas (Gardner, 1999).

Art activities, reading maps, charts and diagrams, thinking in images and pictures are the favorites of the students who have spatial intelligence (Teele, 2000). According to Armstrong (1994) these students have highly developed senses for color, line, shape, form, space. They also have the ability to visualize ideas.

Lesson plans for s*patial* intelligence may include several activities, as follows.

- designing sets, paintings, or placement maps for exhibitions, performances, or concerts.
- visualizing a two-dimensional photograph or illustration and creating a three-dimensional sculpture, set, or dance.

- creating narrative murals on timelines for music, art, drama, or dance history.

- choreographing a marching band, a performance art piece, a dance, or a class skit or dramatization.

1.3.4 Musical Intelligence

Musical intelligence involves skill in the performance, composition, and appreciation of musical patterns. It encompasses the capacity to recognize and compose musical pitches, tones, and rhythms. According to Howard Gardner musical intelligence runs in an almost structural parallel to linguistic intelligence (Gardner, 1999).

The ones with musical intelligence like music. Sound in their surroundings effects them and they listen to music while studying or reading. These students are able to understand pitch, rhythm and timbre. They also can create music and enjoy singing songs. The structure of music and tonal sounds are familiar to them. The musical part of their brains can be motivated by clapping hands, snapping fingers, chanting words or moving rhythmically. The ones in this category can even save (keep) and apply information by musical process (Teele, 2000).

Lesson plans *Musical* for intelligence may include several activities, as follows.

- creating and researching music for inclusion in a play, dance, or exhibition.

- learning about music from other countries, time periods, and cultures.

- composing music on the computer or with instruments to match a mood, painting, dance, or piece of literature.

- using counting cadence with drills and looking for analogous repetitive patterns in visual art, decorative schemes in architecture, or literary repetition.

1.3.5 Bodily-Kinesthetic Intelligence

Bodily-kinesthetic intelligence entails the potential of using one's whole body or parts of the body to solve problems. It is the ability to use mental abilities to coordinate bodily movements. Howard Gardner sees mental and physical activity as related (Gardner, 1999).

This intelligence (kinesthetic) enables the subjects to make use of their bodies in a unique and talented way. They can move and act, they are also able to achieve success in a class where physical activities and hands are provided (Teele, 2000).

Lesson plans for *bodily-kinesthetic* intelligence may include several activities, as follows.

- creating mini-productions of scenes from plays, films, dance or an interpretation of a painting that has come to life.

- interpreting sounds or visual images with movements to produce a group event.

- using pantomime or charades to review a lesson.

1.3.6 Intrapersonal Intelligence

Intrapersonal intelligence entails the capacity to understand oneself, to appreciate one's feelings, fears and motivations. In Howard Gardner's view it involves having an effective working model of ourselves, and to be able to use such information to regulate our lives (Gardner,1999).

These students enjoy being alone; they can feel and appreciate their own powers, weaknesses and inner feelings. They like keeping a journal, they study in quiet atmospheres and they are usually self-reflective. Strong ideas on controversial topics often come from that kind of students (Teele, 2000).

Lesson plans for *intrapersonal* intelligence may include several activities, as follows.

- using reflective journals during and after a unit.
- doing independent research projects with opinion papers about the research findings.
- writing critiques of a production, field trip, or concert performed by others, or writing a self-evaluation about a personal performance.
- writing letters to favorite artists, composers, or performers about a special performance that affected them personally.

1.3.7 Interpersonal Intelligence

Interpersonal intelligence is concerned with the capacity to understand the intentions, motivations and desires of other people. It allows people to work

effectively with others. Educators, salespeople, religious and political leaders and counsellors all need a well-developed interpersonal intelligence (Gardner, 1999).

The ones who have interpersonal intelligence prefer to be with people. They are friendly and can get on well with others so they can easily take part in social activities. Cooperative and collaborative surroundings are best for their learning. The ones who can express empathy for others' feelings, react to their moods and grasp other perspectives usually appear in this group. They like studying in groups and exchanging information with others. (Teele, 2000)

Lesson plans for *interpersonal* intelligence may include several activities, as follows.

- using cooperative learning for a class critique of portfolios.
- creating peer coaching during a rehearsal or production of an artwork.
- creating team contests or quiz shows for review of information, facts, or concepts of an arts unit.
- developing class mini-productions of historical events, folk festivals, or a congregation of famous artists from different time periods meeting for the first time.

1.3.8 Naturalist Intelligence

An eight intelligence named, the naturalist intelligence was introduced by Gardner (1996 as cited Teele, 2000). A student with this kind of intelligence, he claims, has the skills to notice, group, classify flora and fauna and is able to listen

and hear the environmental sounds. He adds that this group of students lives in a harmony with nature.

The naturalist can feel the differences between plants and animals. They also can find out the relationship between nature and civilization people with jobs such as farming, hunting, gardening and also biologists have this kind of intelligence (Teele, 2000).

Lesson plans for *naturalist* intelligence may include several activities, as follows.

- using the outdoors as a classroom for inspiration for creating a play, concert, dance or visual art work.
- learning about and understanding animals and incorporating them into an art work or production.
- listening to animal sounds and movements such as whales and wolves, and creating works of art.
- observing and using plants to create and/or interpret texture and form in an art work.

1.4 Developing Multiple Intelligences

A great number of psychologists including Howard Gardner argued that the formation of human mind was modular and distinct and independent mental processes mean the ability in works requiring mental skills. Gardner claimed that capacities of intelligences were improved and encouraged by environmental richness (Eleanor & Sharon, 1998).

Gardner studied not only the development of MI Theory but he was also concentrated on the experimental psychology and application fields of intelligence. In his opinion intelligence was problem solving and producing. He made detailed studies on the individual effects of both genetic and environmental mental conditions and the intelligence profile (Teele, 1995).

Biological endowment, personal life history, cultural and historical background are three main factors that development of intelligence depends on. A person's intelligence is affected by the interaction of them (Armstrong, 1994).

Biological Endowment: Hereditary or genetic factors and insults or injuries to the brain before, during or after birth are all included in biological endowment.

Personal Life History: It includes experiences with parents, teachers, friends and others. These experiences may keep intelligence awake or prevents it from developing.

Cultural and Historical Background: Time and place in which one was born and brought up, also the nature and position of cultural/historical developments make up one's cultural and historical background (Armstrong, 1994).

1.5 Activators and Deactivators of Intelligences

In Armstrong's (1994) opinion there were two key processes in the development of intelligences: *Crystallizing experiences and Paralyzing experiences.*

Crystallizing experiences which was "turning points" in the development of a person's talents and skills was originated by David Feldman (1980; cited in Armstrong 1994) at Tufts University and then it was improved by Howard Gardner and his friends. They can appear any time in human life but they usually occur in early childhood. For example Einstein said that the magnetic compass which his

father showed him when he was four years old motivated him to find out the secrets of universe. Basically this was an experience that motivated his sleeping genius and made him one of the most important figures of the 20th century. That kind of experiences activate intelligence and starts its development.

In addition, Armstrong (1994) identified paralyzing experiences as "shut down" intelligences. For example a teacher humiliated a student in front of his/her classmates when he/she showed his/her latest artistic creation during art period, and this might mark the student spatial development Paralyzing experiences usually consist of all negative feelings such as shame, guilt, fear, anger which prevent one's intelligences from growing and improving.

Besides there are some environmental influences that activate or stop the development of intelligences. They are: access to resources or mentors; historical-cultural factors, geographic factors, familial factors, situational factors.

A*ccess to Resources or Mentors:* One's musical ability might not develop if one's family was not rich enough to buy a violin, piano or other instrument.

Historical-Cultural Factors: If one were a student who was good at maths at a time maths and science curriculum were highly funded, one's mathematical intelligence would likely have developed.

Geographic Factors: One who was brought up in a farm had more chance to develop bodily kinesthetic intelligence than the one who grew up in an apartment.

Familial Factors: If one wanted to be an artist but one's parents wanted one to be a lawyer, their influence might well have promoted the development of one' linguistic intelligence at the expense of one's spatial intelligence.

Situational Factors: If one had to help take care of large family while one was growing up, and one now have a large family himself/herself, one may have had little time to develop in areas of promise- unless one was interpersonal in nature.

MI Theory provides a personal development model, which can enable teachers to understand the effects of their learning style on the way they teach in the class. It also offers group activities that can activate paralyzed intelligences. (Armstrong, 1994)

1.6 How Teachers Interpret The Multiple Intelligences Theory

Many educators have tried to define intelligence. Some of them tried to measure human intelligence on the basis of human's mental functions or performances or some other learning skills by several I.Q. tests that they developed. (Saban, 2001)

Gardner's theory began to be applied by teachers since "Frames of Mind: The Theory of MI" was published in 1983. Educators have proved the theory of Gardner which suggests that each person has a unique cognitive profile. The theory was practiced by individual teachers and schools and sometimes they tried conflicting ways. Different teachers had different interpretations of Gardner's theory (Some claimed that the student's talents should be created early ages, others gave equal time to the arts every day and many of them used the theory differently). None of these are better or more correct than the other. They applied it in a way that they used best (Checkley, 1997).

1.7 Assessing Students Multiple Intelligences

Armstrong (1994) claimed that observation was the best way to understand a student's intelligences. In addition to observation and checklist Armstrong suggested some ways in order to understand student's intelligences: These were;

1.*Collecting Documents:* Collecting photos sketches, audiocassettes, color photocopies help teacher in MI assessment.

2. *Looking At The School Records:* Using specific test from time to time can give information about students' multiple intelligences.

3. *Talking with other Teachers:* Information about student's interest can be collectedfrom the other teachers. (Music, art, math, lecture)

4.*Talking with Parents:* Parent – teacher conferences may provide a wide understanding of the child's learning style.

5. *Asking Students:* Students can be consulted about their abilities in each area.

6. *Setting-up Special Activities:* Setting up activity centers for each intelligence provides opportunities for seeing how students function in each area or which area students naturally gravitate toward when they are free to choose.

1.8 Turkish Primary Education

In 1998, Compulsory primary education years were increased from five to eight. The "primary school" and "lower secondary school" terms were replaced with "primary education school".

The purpose of the primary education is to ensure that every Turkish child acquires the basic knowledge, skills, behaviors, and habits to became a good citizen, is prepared for life and for the next education level parallel to his/her interests and

skills. Therefore, Primary education stresses on preparing student for life and next education according to his/her interests and skills.

Basic Law of National Education no 1739, also emphasizes the same aspect: The general purpose of the Turkish National Education is to raise all Turkish citizens in line with their own interests and abilities, to prepare them for life by helping them to acquire the required knowledge, skills, behavior and cooperative working habits and to ensure they have a profession which will make them happy and contribute to the happiness of society.

While Turkish National Educational Laws give importance to individual differences, the practices at schools generally ignore individual differences. Traditionally the educational system has focused generally only on two intelligences, linguistic and logical-mathematic. Course objectives, books, teaching methodologies, examinations such as University Entrance Exam, Anatolian Lice Entrance Exam etc. have aimed to determine the level of linguistic and logical-mathematical intelligences.

At that point, Turkish Primary Education Weekly Course Schedule may help to understand current situation of the Turkish Primary Education more clearly.

As indicated in the table 1.2 , first and third grade students, who are at concrete operational stage (8-11 years) according to Piaget, take seven courses, Turkish, Mathematics, Life Sciences, Art, Music, Physical Education, Individual and Group Activities. First and third grade curricula mainly focus on developing some basic skills such as reading, writing and math. In other words, first and third grade curricula's main purpose is to develop students' linguistic and mathematical intelligences.

According to Piaget, (TIP Database 1994-2003a) fifth and eight grade students (12-15 years) were expected to be at formal operations stage and their thinking involve abstractions. In the fifth and eight grade curricula, it is seen that course numbers increase from seven to eleven and at eighth grade, course numbers become thirteen. Therefore at these levels, courses and their contents gain variety.

When students come to these levels, it is accepted that they gained basic linguistic and mathematical skills. At these levels, the students are expected to realize more complex objectives by using these basic skills

Besides Turkish and Mathematic courses, fifth and eight grade students, whose blending of interpersonal relations and exploration of careers begins (Vygotsky, 1978), take Science, Social Studies, Citizenship and Human Rights Education, Turkish Republic Revolution courses. These courses' objective is helping students to understand society and social relationships. These may help students to develop their interpersonal intelligence.

Table1.3 Turkish Primary Education Weekly Course Schedule

COURSES	Grades and Course Hours			
	First Grade	Third Grade	Fifth Grade	Eight Grade
Turkish	12	12	6	5
Mathematics	4	4	4	4
Life Sciences	5	5	-	-
Science	-	-	3	3
Social Studies	-	-	3	3
Citizenship and Human Rights Education	-	-	-	1
Turkish Republic Revolution History and Kemalism	-	-	-	1
Foreign Language	-	-	2	4
Religion Culture and Ethic	-	-	2	2
Art	2	2	1	1
Music	2	2	1	1
Physical Education	2	2	2	1
Work Education	-	-	3	3
Traffic Education	-	-	-	1
Individual and Group Activities	3	3	-	-
Elective Courses	-	-	3	2

1.9 Significance of the Study

As the education system has stressed the importance of developing mathematical and linguistic intelligences, it often bases student success only on the

measured skills in those two intelligences. Supporters of Gardner's Theory of Multiple Intelligences believe that this emphasis is unfair. Besides, this traditional approach makes contents of the education too narrow.

Açıkgöz (2002) emphasized that this situation created inequality by limiting the development of the opportunity of the students who were strong in the other intelligence fields. Besides, focusing on one or two intelligence fields impeded the development of the other intelligence fields and bring about their declivity.

The educators noticed from the outcomes of MI Theory and the other studies carried out the field of education that: "all students can learn and succeed, but not in the same way and not on the same day" (Telee, 2000). Besides, it is known that the students have different potentials, interests and skills, unlike each other. Therefore all of them learn in many different ways, so educators must provide learners' different learning opportunities. This situation requires that the students should be known well and their MI ought to be known by the teachers and the students themselves properly.

Determining the students' MI is important in terms of students and curriculum. Açıkgöz (2002) claimed that the definitions about the students' MI fields would be useful in determining the easier learning way. Besides, she emphasized that by the information related to the MI fields of the students, one might use to plan how he/she could understand himself/herself better, increased his/her awareness, use his strong sides and develop his/her weak points.

Outcomes of the determining students' MI studies may be also useful aspects of curriculum and instruction. Results of kinds of these studies may provide source to develop curricula and to form instructional designs in which individual

differences, interests, and skills are regarded, students' multiple intelligences are allowed to develop and contemporary instructional methods are used.

There are too many studies on both theoretical bases of MI Theory and its application. In Turkey these studies usually include the practices of the theory in primary school education. The studies compare the effectiveness of traditional education activities and the ones that depend on the Multiple Intelligences Theory. There have been no studies related to determine the students' Multiple Intelligences in primary education.

As mentioned in the previous paragraph, outcomes of determining students' MI studies may be useful for students, curriculum and instruction. Starting from this point, the goal of the study has been determined: The purpose of this study is to investigate the different multiple intelligences of students according to their preferences and how students' multiple intelligences differ in terms of grade level (first, third, fifth and eight grade) and gender.

This approach would enrich students self esteem; also their individual gifts and abilities could be improved. Then they could transfer their knowledge from dominant to poor intelligences. Teele (2000) found that students became more enthusiastic to try harder when they become successful in learning.

CHAPTER II

REVIEW OF RELATED LITERATURE

In this chapter Studies On Measuring Intelligences, Implication of The Multiple Intelligences Theory and studies on multiple intelligences theory in Turkey are presented.

2.1 Studies on Measuring Intelligences

The observation of difference in intelligence has many explanations, such as maturity, sex, parental features, education and so on (Throndike, 1971) There are many studies that investigate factors influencing intelligence development. Some of these studies are presented in the following paragraphs.

Gilbert (as cited Thorndike, 1971) investigated influence of maturity on the physical and mental development of school children. He made a number of measurements of both physical and mental traits in boys and girls from six to seventeen years old. The mental traits were:

1. *Delicacy of discrimination of weight* (Muscle-Sense'): Firstly ten weights identical in shape and size, but weighing 84 grams, 86 grams.. were set and child was asked to sort out all those which seemed to him to be of exactly the same weight as the 82 gram one. After that delicacy of discrimination was measured inversely by the difference in weight of the weight thougt to be identical.

2. *Delicacy of discrimination of color*: As the color series of reds varying progressively in darkness were used.

3. *Force of suggestion:* Force of suggestion was measured by the amount a child overestimated a weight small in size compared with the same weight made much longer.

4. *Voluntary motor ability:* The number of taps made with the finger in 45 seconds and 5 seconds was measured.

5. *Fatigue*: Let T= the number of taps made in the first 5 seconds of a trial for 45 seconds. Let L= the number of taps made in the last 5 seconds.

6. *Reaction Time:* Reaction time was measured by the time taken to see a signal and react by pressing down a key.

7. *Reaction with discrimination and choice:* This trait was measured by the time taken to see that the signal was blue and not red and to react by pressing down a key.

According to the results, mental traits differed with age, from six to seventeen. The researcher claimed that this difference could be as a result of the mere maturing of some characteristics of original nature or could be due to some environmental force. Firstly he said that this change comes as a gift from nature which we may not be able to refuse without damaging general growth. Secondly he said that this change comes as the earnings of training. It is a product of education.

Researcher came to a conclusion that individual's age causes a change but this may not be caused by the maturing of the trait or the effect of training on this trait alone but it was possibly due to the effect of maturity and training instructions upon the ability.

As Halpern and Crothers claimed (1997) (as cited Teele, 2000), in the last decade, a number of studies had showed that females, on average were better in the abilities which needed phonological and semantic information in the long term memory, verbal fluency and writing task, production and understanding of difficult reading passages, perceptual speed, fine motor task and non-verbal communication.

According to Rusk's (as cited Thorndike, 1971) detailed research on the grades taken for scholarship in 3 high-school studies, girls were a bit better at the languages and a bit worse in history, chemistry and physics and there were no significant differences in mathematics.

The researcher claimed that the most crucial aspects of these differences was their small amount. The personal changes within one sex was significantly higher than the difference between the sexes as regards to those intellectual and semi intellectual traits. Thus, the sex difference may be disregarded.

Sex differences, primarily in intellectual and semi intellectual tasks, were studied by Thompson (as cited Thorndike, 1971) Thompson claimed that in order to made a reliable research of the changes related to sex only, it was crucial to have both male and female subjects of the same age and same social environments. It was not possible to realize these conditions. Undergraduate students of a coeducational university might be useful in such a research, because the most important thing they wanted to do was to take an education, they were also similar at least with regard to training and environment at school. In addition a great majority of university school students were educated in co-educational schools. In Callifornia University Thompson made the recent research which was composed of 200 students, female and male between the ages of 19 and 25. Both sexes were similar in terms of their ages and social environments. Thompson used a series of tests in this investigation.

In the beginning stage, simple sensory and motor tests were applied to the subjects. In the second part, intellectual tests were given and personality questions were in the end. The taste and smell experiments had to be scattered through most of the periods, since only a few at a time could be performed without fatigue. The entire series was applied to fifty subjects, twenty-five men and twenty-five women. As a matter of fact there was no significant difference between men and women intellectual abilities which was measured.

According to Thorndike (1971) measurements revealed only little inferiority of the sex in receptivity or sensitivity (impressibility) and only little superiority in movement and thought control about concrete mechanical conditions. Thompson (as cited Thorndike, 1971) would interpret the last changes in training and another psychologist could interpret the superior quickness of movement in the same way. The results of the experiment were not of much importance as the differences themselves were not and also if there were any, the differences in training were probably caused by the original difference between the interests of two different sexes. For example, some boys learn more about the mechanics and the reason of this might be their nature that is interested in such learning. In conclusion, Thompson claimed that sexes were significantly similar and sex could effect the human mental changes in the listed abilities only slightly.

An inventory developed by Sue Teele in 1992, entitled, Teele Inventory for Multiple Intelligences (TIMI) was specifically designed to examine the dominant intelligences of students in kindergarten through the twelfth grade, and acts as an indicator as to whether or not students in different grade levels possess different intelligences.

According to results of TIMI administration on preschool children, elementary secondary, community college and institutions of higher education, it can be claimed that students have different combinations of seven intelligences and they acquire information in different ways.

Sue Teele and friends reached the interesting results by analysing of over 4,000 answer sheets. Students at the primary level demonstrated a much stronger preference for linguistic and logical-mathematical intelligences than students at the middle and high school levels. Primary level students most dominant intelligences were spatial, bodily-kinesthetic, linguistic and logical-mathematical while upper elementary students were spatial, bodily-kinesthetic, interpersonal and musical. Middle and high school students were strongest in interpersonal, bodily-kinesthetic, spatial and musical intelligences.

A separation by grade levels indicates the following dominant intelligences by grade level and is listed by order of strongest intelligences in table2.1.

Students at the primary grades were more intrapersonal than students at the upper elementary grades. Students at the upper elementary grades indicated a desire to work together while primary students preferred to work alone.

The study released interesting results: Linguistic intelligence was high from kindergarden period through fourth grade but then it decreased. Students from the first to the fourth grade had strong logical-mathematical intelligence and then it started to fall. Throughout elementary school two most dominant intelligences were spatial and bodily-kinesthetic intelligences. Spatial intelligence was strong in all grades. Ironically, children who start school with high linguistic and logical

Table 2.1 TIMI Results by Grade Level

Intelligences / Grade level	Linguistic	Logical-Mathematical	Spatial	Musical	Bodily-Kinesthetic	Interpersonal	Intrapersonal
Kindergarten	X		X		X		X
First grade	X	X	X		X		
Second grade	X	X	X		X		
Third grade	X	X	X		X	X	
Fourth grade			X	X	X	X	
Fifth grade			X	X	X	X	
Sixth grade			X	X	X	X	
Middle school			X	X	X	X	
High school			X	X	X	X	

mathematical intelligences become poor in both of them when they graduate from high school (Teele, 2000).

René Diaz-Lefebrve (1998) of Glendale Community College in Phoenix, Arizona was a pioneering practitioner and researcher on applications of multiple intelligences at the community college level. Over 500 students in the college were administered the pictorial Teele Inventory of Multiple Intelligences to determine their dominant mode of learning.

The pattern in those TIMI administrations to over 500 students suggested that those Glendale Community College students favor bodily or kinesthetic intellect

more than others--about 27% of the time. According to Diaz-Lefebrve hands-on learning in some form plays to this strength. A close second (24%) was interpersonal intelligence, the kind that thrives in group learning tasks. Spatial intelligence (16%) and linguistic (8%) and mathematical and logical (8%) intellectual approaches (17%) unspecified were also noted.

Diaz-Lefebrve (1998) said that traditionally, higher education had emphasized the linguistic and logical-mathematical styles; however, these styles were representative of only a small minority of this sample. Manipulative action, hands-on experiences, and cooperative learning environments were best suited for the majority.

Besides, Diaz-Lefebvre stated that 96% of the 505 Glendale Community College students surveyed claimed that having learning options increased their motivation to learn, thereby doubling time on task as compared with students in more traditional courses at the college—11 hours per week of study vs. 5.

Ashmore (2003) used Teele Inventory of Multiple Intelligence to search Web site usability. The researcher made this study with 12 children between 3 and 6 using the structural frame of Howard Gardner's theory of MI. In addition to TIMI, data was colleted by means of interviews, observations, questionnaires and click stream logs. This study explored: **a)**particular problems children face when using web sites **b)** most or least influential design element **c)** the part (role) of intelligence type play in usability **d)** other factors effect Web usability

In this study, according to TIMI results, students' highest intelligences were kinesthetic (M=4.67, SD=0.78), spatial (M=4.67, SD=0.78), and intrapersonal (M=4.50, SD=1.38). The medium intelligence types were musical (M=3.92,

SD=1.38), interpersonal (M=3.83, SD=1.75) and logical (M=3.42, SD=1.98). The lowest was linguistic (M=3.0, SD=1.28). Children with high logical intelligence had the greatest success, while children with high linguistic intelligence had the greatest satisfaction.

Same forms website usability were improved and performed in accordance with the children's seven intelligence. Sound effects (musical), characters that interrelated with the children (interpersonal), audio instructions (linguistic), large clickable areas (kinesthetic), limited choices (logical), positive reinforcement (intra personal) and navigation metaphors (spatial) affected usability positively (Ashmore, 2003).

A lot of MIDAS Research projects, one of which is MIDAS for Kids, are currently being carried out. In 1987 The Multiple Intelligence Development Assessment Scales (MIDAS) were developed to evaluate the MI for adolescents and adults. The MIDAS-KIDS for children (grades K8) has been improving since 1994 and was accepted and started to be used on 2200 subjects recently.

The subject's strengths and weaknesses in everyday language were qualitative MI profile report provided by the MIDAS. Then teachers, students and parents were able to reach a detailed explanatory information and guidance.

Shearer (1999) worked on validity studies of MIDAS. The MIDAS KIDS questionnaire was given to the students of eighth grade at a suburban middle school. Then two groups out of those eighth grade students (n: 193) were determined by six teachers. 10 students who were brilliant in a specific area and 10 of them who were weak at it was selected by those teachers who knew the students' abilities in that particular area for example language teacher for linguistic intelligence, math teacher for logical-mathematical intelligence, school counselor for intrapersonal,

interpersonal intelligences, art teacher for spatial intelligence, music teacher for musical intelligence and gym teacher for Bodily-kinesthetic intelligence. It was found that teachers' grouping of students closely matched with theoretical expectations. Low group mean scores ranged from 42% to 50% with a mean score of 40%. High group mean scores ranged from 59% to 73% with a mean score of 63%. These data correspond with the expectation that a score of 60% and above was in the High range and 40% and below was in the Low range.

After the validity studies, Shearer (1999) conducted MIDAS on 1679 students from kindergarten to eight grade in order to define the students most dominant intelligences. There were two versions of *The MIDAS-KIDS*. The *My Child* questionnaire was appropriate for use by the parents of children in grades first to third, while the All About Me version was self-completed by children in grade four to grade eight.

The research results showed that the students at the first grade level demonstrated strong preference for musical intelligence and spatial intelligence and two intelligences that were followed were interpersonal intelligence, and bodily kinesthetic intelligence.

While the third grade students' most dominant intelligences were spatial, bodly kinnesthetic and musical, the fifth grade students were strongest in spatial intelligence, musical interpersonal, bodily-kinesthetic intelligence. Lastly the students at the eighth grade were strongest in musical intelligence, intrapersonal intelligence, and spatial intelligence.

Pooler (2003) from Futures Alternative High School Boone Community School said that they applied MIDAS to every student (grades 9th to12th and 16 years old and above) at their orientation and results were given to students, parents

and facilitators by explaining the results to each student. They also made it clear how these results can used by the subjects to plan their future careers and how they can be helpful with their current education. The students might also ask for adaptations that suit their MI when there was only one assignment alternative given.

After the application of MI theory for six years, it could be concluded from the results that most of the students prefere to do a kinesthetic or spatial activity rather than a linguistic one. That was to say the subjects created posters, artwork, and surveys rather than writing a passage for a given topic. The teachers also assigned them with alternative studies, so the subjects could easily show their preferences (Pooler, 2003).

2.2 Implication of the Multiple Intelligences Theory

In addition to these descriptive studies, which aimed to determine students' Multiple Intelligences, there were many studies, which focused on the implication of MI Theory in different educational settings.

Moore (1998) made a cross case survey of research based on Howard Gardner's Theory of Multiple Intelligences. She investigated the answer to the following question: "Does teaching to a student's individual intelligence as defined by Howard Gardner have an effect on student's progress. She examined the variables that influence the relationship between matching individual intelligence to a particular type of instruction. A complete literature search was conducted. From that search eight relevant studies were pinpointed for review and analysis. According to these studies Gardner's theory had positive effects both on students and teachers It also improved classroom environment. The studies also revealed that the use of Gardner's Theory in school does serve to heighten student progress in an

indirect way. MI Theory serves to heighten the awareness of student needs in many different types of classroom settings. Additionally, Gardner's Theory had positive influences when developing curriculum, utilizing cooperative education, and working with different populations of students. Finally, the use of Gardner's Theory enabled educators to create learning environments that better enabled all types of students to learn.

Carver, Pricee, and Wilken (2000) tried to improve the ability of applying knowledge to real-life experiences. They made research on second, sixth and tenth grade students at a school outside the city and they collected data by teacher generated assessments, observations and students responses. Analysing of these data revealed that students had difficulty transferring knowledge due to the lack of motivation and the inability to make connections between classroom lessons and real life situations. Researchers reviewed solution strategies and founded three strategies that were multiple intelligences, cooperative-learning and journaling experiences. The study lasted 15 weeks and these strategies were implemented. At the and of 15 weeks the results showed that students improved their knowledge transfer through the use of multiple intelligences, cooperative-learning experiences and these three strategies improved students' knowledge transfer from classroom to daily life activities.

According to Condis, Parks, and Soldwedel, (2000) who studied on kindergarden children lacking conversational skills and language concepts, the use of MI Theory resulted in significant improvements in students' expressive and receptive language skills.

The effects of incorporating multiple intelligences strategies in the language arts were compared with traditional methods of teaching in a research made in

Suburban,Chicago Illinois school. The target group was chosen from the 2nd , 3rd and 5th grades. There was a general trend towards increase in achievement with MI strategies. Students with Individual Education Programs showed the highest success. Homework completion, quality of homework, student time on task were also improved.

There are many projects at different educational levels to which Multiple Intelligences Theory have been applied: These are: Project Zero, Arts PROPEL, Spectrum Project, Key School Project, Green Tree East, Hart-Ransom IDEAL Project, Renaissance Project.

In 1967 Nelson Goodman who founded an educational research group at the Harvard Graduate School of Education to study cognition and development in the arts believed that arts learning must be taken as an important cognitive activity but nearly nothing had been done before so they started their project and called the research group "Project Zero".

Project Zero, studied children's, adults', and organizations' learning process. Project Zero went on helping to create reflective self-directed learners and improve critical and creative thinking. The duty of Project Zero was perceiving and enriching learning and thinking. It did not concentrate only on individuals but it also dealt with classrooms, schools and other educational and cultural organizations. Creativity in the arts and scientific disciplines were also in its concern (Gardner 1993).

Project Zero, whose research programs were concentrated on a deep perception of human development and the process of learning in arts and other disciplines, put the student /learner at the center of the process. They respected the

differences in learning at different periods of life and they also took the differences between individuals into consideration.

Testing Service of Harvard Project Zero helped piloting Arts PROPEL Project in the Pittsburgh Public Schools in Pennsylvania. Middle and high school students practiced the model programmes, which combined instruction and assessment. These programmes included 3 arts: music, visual arts, imaginative writing. Arts PROPEL project dealt with these three main issues and combined these with Multiple Intelligences Theory.

PROPEL (Production, Reflection, Perception and Learning) was created to let the students recognize how the composition and the hit of artistic work were influenced by arrangements and interrelations. Arts students could be taught how to make compositional conclusions and reflect on the influences of such conclusions in their work by this method. (Coşkungönüllü, 1998)

There were there steps of the process in an Arts Propel Classroom;

1.Production: Students learned the basic artistic skills and theories by thinking about music, words or visual forms

2. *Perception:* Students could compare their works with the others by studying works of art.

3.*Reflection:* Students created their works according to their aims and abilities.

Many researchers from Harvard Project Zero and David Feldman at Tufts University started to pilot Project Spectrum, a long term collaborative project at the Elliot Pearson Children's School at Tufts University in Medford. This project offered an alternative approach to pre-school and early primary school children.

According to their belief every child shows different abilities and intelligences. The Spectrum approach tried to apply an individualized programme by identifying children's areas of strength.

Spectrum researchers tried to determine if they could identify different intellectual areas in children as young as four years old and formed activities for seven different areas of knowledge; language, math, music, art, social understanding, science and movement. The activities were in meaningful, hands-on activities such as a bus game, telling stories a story board.

The project was tried on slightly older (k-2) children of public schools in Somerville and Roxbury from 1988 to 1993. The work consisted of 1. developing a modified field inventory by using a subset of the original assessment activities. 2. forming learning centered activities to help children develop key skills in eight areas 3. adapting the Spectrum frame work for a children's museum 4. making a mentorship programme based on the Spectrum approach in an elementary school in the city.

The Spectrum approach could be used in different ways, such as an alternative assessment technique, curriculum activities or as a strong component for intervention programmes. It may lead to important changes and improvements in child's learning.

Key School Project – Pet Bolanos (1990) (as cited Oklan, 2001) developed an education program in which alternative evaluation methods were used in each class and which was prepared by interdisciplinary approach in Indianapolis in 1987; he also established an elementary school based on the multiple intelligence theory.

That project was formed in three years with the cultural organizations of artists, businessmen, government leaders, families and children. Every child who

joined the project developed three common and independent projects about interdisciplinary education approach. Every child was given a chance to improve seven intelligences and discover weak and dominant intelligences by special class environments and enriched activities. Children sometimes took part in discussions during the evaluation process. It was observed that positive motivation techniques were useful for children. Basic lessons and also environments where foreign languages were spoken, computer, visual arts, dances and music were targeted. Key School accepted the idea of providing equal education chance for every child.

Green Tree East (Oklan, 2001) an elementary multiple intelligences school was established in California Victorville in 1992. The school accepted the idea that every child can learn and children can be prepared for the society by an education which has equal quality. Basic skills were acquired by educational projects including seven intelligences. The projects lasted for 6 weeks. At the end of the projects, celebrations were arranged for the success in seven intelligences. Children were evaluated three times in a year, families took part in those evaluations. The school wanted every child to be equipped with variety of talents and skills and make them use those talents to improve their own basic learning techniques. The school was renewed every five years. And that school model believed that responsibility and success should be shared by the children and also staff for a qualified education.

Hart-Ransom- In 1992, Hart Ransom K8 rural school in California Modeso formed itself as a school of multiple intelligence theory to provide academic equality for every child and to support personal improvement. Hart Ransom aimed to meet the needs of learning through life with a qualified education in a safe educational environment. Main purpose of that school was to form a common society that can be

shared and to teach the children how to learn by enjoying themselves.

Ideal Project Bangladesh is a densely populated country and Bangladesh Government prepared a program called “equal education opportunity for every child” in1998. Unicef Bangladesh Education Department provided consultancy including brain based For a week, observations were made in every class and then the project called IDEAL (Indiana Designs Equitable Access for Learning) as managed by main education department started. Objectives of ideal project were active learning which basic education includes, teaching methods and improving school environment, and also increasing its quality.

In 1996 13.000 teachers working in 2.900 elementary schools were trained about learning and teaching by multiple methods with IDEAL project. The program reached 3.200 teachers working in 7000 schools at the end of 1998. After the training program the teachers worked about providing quality in individualized education for every child and abolishing obstacles.

On the basis of UNICEF IDEAL project seminars about new teaching learning dimensions in elementary school education were arranged in Dhaka. A lot of children started schools in Bangladesh and they enjoyed learning experiences very much. Children participated in the education actively, teachers started to give more importance to the children’s individuality. Mothers were happy with the study and thought that the project might provide the students with positive school perception, on the other hand their children who joined the project perceived the activities enthusiastic. They expressed that Bangladesh schools really improved with little money and material. Multiple Intelligences Theory was also accepted in the

Bangladesh culture well. It was a privilege for Bangladesh to work on that field and they developed a successful national education model.

Renaissance Project (Teele, 1995) - The University of California, Riverside Education Department was conducted a research project entitled the Renaissance Project. The emphasis of this project was to link instructional strategies, technology and assessment with multiple intelligences in order to maximize student learning. The study focused on developing teaching and assessment methods that relate to the student's dominant intelligences and help students develop capabilities in all seven intelligences.

The project developed teaching strategies and assessment measures that respect student diversity, made learning relevant, and provided equitable educational opportunities for all students to learn read, write, compute and be able to apply this knowledge in real life experiences.

Bruce & Linda Campbell arranged Multiple Intelligences classroom, where seven learning centers, each devoted to one of the intelligences identified by Gardner was established. The students spent approximately two thirds of their day rotating through the various stations. The morning began with a brief lecture and discussion of the classroom's current theme. Students then divided into groups of approximately four children each to begin multiple intelligences centers work. The class spent 20 to 30 minutes at each center, learning about the day's topic through all the intelligences.

This program consisted of 4 structural steps: *Basic Lesson, Multiple Intelligences based Centers, Sharing and Reviewing, Personal Project.*

I. Basic Lesson: Every school day at multiple intelligence theory based centers, started with basic lessons. Basic subject was developed according to the interests of the children and children's interests were used for this. Every basic lesson consisted of preparation step and teaching or presentation step and teaching or presentation. Some questions were answered during the basic lessons but most of them were left to be searched by the children.

II. Multiple Intelligences Based Centers: Children spent most of their school days at the centers related to seven intelligences. After basic lesson, the children were grouped and worked at the centers. They searched learning activities and the subject chosen during the basic lesson by seven ways.

The individual features at the centers and some of the typical center activities follow:

Emily Dickinson Center—*(Intrapersonal Intelligence)* journal, independent research projects, thinking skills, student choice, self-esteem activities, and learning-to-learn skills;

Mother Teresa Center—*(Interpersonal Intelligence)* cooperative learning tasks, conflict management techniques, learning games, group discussions, interviews;

Ray Charles Center— *(Musical Intelligence)* rhythmical learning activities, background music, song writing, instrument making;

Martha Graham Center—*(Bodily/Kinesthetic Intelligence)*--model building, manipulatives, puzzles, role play, dance activities, scavenger hunts, skits, simulations;

Pablo Picasso Center *—(Visual/Spatial Intelligence)* art activities, reading maps, charts and diagrams, thinking in images and pictures;

William Shakespeare Center— *(Verbal/Linguistic Intelligence)* reading, writing, word-processing, bookmaking, storytelling and creative writing activities, research, public speaking;

Albert Einstein Center— (*Mathematical/Logical Intelligence)* math games, manipulatives, timelines, flow charts, science experiments, deductive reasoning, and problem-solving activities.

III. Sharing and Reviewing Time: Children shared the things they learned after central studying time. They read poems voluntarily, made artistic work and sang songs.

IV. Personal Project: The children improved their talents at the centers. They worked at independent projects after sharing and central studying time. They started independent projects after each three- week period they presented their projects. Studies were made 12 times in a year and the children were evaluated 12 times in a year. Small group activities and research results showed that independence and responsibility of children were improved during the year.

All children developed new skills and they could practice those skills. At the beginning of the period each child targeted a favorite center and worked especially there. Each had 3 or 4 favorite centers towards the middle of the year and each started to work at least 6 centers at the end of the year. They prepared and presented individual multi model projects.

Bruce & Linda Campbell undertook a yearlong action research project to assess the effects of this multi-modal learning format. They found out that:

1. Academic achievement improved.
2. Students demonstrated increased responsibility, self-direction, and independence
3. Discipline problems were significantly reduced.
4. All students developed and applied new skills.
5. Cooperative learning skill improved in all students.

2.3 Studies on the Multiple Intelligences Theory in Turkey

An increase in academic studies in the field of multiple intelligences theory has been noticed in our country. Besides the some descriptive studies, there were several experimental studies. These studies usually include the practices of the theory in primary school education. The studies compare the effectiveness of traditional education activities and the ones that depend on Multiple Intelligences Theory.

Oklan (2001) conducted a research to find out six years old children's interest in the seven intelligence areas. The Researcher used Teele Inventory of Multiple Intelligences (TIMI) and Multiple Intelligences Developmental Assessment Scales (MIDAS) and compared their results. TIMI was administrated to the 411 six years old students. MIDAS was administrated to their families to find out their perception of their childrens' multiple intelligences.

It was found that according to the TIMI results dominant intelligences were ranked as spatial intelligence, bodily-kinesthetic intelligence and interpersonal intelligence. MIDAS results showed that according to families their childrens' dominant intelligences were ranked as spatial intelligence, interpersonal intelligence and bodily-kinesthetic intelligence.

In 1999-2000 educational year, Multiple Intelligences Theory Application project was performed as a qualitative experimental study at Başkent University College, Ayşeabla Schools whose facilitator was Gözütok (2000). This Project aimed to make the students become a ware of their abilities, parents to recognize their children's skills, parents and teacher to be informed about MI Theory and the teachers to apply educational methods which take care of the talents of their students.

In order to attain the above aims these following steps were taken: Two control lists named "what I Like" and "What I Want to Learn" were developed by using Thomas Armstrong' MI Scale. Control lists' test-retest correlations were found as r=0,93 and r=0,89. MI profiles of each class were taken and given to the teachers. Teachers were informed about MI Theory and MI Educational Methods. Parents were also informed. Each teacher planned and applied his/her lessons according to MI Theory and MI profile during March.

At the end of the project, teachers claimed that the lessons they planned and performed according to MI Theory were useful and the students were both successful and happy. They had no difficulty about class management in the lessons, which MI Theory was performed. The students said that they had learned those lessons well and felt happy during the lessons. Some of high school teachers however claimed that they had difficulty in applying MI Theory to their students.

The last grade (11th grade) students considered the activities performed during the lesson as a waste of time and said that test solving would have been more useful for them.

Demirel (1998) and his PhD students investigated whether there was a significant effect of Multiple Intelligences Theory on the fourth grade Social Science students' achievement. Beside, it was also investigated whether there was a significant effect of this theory on fourth graders' attitudes toward social science ; and what opinions and views students' teachers and observers possessed about the implementation of the theory in social science classrooms.

This study, lasting for fifteen days, was conducted with fourth graders in Ankara Tevfik Fikret College Primary School. Two classes were selected. The experimental group had social science lessons through MI Theory, whereas the control group with traditional methods.

The observation results showed that the students in the experimental group participated actively in the MI activities, produced creative and original thoughts. In addition, those MI activities affected the relationships among the students and students' MI positively.

Results of the teacher interviews showed that MI theory activities affected students positively in terms of their logical thinking, establishing relations among cases, problem solving abilities. On the other hand, the teachers also thought that when conditions of the Turkish Schools were considered, conducting MI Theory was so difficult in the schools.

Most of the students found MI activities and materials pleasant and enjoyable. Moreover, they stated that those activities and materials were more enjoyable and different than other classroom activities and materials. The

experimental group students' attitudes toward social science was significantly more positive than the students' in the control group. Finally, according to results of the achievement test there was no significant effect of MI Theory on fourth grader's Social Science achievement. According to researchers, the reason of this could be because the lessons were conducted by using MI Theory; however, the assessment of it was done by using traditional methods.

Şahin (2001) investigated whether there was a significant difference between Multiple Intelligences Theory and traditional methods on third grade Social Science students' achievement and what opinions and views experimental group students and their teacher possessed about the implementation of the theory. This research was conducted in the second term of 1999-2000 academic year with third graders in Zonguldak (Ereğli) Kışla Primary School. Pretest-posttest experimental and control group design, observations, and interviews were utilized in the study.

According to results of tests, students' achievement scores in the experimental group were significantly higher than the students in the control group. Besides, in the experimental group, there was no significant difference in terms of sex. In addition to those, the results of the observations and interviews made with the students in the experimental group indicated that using multiple intelligences activities and materials in the social science lessons affected students' multiple intelligences positively. Finally, teacher interview results showed that he had positive views on Multiple Intelligencees activities and materials.

Coşkungönüllü, (1998) investigated whether there was a significant effect of Multiple Intelligences Theory on fifth graders' mathematics achievement in her research. It was also investigated whether there was a significant effect of this theory on fifth graders' attitudes toward mathematics; and what opinions and views

students and teachers possessed about the implementation of the theory in mathematics classrooms.

This experimental research, lasting for three weeks, was conducted in the 2nd term of 1997-1998 educational year with fifth graders in TED Ankara College Primary School. Two classes each with 32 students were selected with cluster sampling. The experimental group had mathematics lessons through Multiple Intelligences whereas the control group with traditional methods.

Coşkungönüllü utilized Mathematics Achievement Test and Mathematics Attitude Scale. Also interviews were made with experimental group students and their teacher. Data analyses revealed the following: there was a significant effect of Multiple Intelligences Theory on fifth graders' mathematics achievement. There was no significant effect of Multiple Intelligences on fifth graders' attitudes toward mathematics. Both the students and their teacher had positive views and opinions about the implementation of the theory.

Bümen (1999) also investigated possible differences between multiple intelligences theory and traditional teaching. The achievements and attitudes of the students were discussed in the research. In this research, the lesson "Citizenship and Human Rights" was chosen.

The students were 112 8-grade students of a private test – retest was administered with control groups. For data collection, achievement tests and attitude scale were administered which the researcher developed.

According to results no significant difference could be seen in knowledge achievement between the group which used MI strategies and the one which used conventional method. But there was an important difference in tests including

comprehension, application and total levels for the experimental group. Also, the experimental groups' final attitude score average was higher than the control group. Furthermore, there was a significant difference between the control and the experimental groups in the retention test, it can be said that Multiple Intelligence implementations were more effective and stable in learning.

Demirci (1999) used both multiple intelligences theory and active learning approach in order to compare the effects of active learning approach on students success with the effects of traditional method. The study was carried on in Life Sciences Course that was used for the first time on second grade students of primary education in 1998-1999 term. The students were chosen from among Beytepe Primary Education school students.

The results post test average points showed that multiple intelligences and effective cooperative learning approaches had more positive results than the traditional method.

The objective of Acat's (2002) study was to find out whether multiple intelligences theory was applicable in teaching and learning situations of Turkey. The researcher analyzed the qualitative data obtained. The results fell into two categories: positive and negative effects.

The positive effects were as follows: Multiple Intelligence Theory contributed a lot to the control of the class and effectiveness of the lesson and caused a more effective evaluation. All potentials of the individual were activated by Multiple Intelligences Theory and this was contributed to social academic and personal development of the individual. In addition, it was concluded that Multiple Intelligence Theory was beneficial for the preparation of learning / teaching activities and that it had an approach different from the traditional one.

Besides, negative ideas about the realization of Multiple Intelligences Theory result from the lack of time, heavy lesson schedules in Turkey, evaluation system and overcrowded classrooms. It was observed that Multiple Intelligences Theory caused some difficulties in practice and these result from the inability in making a connection between level, subject and intelligences domain.

In this chapter the researches that explored the differences in intelligence and that consist of implication of MI Theory were included. For the first group of researchers, the results showed that reasons of difference in intelligence were depended on maturity, gender, parental fetures, education and so on. For the second group of researchers, MI Theory in school did serve to heighten student progress in an direct way. The theory served to heighten the awareness of student needs in many different types of classroom settings. Additionally, Gardner's Theory had positive influences when developing curriculum, utilizing cooperative education, and working with different populations of students. Finally, the use of Gardner's Theory enabled educators to create learning environments that better enabled all types of students to learn.

CHAPTER III

METHOD

In this chapter, methodological details of the study are presented. First, the overall research design is explained. This is followed by the research questions. After the data sources, data collection instruments and data collection procedures are presented. Then, data analysis procedures are stated. Finally, limitations concerning this study are discussed.

3.1 Overall Research Design

The purpose of the research was to investigate the different intelligences of students according to their preferences and how students' intelligences differ in terms of grade level (first, third fifth and eight class) and gender.

The study took place in Middle East Technical University Development Foundation School in the spring of the 2001-2002 academic-year and was conducted with three classes from each level namely first grade, third grade, fifth grade, eight grade. In this study, Teele Inventory for Multiple Intelligences (TIMI) and the Background Information Questionnaire were administrated to 321 students and the results were analysed.

Cross-sectional survey was used in this study. It is clear that longitudinal study is more appropriate than cross-sectional, but it also has many limitations. For

example, absence of some individuals is a frequent problem in longitudinal studies, particularly, if the study extends over a fairly long period of time. Cross-section study has also some limitations. On the other hand, cross-sectional study is less time consuming.

In this cross-sectional study, it was assumed that subjects' background was nearly the same in terms of some aspects. For example, most of the parents of these students have high level of education and high socioeconomic status. Furthermore, all of the students were at the same school, whereas most of them have been at the same school from grade 1 to grade 8.

3.2 Problem Statements

This study focused on following research questions:

1) What different intelligences do students have?

2) Do students' multiple intelligences differ in terms of gender and grade level for each intelligence?

3.3 Hypothesis

There is no significant main effect of gender and grade levels(1,3,5,8) on the students' Multiple Intelligences scores.

Hypothesis 1.1: There is no significant main effect of gender and grade levels (1, 3,5,8) on the students' Linguistic Intelligence scores.

Hypothesis 1.2: There is no significant main effect of gender and grade levels (1,3,5,8) on the students' Logical-Mathematical Intelligence scores.

Hypothesis 1.3: There is no significant main effect of gender and grade levels (1,3,5,8) on the students' Spatial Intelligence score.

Hypothesis 1.4: There is no significant main effect of gender and grade levels (1,3,5,8) on the students' Musical Intelligence score.

Hypothesis 1.5: There is no significant main effect of gender and grade levels (1,3,5,8) on the students' Bodily-Kinesthetic Intelligence score.

Hypothesis 1.6: There is no significant main effect of gender and grade levels (1,3,5,8) on the students' Intrapersonal Intelligence score.

Hypothesis 1.7: There is no significant main effect of gender and grade levels (1,3,5,8) on the students' Interpersonal Intelligence score.

3.4 Subjects

This study was conducted with first, third, fifth and eight grade students attending the METU Development Foundation School in Ankara. For each grade level 3 classes were selected, these classes were selected by the school administration. 321 students were participated in the study. The information about the students is given in the following tables 3.1, 3.2, and 3.3:

Table 3.1. Distribution of the Subjects by Grade Level and Gender

GRADE	*MALE*	*FEMALE*	*TOTAL*
FIRST GRADE	51	34	85
THIRD GRADE	43	37	80
FIFTH GRADE	51	27	78
EIGHT GRADE	42	36	78
TOTAL	186	134	321

Table 3.2 Distribution of the Subjects by The Students' Mothers' Level of Education

	High School		**University**		**Master and PhD**		**Total**	
	f	%	f	%	f	%	f	%
First Grade	15	4,7	61	19,1	9	2,8	85	26,6
Third Grade	12	3,8	46	14,4	22	6,9	80	25
Fifth Grade	10	3,1	38	11,9	30	9,4	78	24,2
Eight Grade	15	4,7	39	12,2	24	7,5	78	24,2
Total	42	16,3	184	57,5	85	26,6	321	100

Table 3.3 Distribution of the Subjects by The Students' Fathers' Level of Education

	High School		University		Master and PhD		Total	
	f	%	f	%	f	%	f	%
First Grade	6	1,8	68	21,2	12	3,7	85	26,6
Third Grade	5	1,5	50	15,6	25	7,8	80	25
Fifth Grade	5	1,5	36	11,2	37	11,5	78	24,2
Eight Grade	3	0,9	37	11,5	38	11,9	78	24,2
Total	19	5,7	191	59,7	112	35	321	100

3.5 Description of Variables

The participants' gender, and grade levels were the independent, categorical variables, and the students' Multiple Intelligence scores were the dependent variables.

3.6 Data Collection Instruments

In this research, the instruments used to collect data were Teele Inventory for Multiple Intelligences to describe students multiple intelligences and the questionnaire to get information about students and their parents.

3.6.1. Teele Inventory for Multiple Intelligences

The Teele Inventory for Multiple Intelligences (TIMI) developed by Sue Teele in 1992 was specifically designed to examine the dominant intelligences of students from kindergarten through the twelfth grade, and acts as an indicator as to whether students in different grade levels possess different intelligences or not. TIMI is a forced choice pictorial inventory that contains 56 numbered pictures of panda bears representing characteristics of each of the seven intelligences and provides students twenty-eight opportunities to make their selections of two choices (See Figure1). The different intelligences are matched with one another and students for eight different times select each of the seven intelligences.

Scoring the TIMI: The transparency sheet (See Figure 2) is placed over the responses on the answer sheet (See Figure 2). Marks in the appropriate boxes below the answer sheet for each of the responses are recorded. For example, response one was either 1 or 3. A mark in either 1-Linguistic or 3-Spatial is placed. For number two the responses are either 4 or 5. Then all 28 responses are marked like that. When it is finished, the marks for the responses in each of the seven intelligences are tallied up. The maximum score of the inventory is eight. Based on the number of each, student's most dominant intelligences are determined.

Figure 3.1: Example Picture from Teele Inventory of Multiple Intelligences

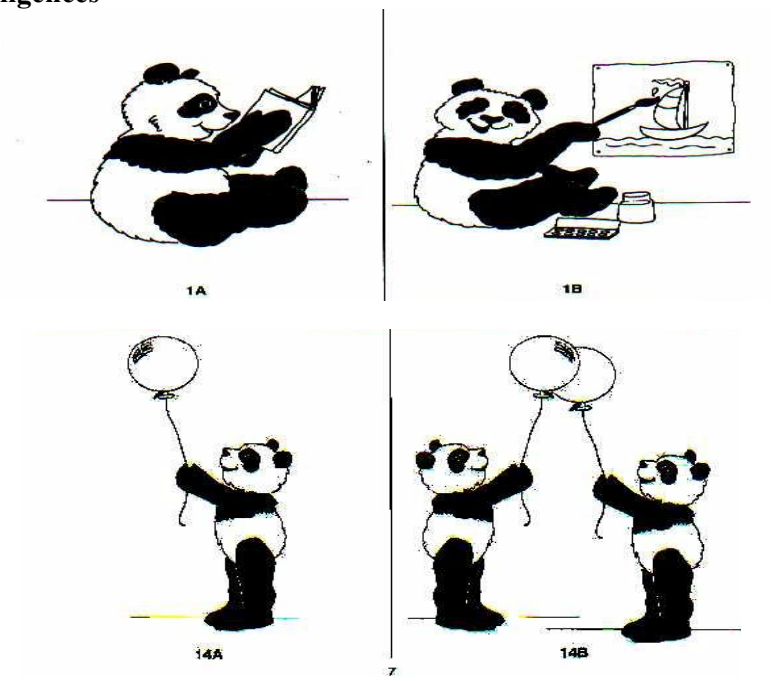

Figure 3.2: Teele Inventory Of Multiple Intelligence Answer Sheet

The Teele Inventory Of Multiple Intelligences

Name:
Grade:

Answer Sheet

	A	B		A	B
1			15		
2			16		
3			17		
4			18		
5			19		
6			20		
7			21		
8			22		
9			23		
10			24		
11			25		
12			26		
13			27		

The Teele Inventory Of Multiple Intelligences

Name:
Grade:

Answer Sheet

	A	B		A	B
1	1	3	15	7	5
2	4	5	16	2	5
3	1	7	17	4	2
4	7	2	18	4	6
5	3	5	19	3	7
6	1	6	20	2	3
7	4	3	21	1	7
8	1	5	22	5	4
9	2	3	23	2	6
10	4	7	24	6	3
11	1	4	25	1	6
12	1	2	26	3	5
13	6	5	27	2	4
14	6	7	28	7	6

3.6.1.1 Validity and Reliability of the TIMI

Sue Teele stated that establishing reliability and validity for the TIMI has been an on-going process. When the instrument was created, she conducted field-testing at an elementary school to analyze each of the pictures to determine content validity. Based on an item-by-item analysis many corrections were made to the pictures in the inventory in order to make them as valid as possible to the specific intelligence they represented. An examination of each picture was done to see if the pictures adequately represented descriptors for each of the seven intelligences.

Validity of the TIMI:

In order to establish validity for the TIMI Teele examined the results of two students scores at a school she studied which compared TIMI to the Metropolitan Achievement Test (MAT 6). The MAT 6 is designed to measure the achievement of students in reading, mathematics, language, science and social studies.

Student number one, a third grade male, scored five points on linguistic intelligence and eight points on logical-mathematical intelligence on the TIMI. On the MAT 6 taken in March , 1993 he scored at the 81% in total reading, 84% in total language, 96% in math and 92% overall in the total battery. Comments from his teacher in his report card indicated strengths in language, reading and mathematics. There was a high correlation between the two assessments as in mathematics. He scored the highest number of points in mathematics, 8, and received his highest scores on the MAT 6 in math. His score of five points on the TIMI correlates with his scores in reading and language as his scores were as follows: Vocabulary-92%, Word Recognition-97%- Reading Comprehension-65%- Spelling-61%, Language- 93%, Total Reading- 81%, Total Language-84%. Student number one indicated in an interview that math was his most favorite subject and that he wanted to be a math

teacher when he became an adult. He also indicated that reading and spelling were hard for him, which was supported by his scores in spelling, 61% and reading comprehension 65%.

Student number two, a third grade male, scored eight in logical-mathematical and five in linguistic intelligence on the TIMI. His total math scores in March, 1993 was 99%. It was the same score in March 1992 indicating he has maintained a strong dominance in mathematical ability. There was a high correlation between his TIMI score of 8 in logical mathematical intelligence and his MAT 6 score of 99% in mathematics. His total language score in March 1993 was 78% but his reading score was 98%. In March, 1992 his total reading and language scores were both 99%. His TIMI score in linguistic intelligence was a 5 and was his third highest score indicating strength in this area but not as strong as the logical mathematical intelligence. There was a positive correlation between these two test results as well.

Reliability of the TIMI :

In order to establish reliability for the TIMI Teele conducted 4 weeks, 3weeks and 2 weeks test – retest between April, 1992 and August, 1993. The correlation coefficients of each intelligence within a .01 significance level were the following:

Table 3.4. Reliability of the TIMI (1)

INTELLIGENCES	*4 WEEKS*	*3 WEEKS*	*2 WEEKS*
Linguistic	.6308	.6213	.6458
Logical-Mathematical-	.6602	.6840	.8117
Intrapersonal-	.5471	.4961	.4582
Spatial-	.4870	.5812	.7717
Musical	.6002	.6586	.8819
Bodily-Kinesthetic-	.5153	.5977	.5881
Interpersonal-	.5452	.6153	.5460

3.6.1.2 Piloting of the TIMI

Pilot study of the inventory was made in Private Tevfik Fikret School in İzmir in the spring of the 2001-2002 academic-year. The researcher made the reliability and validity studies related to the inventory. Before making these studies, researcher investigated whether the inventory was appropriate for the Turkish culture and Turkish students. So, the following were carried out:

Interview with Experts about the TIMI:

In April 2002, in order to investigate whether the inventory was appropriate for the Turkish culture and the students, researcher made interviews with experts, a pedagogue, a teacher, a psychological consultant and guidance teacher and a

psychologist. In the interview, they were asked whether the pictures in the inventory were appropriate for the Turkish students. They said that the inventory was appropriate for the Turkish culture and Turkish students; however, they suggested that the researcher had better explain some of the pictures to the students during the application.

Besides these interviews, in April 2002 at Private Tevfik Fikret School in İzmir, the researcher applied Teele Inventory of Multiple Intelligence totally to ten students from the first, second, third, fourth, fifth and sixth grades and observed whether the students had any difficulty in figuring out the pictures. No such difficulties were observed.

The Validity Studies of TIMI :

Two methods were used for obtaining evidence for the validity of the TIMI. For mathematical-logical and linguistic intelligences, correlation between students' mathematical-logical TIMI score and mathematics course score, correlation between linguistic TIMI score and Turkish course score were examined. For the other intelligences, some interviews have been made with the teachers of the students who got high scores from the TIMI and students' interests and abilities were asked considering their intelligences.

Firstly, thirty students, from third, fourth and fifth grades, with high TIMI mathematical– logical scores and thirty students with high linguistic scores were chosen. Then, these students' Turkish course grade and mathematic course grade were compared with the students' linguistic and logical-mathematical intelligences scores. Pearson product moment correlation was used to calculate the correlation between the linguistic intelligence scores and Turkish course score, and between the logical-mathematical score and the math course score.

The results showed that the correlation between the linguistic score and the Turkish course score was significant at the level 0,05 (r:0,413 p<0,05) And the correlation between logical-mathematical and math course score was significant at the level 0,05 (r:0,391 p<0,05)

Secondly, the students who had got high scores from the other intelligence fields except for the Mathematical-logical and linguistic were studied. The views of the teachers of these students are as in the following:

Class 3 – A; Student A : The TIMI Spatial score of the student was 7 out of 8. Researcher discussed with her classroom teacher and art teacher about the student. According to the teachers, Student A was a successful student, who loves learning with visual materials and perfectly depicts objects and is good at art. It was also explained that she was placed in an art competition held in the school.

Class 3 – B; Student B: The bodily kinesthetic score of the student was 8 out of 8. From talk with her gym teacher, it has been learned that she was happy and successful in the classroom activities in which she uses her body. Furthermore, it was learned that she has been attending to ballet and gymnastics classes and was very successful at gym.

Class 5 –B; Student C; The TIMI interpersonal score of the student was 7 out of 8. From the interview with his teacher, it was learned that his social skills were well developed and his relations with his friends were very good. He was empathic and successful in teamwork, and his leadership ability was well developed.

Class 3 – C; Student D; his intrapersonal score was found to be 7 out of 8. It was learned from his teacher that he was aware of his weak and strong points, criticizes himself and he was more successful at individual work.

Class 5 – B; Student E ; the TIMI musical score of the student was 8 out of 8. It was learned from his teacher that he was quite sensitive to the sounds, is interested in musical instruments and played guitar, org and he also practiced in the school choir.

The Reliability Studies:

In April 2002 at Private Tevfik Fikret Schools in İzmir, with a goal of studying the reliability of the TIMI, three subgroups were formed for the study of 2 weeks 3weeks 4 weeks test – retest reliability. The two- weeks' group included 126 students, the three- weeks' group included 45 students, and four- weeks' group included 45 students. The correlation coefficients for each intelligence found to be:

Table3.5. Reliability of the TIMI(2)

INTELLIGENCES	*4 WEEKS*	*3 WEEKS*	*2 WEEKS*
LINGUISTIC-	.584**	.621**	.688**
LOGICAL-MATHEMATICAL	.652**	.601**	.772**
SPATIAL-	.417*	.570**	.615**
MUSICAL-	.576**	.747**	.706**
BODILY-KINESTHETIC	.477**	.543**	.618**
INTRAPERSONAL-	.392*	.500**	.511**
INTERPERSONAL-	.414*	.558**	.648**

***p< 0,05 **p<0,01**

Therefore, The Teele Inventory for Multiple Intelligences (TIMI) developed by Sue Teele in 1992 was selected in order to use in this research. There were some reasons to select TIMI. Firstly, TIMI gives chance to examine the dominant intelligences of students from kindergarten to through the twelfth grade. Secondly, TIMI is a forced choice pictorial inventory that contains 56 numbered pictures of

panda bears representing characteristics of each of the seven intelligences and provides students twenty-eight opportunities to make their selections of two choices. It was thought that being pictorial students might find TIMI interesting. Thirdly, validity and reliability results which were made by Sue Teele and researcher showed quite good results. Lastly, results of Interview with Experts about the TIMI showed that experts find this inventory appropriate for the Turkish culture and Turkish students.

3.6.2 Background Information Questionnaire:

The Background Information Questionnaire was composed of the questions about the demographic information of the students and their parents.

3.7 Procedure:

Teele Multiple Intelligences Inventory was applied in the spring term of 2001-2002 academic year at METU Development Foundation School. 321 students participated in the study from first, third, fifth and eight grades.

First of all, the aim of the study was explained to the students. Then, it was said that a pair of 28 panda pictures would be shown to them. Then, students were asked to select one of the two pictures from each pairs that they felt more like them. It was said to students that there were no right or wrong answers.

During the application, the TIMI booklets were given to the students of the first grade and they were asked to mark the pictures they liked on the booklets. For

the other grades, the pictures were shown via projector in the other classrooms and the students were asked to mark their preferences on the answer sheets.

Besides, the Background Information Questionnaire was administered which was composed of the questions about the demographic information of the students and their parents, after the application of Teele Inventory of Multiple Intelligences.

The instruments were administered at the proper class hours determined by the school management. The application lasted for 25-30 minutes.

3.8 Data Analysis Procedures

The purpose of the research was to investigate the different intelligences of students according to their preferences and how students' intelligences differ in terms of grade level (first, third fifth and eight class) and gender.

For the first problem mean and standard deviation were used and for the second problem MANOVA was used to examine the difference between the students' TIMI scores averages by considering, grade levels and genders.

3.9 Limitations of the Study

Because of the fact that the study is a cross-sectional it has some limitations. The initial limitation was related to the assumption of the similarity of students' socio-economic and cultural backgrounds. Although it is assumed that the subjects have nearly the same background in terms of their parents' level of education and socioeconomic status, and their being at the same school, this assumption may not reflect all of the subjects' features.

The second limitation was related to the number and the level of the students attended to the study. 321 students from four different grade levels- first grade, third grade, fifth grade and eight grades- may not be enough to reflect all of the grade level features.

CHAPTER IV

RESULTS

In this chapter, the results gained through the data analyses of instrument of the research are presented.

4.1 Interpretations From Teele Inventory of Multiple Intelligences

Problem 1: What different intelligences do students have?

To find and answer to this problem What different intelligences do students have? the students' picture preferences means and standard deviations were calculated. As the table 4.1 indicates, students at the first grade level demonstrated strong preference for linguistic intelligence ($\overline{X}$=5,51 sd=1,78) and logical-mathematical intelligence ($\overline{X}$=4,81 sd=1,95) and the two intelligences followed were spatial intelligence ($\overline{X}$=4,35 sd=1,47), and bodily kinesthetic intelligence ($\overline{X}$=4,31 sd=1,62).

The third grade students' most dominant intelligences were interpersonal ($\overline{X}$=4,59 sd=1,43), spatial ($\overline{X}$=4,55 sd=1,53), logical-mathematical ($\overline{X}$=4,50 sd=2,09), and linguistic intelligence ($\overline{X}$=4,40 sd=1,56).

For the fifth grade students, interpersonal intelligence ($\overline{X}$ = 6,23 sd=1,23) bodily-kinesthetic intelligence ($\overline{X}$ =4,86 sd=1,54), spatial intelligence ($\overline{X}$ =4,31 sd=1,22), musical intelligence ($\overline{X}$ =3,54 sd=1,21) were more dominant.

For the students at the eight grade interpersonal intelligence ($\overline{X}$ =6,44 sd=1,73), bodily kinesthetic intelligence ($\overline{X}$ =4,82 sd=1,73), musical intelligence ($\overline{X}$ =4,08 sd=1,89) spatial intelligence ($\overline{X}$ =3,81 sd=1,60) were more dominant.

Table 4.1. **The Seven Intelligences by Gender and Grade Level**

	First Grade						Third Grade						**Fifth Grade**						Eight Grade						Total			
	Male		***Female***		Total		Male		Female		Total		Male		Female		Total		Male		Female		Total		Male		Female		Total	
	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*	$\overline{X}$	*S*
Linguistic	5,81	1.78	5,03	1,70	**5,51**	1.74	4,28	1,82	4,54	1,22	**4,40**	1,56	3,25	1,28	3,04	1,34	3,18	1,30	3,02	1,26	3,08	1,34	3,05	1,29	3,82	1,72	3,96	1,64	4,07	1,75
Logical-mathematical	5,00	2,02	4,52	1,82	**4,81**	1,95	5,35	2,01	3,51	1,73	**4,50**	2,09	3,41	2,15	2,48	1,81	3,09	2,07	3,38	2,16	2,25	1,83	2,86	2,08	4,29	2,25	3,21	1,99	3,84	2,21
Spatial	4,23	1,58	4,55	1,28	**4,35**	1,47	4,58	1,56	4,51	1,50	**4,55**	1,53	4,45	1,60	4,04	1,22	**4,31**	1,49	3,81*	1,53	3,81*	1,70	**3,81**	1,60	4,28	1,58	4,23	1,48	4,26	1,54
Musical	2,79	1,63	3,85	1,42	3,20	1,62	2,30	1,49	4,24	1,62	3,18	1,82	3,12	1,29	4,33	1,21	**3,54**	1,38	3,48	1,71	4,78	1,87	**4,08**	1,89	2,92	1,57	4,31	1,59	3,50	1,72
Bodily-kinesthetic	4,63	1,44	3,79	1,76	**4,31**	1,62	4,21	1,32	3,68	1,65	3,96	1,50	4,82	1,60	4,93	1,44	**4,86**	1,54	5,21	1,69	4,36	1,68	**4,82**	1,73	4,72	1,54	4,14	1,70	4,48	1,63
Intrapersonal	2,54	1,51	2,94	1,12	2,69	1,38	2,42	1,87	3,05	1,51	2,71	1,73	2,86	1,20	2,48	1,34	2,73	1,26	2,67	1,76	2,86	1,10	2,76	1,49	2,63	1,58	2,86	1,28	2,72	1,47
Interpersonal	4,15	1,53	3,33	1,29	3,84	1,49	4,79	1,44	4,35	1,40	**4,59**	1,43	5,96	1,88	6,74	1,23	**6,23**	1,71	6,24	1,91	6,67	1,49	**6,44**	1,73	5,26	1,89	5,21	1,99	5,24	1,93

Note: Maximum Score was 8.

Problem 2: Do students' multiple intelligences differ in terms of gender and grade level (first, third, fifth, eighth) for each intelligence?

To find out, whether the students' gender and grade levels affected the difference among the mean scores of the seven intelligence fields MANOVA was used. This research had two independent variables gender, grade levels and seven dependent variables linguistic, logical-mathematical, spatial, musical, bodly kinesthetic, intrapersonal and interpersonal test scores. In this study, it was examined interaction among these two independent and seven dependent variables that is why MANOVA was used in this study. In order to test hypothesis 1 seven sub hypothesizes were set. The results are presented in the following tables:

Hypothesis 2.1: There is no significant main effect of gender and grade levels(1,3,5,8) on the students' linguistic Intelligence scores.

Table 4.2 Linguistic Intelligence Scores by Grade Level

Linguistic Intelligence Scores	Male		***Female***		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	5,81	1,78	5,03	1,70	5,51	1,74
Third Grade	4,28	1,82	4,54	1,22	4,40	1,56
Fifth Grade	3,25	1,28	3,04	1,34	3,18	1,30
Eight Grade	3,02	1,26	3,08	1,34	3,05	1,29
Total	3,82	1,72	3,96	1,64	4,07	1,75

As can be seen in the table 4.3 while there was no significant difference among the students' linguistic intelligence mean scores according to gender (p>0,05), there was a significant difference among the students' mean scores of linguistic intelligence according to grade levels, first, third, fifth, eight grades (p<0,05) In order to see which ones differ from the others, the Scheffe Test was used.

Table 4.3. The Results of the MANOVA Among the Students' Mean Score of Linguistic Intelligence According to the Grade Levels and Gender

Source	*Type III Sum of Squares*	*df*	$\overline{X}^2$	*F*	*p*
Gender	2,185	1	2,185	,159	,690
Grade	296,328	3	98,776	7,205	,000
Gender * Grade	12,212	3	4,071	,297	,828
Error	4291,262	313	13,710		

Gender p>0,05 Grade p<0,05 Gender * Grade p>0,05.

From Scheffe Test it is seen that:

- There was a significant difference between the first graders' linguistic intelligence mean score and fifth graders' means score (p<0,05) (first graders' $\overline{X}$ =5,51 sd=1,74 fifth graders' $\overline{X}$ = 3,18 sd=1,30)
- There was significant difference between the first graders' linguistic intelligence mean score and eight graders' means score (p<0,05) (first graders' $\overline{X}$ =5,51 sd=1,74 eight graders' $\overline{X}$ =3,05 sd=1,29)

In terms of gender and grade levels interaction, there was no significant interaction among the students' mean score of linguistic intelligence according to their gender and grade levels (p>0,05).

Hypothesis 2.2: There is no significant main effect of gender and grade levels(1,3,5,8) on the students' of Logical-Mathematical Intelligences scores.

Table 4.4 Logical-Mathematical Intelligence Scores by Grade Level

Logical-Mathematical Intelligence Scores	Male		***Femal e***		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	5,00	2,02	4,52	1,82	4,81	1,95
Third Grade	5,35	2,01	3,51	1,73	4,50	2,09
Fifth Grade	3,41	2,15	2,48	1,81	3,09	2,07
Eight Grade	3,38	2,16	2,25	1,83	2,86	2,08
Total	4,29	2,25	3,21	1,99	3,84	2,21

As indicated in the table 4.5 there was significant difference among the students' logical-mathematical intelligence mean scores according to gender ($p<0,05$). (females' logical-mathematical intelligence $\overline{X}$ = 3,21 sd=1,99 males' $\overline{X}$ =4,29 sd=2,25).

Table 4.5. The Results of the MANOVA Among the Students' Mean Score of Logical-Mathematical Intelligence According to the Grade Levels and Gender

Source	*Type III Sum of Squares*	*df*	$\overline{X}^2$	*F*	*p*
Gender	92,270	1	92,270	23,770	,000
Grade	232,054	3	77,351	19,927	,000
Gender * Grade	18,919	3	6,306	1,625	,184
Error	1215,002	313	3,882		
Total	6297,000	321			

Gender $p<0,05$ Grade $p<0,05$ Gender * Grade $p>0,05$

Besides there was significant difference among the students' logical-mathematical intelligence mean score according to grade levels ($p<0,05$) In order to see which ones differ from the others, Scheffe Test was used:

From Scheffe Test the following conclusion can be made:

- There was significant difference between the **first** graders' logical-mathematical mean score and the **fifth** graders' mean score ($p<0,05$) (first graders' $\overline{X}$ =4,81 sd=1,95 fifth graders' $\overline{X}$ = 3,09 sd=2,07)
- There was significant difference between the **first** graders' logical-mathematical mean score and **eight** graders' logical-mathematical mean score ($p<0,05$) (first graders' $\overline{X}$ =4,81 sd=1,95 eight graders' $\overline{X}$ =2,86 sd=2,08)
- There was significant difference between the **third** graders' logical-mathematical mean score and **fifth** graders' mean score ($p<0,05$) (third graders' $\overline{X}$ =4,50 sd=2,09 fifth graders' $\overline{X}$ =3,09 sd=2,07)

- There was significant difference between the **third** graders' logical-mathematical mean score and **eighth** graders' logical-mathematical mean score of linguistic intelligence (p<0,05) (third graders' $\overline{X}$ =4,50 sd=2,09 eight graders' $\overline{X}$ =2,86 sd=2,08)

According to the students' gender and grade levels interaction, their mean scores of logical-mathematical intelligence got in TIMI did not show a significant interaction (p>0,05).

Hypothesis 2.3. There is no significant main effect of gender and grade levels(1,3,5,8) on the students' Spatial Intelligences scores.

Table 4.6: Spatial Intelligence Scores By Grade Level

Spatial Intelligence Scores	Male		***Femal e***		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	4,23	1,58	4,55	1,28	4,35	1,47
Third Grade	4,58	1,56	4,51	1,50	4,55	1,53
Fifth Grade	4,45	1,60	4,04	1,22	4,31	1,49
Eight Grade	3,81	1,53	3,81	1,70	3,81	1,60
Total	4,28	1,58	4,23	1,48	4,26	1,54

Table 4.7. The Results of the MANOVA Among the Students' Mean Score of Spatial Intelligence According to the Grade Levels and Gender

Source	Type III Sum of Squares	df	$\overline{X}^2$	F	*p*
Gender	,141	1	,141	,060	,806
Grade	23,761	3	7,920	3,401	,018
Gender * Grade	5,043	3	1,681	,722	,540
Grror	728,826	313	2,329		
Total	6579,000	321			

Gender p>0,05. Grade p<0,05 Gender * Grade p>0,05.

As can be seen from table 4.7 there was no significant difference among the students' spatial intelligence mean scores according to their gender (p>0,05).

On the other hand, there was significant difference among the students' spatial intelligence mean scores according to their grade levels (p<0,05). In order to see which ones differ from the others, the Scheffe Test was used.

From Scheffe Test it is seen that

- There was significant difference between the **third** graders' spatial mean score and **eight** graders' spatial mean score (p<0,05) (third graders' $\overline{X}$ =4,55 sd=1,53 fifth graders' $\overline{X}$ = 3,81 sd=1,60)

There was no significant interaction among the students' spatial intelligence mean scores according to their gender and grade levels (p>0,05).

Hypothesis 2.4.: There is no significant main effect of gender and grade levels(1,3,5,8) on the students' Musical Intelligences scores.

Table 4.8 Musical Intelligences Scores By Grade Levels

Musical Intelligence Scores	Male		**Female**		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	2,79	1,63	3,85	1,42	3,20	1,62
Third Grade	2,30	1,49	4,24	1,62	3,18	1,82
Fifth Grade	3,12	1,29	4,33	1,21	3,54	1,38
Eight Grade	3,48	1,71	4,78	1,87	4,08	1,89
Total	2,92	1,57	4,31	1,59	3,50	1,72

As can be seen in the table 4.9 there was significant difference among the students' means score of musical intelligence according to their gender ($p<0,05$). (Females' musical intelligence score $\overline{X}= 4,31$ sd=1,59 males' $\overline{X}= 2,92$ sd=1,57).

Table 4.9. The Results of the MANOVA Among the Students' Mean Score of Musical Intelligence According to the Grade Levels and Gender

Source	*Type III Sum of Squares*	*df*	$\overline{X}^2$	*F*	*p*
Gender	146,363	1	146,363	61,018	,000
Grade	37,560	3	12,520	5,220	,002
Gender * Grade	8,919	3	2,973	1,239	,295
Error	750,789	313	2,399		
Total	4870,000	321			

Gender $p<0,05$ Grade $p<0,05$. Gender * Grade $p>0,05$.

There was also significant difference among the students' spatial intelligence mean scores according to their grade levels ($p<0,05$) In order to see which ones differ from the others, the Scheffe Test was used.

From Scheffe Test it can be seen that:

- There was a significant difference between the **third** graders' musical intelligence mean score and **eight** graders' mean score (p<0,05) (first graders' $\overline{X}$ =3,20 sd=1,62 eight graders' $\overline{X}$ = 4,08 sd=1,89)
- There was a significant difference between the **first** graders' musical intelligence mean score and **eight** graders' mean score (p<0,05) (third graders' $\overline{X}$ =3,18 sd=1,62 eight graders' $\overline{X}$ = 4,08 sd=1,89)

In terms of gender and grade levels interaction, there was no significant interaction among the students' mean score of musical intelligence according to gender and grade levels (p>0,05).

Hypothesis 2.5.: There is no significant main effect of gender and grade levels(1,3,5,8) on the students' Bodily-Kinesthetic Intelligence scores.

Table 4.10. Bodily-Kinesthetic Intelligence Scores By Grade Levels

Bodily-Kinesthetic Intelligence scores	Male		**Female**		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	4,63	1,44	3,79	1,76	4,31	1,62
Third Grade	4,21	1,32	3,68	1,65	3,96	1,50
Fifth Grade	4,82	1,60	4,93	1,44	4,86	1,54
Eight Grade	5,21	1,69	4,36	1,68	4,82	1,73
Total	4,72	1,54	4,14	1,70	4,48	1,63

As shown in the table 4.11 there was a significant difference among the students' mean score of bodily-kinesthetic intelligence according to gender (p<0,05).

Females' bodily kinesthetic intelligence mean score was ($\overline{X}$ = 4,14 sd=1,70) males' was ($\overline{X}$ = 4,72 sd=1,54)

Table 4.11: The Results of the MANOVA Among the Students' Mean Score of Bodily-Kinesthetic Intelligence According to the Grade Levels and Gender

Source	*Type III Sum of Squares*	*df*	$\overline{X}^2$	*F*	*p*
Gender	21,830	1	21,830	8,834	,003
Grade	46,635	3	15,545	6,291	,000
Gender * Grade	11,079	3	3,693	1,494	,216
Error	773,438	313	2,471		
Total	7294,000	321			

Gender $p<0,05$. Grade $p<0,05$ Gender * Grade $p>0,05$.

There was also a significant difference among the students' bodily-kinesthetic intelligence mean scores according to grade levels, first, third, fifth, eight grade ($p<0,05$) In order to see which ones differ from the others, the Scheffe Test was used.

From Scheffe Test it can be seen that:

- There was significant difference between the **third** graders' bodily-kinesthetic intelligence mean score and the **fifth** graders' mean score ($p<0,05$) (third graders' $\overline{X}$ =3,96 sd=1,50 fifth graders' $\overline{X}$ = 4,86 sd=1,54)
- There was significant difference between the **third** graders' bodily-kinesthetic intelligence mean score and **eight** graders' means score ($p<0,05$) (third graders' $\overline{X}$ =3,96 sd=1,50 eight graders' $\overline{X}$ =4,82 sd=1,73)

In terms of gender and grade levels interaction there was no significant interaction among the students' mean scores of bodily-kinesthetic intelligence according to gender and grade levels ($p>0,05$).

Hypothesis2.6. There is no significant main effect of gender and grade levels(1,3,5,8) on the students' Intrapersonal Intelligences scores.

Table 4.12. Intrapersonal Intelligences Scores By Grade Levels

Intrapersonal Intelligences Scores	Male		**Female**		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	2,54	1,51	2,94	1,12	2,69	1,38
Third Grade	2,42	1,87	3,05	1,51	2,71	1,73
Fifth Grade	2,86	1,20	2,48	1,34	2,73	1,26
Eight Grade	2,67	1,76	2,86	1,10	2,76	1,49
Total	2,63	1,58	2,86	1,28	2,72	1,47

As seen from the table 4.13 there was no significant difference among the students' spatial intelligence mean scores according to their gender (p>0,05) Similarly, there was no significant difference among the students' spatial intelligence mean scores according to grade levels (p>0,05).

Table 4.13: The Results of the MANOVA Among the Students' Mean Score of Intrapersonal Intelligence According to the Grade Levels and Gender

Source	*Type III Sum of Squares*	*df*	$\overline{X}^2$	*F*	*p*
Gender	3,469	1	3,469	1,612	,205
Grade	,335	3	,112	,052	,984
Gender * Grade	10,480	3	3,493	1,623	,184
Error	673,578	313	2,152		
Total	3068,000	321			

Gender p>0,05 Grade p>0,05. Gender * Grade p>0,05

In terms of gender and grade levels interaction, there was no significant interaction among the students' mean scores of intrapersonal intelligence according to their gender and grade levels (p>0,05).

Hypothesis 2.7: There is no significant main effect of gender and grade levels(1,3,5,8) on the students' Interpersonal Intelligences scores.

Table 4.14 Interpersonal Intelligence Scores By Gade Levels

Interpersonal Intelligence Scores	Male		**Female**		Total	
	$\overline{X}$	S	$\overline{X}$	S	$\overline{X}$	S
First Grade	4,15	1,53	3,33	1,29	3,84	1,49
Third Grade	4,79	1,44	4,35	1,40	4,59	1,43
Fifth Grade	5,96	1,88	6,74	1,23	6,23	1,71
Eight Grade	6,24	1,91	6,67	1,49	6,44	1,73
Total	5,26	1,89	5,21	1,99	5,24	1,93

As can be seen in the table 4.15 there was no significant difference among the students' means score of interpersonal intelligence according to gender (p>0,05).

Table 4.15 The Results of the MANOVA Among the Students' Mean Score of Interpersonal Intelligence According to the Grade Levels and Gender

Source	Type III Sum of Squares	df	$\overline{X}^2$	F	Sig.
Gender	1,266E-02	1	1,266E-02	, 005	, 943
Grade	417,514	3	139,171	56,398	, 000
Gender * Grade	10,779	3	3,593	1,556	,225
Error	772,377	313	2,468		
Total	9997,000	321			

Gender P>0,05 Grade P<0,05 Gender * Grade P>0,05

On the other hand, there was significant difference among the students' interpersonal intelligence mean scores according to grade levels (p<0,05) In order to see which ones differ from the others, the Scheffe Test was used.

From Scheffe Test it can be seen that:

- There was a significant between the first graders' interpersonal intelligence mean score and third graders' mean score (p<0,05) (first graders' $\overline{X}$ = 3,84sd=1,49 third graders' $\overline{X}$ = 4,59 sd=1,43)
- There was a significant difference between the first graders' interpersonal intelligence mean score and fifth graders' mean score (p<0,05) (first graders' $\overline{X}$ = 3,84sd=1,49 fifth graders' $\overline{X}$ = 6,23 sd=1,71)

- There was a significant difference between the first graders' interpersonal intelligence mean score and eight graders' mean score ($p<0,05$) (first graders' $\overline{X} = 3,84$ sd=1,49 eight graders' $\overline{X} = 6,44$ sd=1,73)
- There was a significant difference between the third graders' interpersonal intelligence mean score and fifth graders' mean score ($p<0,05$) (third graders' $\overline{X} = 4,59$ sd=1,43 fifth graders' $\overline{X} = 6,23$ sd=1,71)

Lastly, there was no significant interaction among the students' interpersonal intelligence mean scores according to gender and grade levels ($p>0,05$)

Table 4.16 Summary of Results for Problem Two Differences Observed According to Grade Level and Gender For Each Intelligence

	Linguistic	Logical-Matehematical	Spatial	Musical	Bodly-Kinesthetic	Intrapersonal	Interpersonal
Grade	1x5	1x5	3x8	1x8	3x5	1x3	
Level	1x8	1x8		3x8	3x8	1x5	
		3x5				3x5	
		3x8				3x8	
Gender		x		x	x		

CHAPTER V

CONCLUSION AND IMPLICATIONS

In this chapter, conclusions drawn from the results and interpretation of the findings are reviewed first. Then some suggestions for the institution are made. Finally, suggestions for further research are presented.

5.1. Conclusion and Interpretations of the Findings

The purpose of the study was to investigate the students' multiple intelligences according to their picture preferences and how students' multiple intelligences differ in terms of grade level (first, third fifth and eighth) and gender.

This research was conducted at Middle East Technical University Development Foundation School in the spring of the 2001-2002 academic-year with three classes from each level namely first grade, third grade, fifth grade and eight grade. In this study, Teele Inventory for Multiple Intelligences (TIMI) was applied on 321 students and the results were analyzed. In order to investigate the students' multiple intelligences according to their picture preferences, means and standard deviations were calculated and MANOVA were used.

Table 5.1. Dominant Intelligences by Grade Level

Intelligences / **Grade level**	Linguistic	Logical-Mathematical	Spatial	Musical	Bodily-Kinesthetic	Interpersonal	Intrapersonal
First grade	X	X	X		X		
Third grade	X	X	X			X	
Fifth grade			X	X	X	X	
Eight grade			X	X	X	X	

From the data obtained from the administration of TIMI on students, several results were observed. First of all, students multiple intelligences showed variety according to their grade levels. For example, the students demonstrated strong preference for linguistic intelligence and logical-mathematical intelligence in the first grade and the two intelligences were followed by spatial intelligence, and bodily kinesthetic intelligence. While the third grade students demonstrated strong preference for interpersonal, spatial, logical-mathematical, and linguistic intelligences, the fifth and eight grade students' strong preferences were interpersonal, bodily-kinesthetic, musical, and spatial intelligences.

Secondly, according to MANOVA results, except for intrapersonal intelligence scores, students' MI scores; linguistic, logical-mathematical, spatial, musical, bodily kinesthetic, interpersonal, significantly differed in terms of grade levels. The grade levels caused a change and this change may be caused by several factors among which the existing curricula being implemented at the schools today or maturity may be considered. These findings were parallel with Sue Teele (2000)

results. She administrated Teele Inventory of Multiple Intelligences over 6000 students from kindergarten to twelfth grade in 1992. She found that the first grade students' dominant preferences were for spatial, logical-mathematical, bodily-kinesthetic and linguistic intelligences. The students in the third grade were demonstrated the strong picture preference for spatial, bodily-kinesthetic, interpersonal and linguistic and logical-mathematical intelligences. The student's picture preferences in the fifth grade were spatial, bodily kinesthetic, interpersonal and musical while the students in the middle school were the most dominant in interpersonal, spatial, bodily-kinesthetic and musical intelligences.

These findings were also similar to Shearer' research results (1999). She conducted The Multiple Intelligence Developmental Assessment Scales (MIDAS) on 1679 students from kindergarten to the eighth grade in order to define the students' most dominant intelligences. It was found that the students at the first grade level demonstrated strong preference for musical and spatial intelligences and these two intelligences were followed by interpersonal intelligence, and bodily kinesthetic intelligence. Whereas for the students in the third grade the most dominant intelligences were spatial, bodily kinesthetic the fifth grade students were strongest in spatial intelligence, musical interpersonal, and bodily-kinesthetic intelligence. Additionally the students at the eighth grade were strongest in musical intelligence, intrapersonal intelligence, and spatial intelligence.

As mentioned before, the change in the intelligences regarding the grade levels may be explained by the existing curricula being implemented at the schools today and cognitive development.

The results revealed that in the first and third grades, the dominant intelligence types are linguistic and mathematical-logical ones whereas in the fifth and eighth grades, the dominant intelligence types are interpersonal, spatial, musical and bodily kinesthetic ones. This can be explained as a result of the programs implemented in the schools.

The students in the first and third grades showed some differences than the students in the fifth and eighth grades. The first difference is the number of the courses and their contents.

According to Turkish Primary School Education Curriculum the students in the first and third grades took the courses of Turkish, Mathematics, Life Sciences, Art, Music, Physical Education, Individual and Group Activities. At these grades, curriculum mainly focus on developing some basic skills such as reading, writing and math. In other words, the main purpose of the curriculum in the first and third grades is to develop students' linguistic and mathematical intelligences. Nonetheless, in the fifth and eight grades, there is an increase in the number of the courses the students are supposed to take. In the fifth grade, the number of the courses increase from seven to eleven and in the eighth grade, the number of courses become thirteen. Therefore at these levels, the courses and their contents gain variety. Since it is accepted that they have developed basic linguistic and mathematical skills beforehand, the students are expected to realize more complex objectives by using these basic skills.

When these findings are elaborated with regard to the students, the school and class activities at first grades were interesting for them. The center of their lives includes these activities. They come across the courses of mathematics and Turkish

for the first time; therefore, these courses attracts their attentions. They spend most of their times with these activities and they do not get bored. Nevertheless, the needs and interests of the students starts to change after the fifth grade. The school and class activities in the first and third grades do not seem interesting for them. The program implemented after the fifth grade becomes more complicated for the students and it is expected for them to think in amore complex way and to solve more complex problems. Thus, the students can get bored. This can cause them to get away the school experiences mostly referring to linguistic and mathematical intelligences.

The other difference is the instructional methods and techniques utilized in the classrooms. The students at the first and third grades are usually at the concrete operational stage. Hence, their interests and participation can be increased by implementing the concrete instructional methods and using some materials, pictures, colorful objects, games, role-plays, and group activities. This can help the linguistic and mathematical intelligences aimed at this level to be developed. However, when the high grades are concerned, more abstract instructional methods and less colorful materials are initiated. This can reduce the interests and participation of the students. As a result of this, the students can develop different interest areas such as arts and sports. At these grades, this condition can lead to improve their musical, spatial, and bodily-kinesthetic intelligences. Additionally, the activities of singing songs, drawing pictures, games and role-plays may help the musical, spatial, bodily-kinesthetic intelligences of the students.

The last significant difference is that the students in the first grades are more ego-centric; however, it was observed that in line with their social development the interpersonal intelligence of them developed.

With respect to curriculum, the courses of Turkish and Mathematics, the students in the fifth and eight grades, whose blending of interpersonal relations and exploration of careers begin (Vygotsky, 1978), take the courses of Science, Social Studies, Citizenship and Human Rights Education and Turkish Republic Revolution and Kemalism. The main objective of these courses is to help students to understand society and social relationships. These may help students develop their interpersonal intelligence.

Regarding the cognitive development of the students, the results can be explained according to two theorists: Piaget and Vygostsky.

According to Piaget, there were four primary cognitive developmental stages; *sensorimotor, preoperations, concrete operations* and *formal operations. These* stages are related to characteristic age periods, and every stage have many detailed forms of structure. To illustrate, the concrete operational period have more than forty different structures including classification and relations, spatial relationships, time, movement, chance, number, conservation and measurement. All of these characteristics may affect students multiple intelligences.

The other scholar is Vygotsky. The main issue of Vygotsky's (1978) theory was that social interaction had an important role in the development of cognition. Vygotsky claimed "every function in the child's cultural development appears twice; first, on the social level, and later, on the individual level; first between people (interpsychological) and then inside the child (intrapsychological). This applies

equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals".

According to Vygotsky (1978), when a child was 2 years old it was important to manipulate the objects. Role-play and symbolic activity appeared between 3 and 7 years. During the following four years, until the age of 11 development of formal study at school was emphasized. Adolescence was a period in which the mixture of interpersonal relation and exploration of careers started.

Considering the cognitive development theories of Piaget and Vygotsky, they both emphasize that every age has its own characteristics and the interests and needs of the children can show some differences accordingly. Thus, it can be explained that intelligences may change according to age, which can refer to the grade levels as well. Moreover, Vygostsky (1978), different from Piaget, stresses on the effects the social interaction. According to him, the development of the intelligence is influenced by the relations with himself and with others. This brings about two concepts of Howard Gardner: enrichment and opportunities. Also, it reveals that these concepts are important for the development of the intelligences. Gardner claimed that capacities of intelligences were improved and encouraged by environmental richness and opportunities (Eleanor & Sharon, 1998). It can be said that the development of the exceptional accomplishment required special environmental support, excellent teaching, and motivational encouragement.

To elaborate the results of this study it is necessary to know the other factors affecting the development of the intelligences. Biological endowment, personal life history, cultural and historical background are three main factors that development of intelligence depends on. A person's intelligence is affected by the interaction of them

(Armstrong, 1994). The other factors required to be concerned are activators and deactivators of Intelligences which are *Crystallizing experiences and Paralyzing experiences* (see Introduction chapter pp.25-26) (Armstrong, 1994). All these factors and their relations with each other may influence the results of this study. In this study, these factors are not concerned since no data was gathered from the students in line with them.

Lastly, results revealed that gender differences were statistically significant in logical-mathematical, bodily kinesthetic and musical intelligences scores. It was observed that the male students' logical-mathematical and bodily kinesthetic intelligence smean score was higher than female students whereas the female students' musical intelligence mean score was higher than male students.

This result may be caused by many reasons. First reason may be related with history or culture. Gurian, M (2001) stated that historically, in Western and East cultures, education has been both a male and a masculine domain. While learning facilities including schools and universities were set up for boys and men, women were, until the late nineteenth century, educated in the home and according to their gender roles.

On the other hand, Piaget's (1996) stages of cognitive development do not take sex or gender into consideration when differentiating among the levels of development. It may be argued that because sex differences are not a factor in Piaget's analysis he offers a universal and therefore unbiased account of cognitive development in children.

The second reason may be related with altering the brain physically. While gender affects the types of knowledge and ways of knowing we are exposed to from

birth, there are also gender differences that physically alter the brain. Studies on "brain sex" – the physical differences between females' brains and males' brains – have revealed quantifiable evidence that males and females really do develop and think differently based on the structure of their brains, the presence and amount of certain chemicals and hormones detected within the brain, and the parts of the brain that are active when the reception and processing of information occurs (Gurian, 2001).

On the other hand there is a danger in ascribing too rigidly to 'brain sex' models and explanations of cognitive differences between men and women. Physical differences between male and female brains, such as females' use of emotive reasoning in the limbic region of the brain, may be used to justify historically misogynist assumptions concerning women. It is considered that men use logic whereas women rely on emotional reasoning, or that women excel in language while men excel in spatial manipulation. (Gurian, 2001).

In conclusion, the purpose of the study was to investigate the students' multiple intelligences according to their preferences and how students' multiple intelligences differ in terms of grade level (first, third, fifth and eighth) and gender.

Results showed that students multiple intelligences showed variety according to their grade levels. The students at the first grade level demonstrated strong preference for linguistic intelligence and logical-mathematical intelligence in the first grade and the two intelligences were followed by spatial intelligence, and bodily kinesthetic intelligence. While the students in the third grade were dominant in the interpersonal, spatial, logical-mathematical, and linguistic intelligences, the students in the fifth grade were dominant in the interpersonal, bodily-kinesthetic, musical, and

spatial intelligences. The students in the eighth grade were dominant in the interpersonal, bodily-kinesthetic, musical, and spatial intelligences. In terms of gender, it can be said that the mean score of the male students' logical-mathematical and bodily kinesthetic intelligences were higher than the ones of female students' whereas the mean score of the female students' musical intelligence was higher than the ones of the male students'.

It is considered that this study contributes to the literature regarding the clues about the differences in accordance with each age level of the students and their gender in some parts. It is expected that these findings can help the discipline problems to be solved and the interests and needs of the students to be considered when the class activities are designed.

5.2 Suggestions for Administrators and Teachers

The findings of this study indicated that students' MI differed in terms of grade levels, first, third, fifth, eighth, and some intelligences fields, mathematical-logical, bodily-kinesthetic and musical, according to gender.

As can be seen from the results, all grades, first, third, fifth, eighth, had different dominant multiple intelligences. These results may help to develop appropriate and effective curricula.

Determining the students' MI is important in terms of students and instruction. Açıkgöz (2002) claimed that the definitions about the students' MI fields would be useful in determining the easier learning way. Besides, she emphasized that by the information related to the MI fields of the students, one might use to plan how

he/she could understand himself/herself better, increase his/her awareness, use his strong sides and develop his/her weak points.

Outcomes of determining students' MI studies may be also useful aspects of curriculum and instruction. Results of kinds of these studies may provide source to develop curricula and to form instructional designs in which individual differences, interests, and skills are regarded, students' multiple intelligences are allowed to develop and contemporary instructional methods are used.

5.3 Implications for Research

This study was conducted with first, third, fifth and eight grade students. It may be a worthwhile attempt to investigate students' multiple intelligences at kindergarten, high school and university levels, these levels may show other variances.

Secondly, future researchers may compare private school' students' MI with public school' students' MI. These kinds of research results may provide information about environmental effect on child's social development.

Finally, effects of MI based curriculum design on students' MI development may be examined by using pre-post test research design.

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