THE ROLE OF BRAIN-BASED GENDER DIFFERENCES ON THE VOCABULARY LEARNING AND CONSOLIDATION SKILLS AND STRATEGIES

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the Master of Science/Arts/Doctor of Philosophy.

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ABSTRACT

THE ROLE OF BRAIN-BASED GENDER DIFFERENCES ON THE VOCABULARY LEARNING AND CONSOLIDATION STRATEGIES

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This study aims to investigate the possible relationship between the differences of the male and female brain and vocabulary learning strategies of male and female students. For this purpose, a study has been carried out with a group of 200 students attending the Preparatory Program at TOBB University of Economics and Technology.

This study initially aims to identify the differences between the biology of the male and female brain as well as the hormones influencing the memory and vocabulary retention. This information will then be applied to the vocabulary learning strategies of males and females.

In order to identify the strategies used by males and females, a questionnaire was administered to a group of students attending the Preparatory Program at TOBB Economy and Technology University. Before the main study, the questionnaire was administered as a pilot study with 50 students from the same achievement group. After the pilot study of the questionnaire; validity, reliability and factor analysis studies were carried out. All of these subjects were at the same level of proficiency.

The relationship between the genders and their vocabulary learning strategies was studied according to the results of the study through statistical evaluation through t-test analysis on SPSS. The data collected through the questionnaire were analyzed by comparing them to the literature suggesting the differences between the male and female brain characteristics.

As the result of this study, it has been found out that females use more variety of strategies than males. Females have been found to employ determination, social, and cognitive strategies more frequently than males while males employ memory strategies more than females. In addition, there was not a statistically significant difference between the use of metacognitive strategies of male and female participants.

Keywords: The male and female brain, recall, consolidation, learning skills and strategies

ÖZ

SÖZCÜK ÖĞRENME VE PEKİŞTİRME STRATEJİLERİNDE BEYİN TEMELLİ CİNSİYET FARKLILIKLARININ ROLÜ

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Bu çalışmanın amacı, kadın ve erkek beyinlerinin farklılıkları ve bu farklılıkların kız ve erkek öğrencilerin sözcük öğrenme stratejilerine etkisini araştırmaktır. Bu amaç doğrultusunda, TOBB Ekonomi ve Teknoloji Üniversitesi Hazırlık programından 200 öğrenci ile bir çalışma yapılmıştır.

Bu çalışma ilk olarak, kadın ve erkek beyinleri arasında, belleği ve sözcük öğrenmeyi etkileyen biyolojik ve hormonal farklılıkları bulmayı amaçlamaktadır. Daha sonra, bu bilgi, kadın ve erkek öğrencilerin sözcük öğrenme stratejilerine uygulanmaktadır.

Kadın ve erkek öğrenciler tarafından kullanılan stratejiler arasında fark olup olmadığını belirlemek için, TOBB Ekonomi ve Teknoloji Üniversitesi Hazırlık programından 200 öğrenciye, sözcük öğrenme ve öğrenilen sözcüğün anlamını pekiştirme amacıyla kullandıkları stratejileri belirlemek üzere bir anket uygulanmıştır. Asıl uygulamadan önce, anketin güvenirliğini sağlamak üzere bir

pilot uygulama da yapılmıştır. Çalışmada yer alan tüm katılımcıların İngilizce düzeyinin aynı olmasına özen gösterilmiştir.

Çalışmanın sonunda, cinsiyet ve sözcük öğrenme stratejileri arasındaki ilişki SPSS programı üzerinde t-test yöntemi ile analiz edilmiştir. Daha sonra ise çalışmanın sonucunda elde edilen veriler, bu alandaki daha önce elde edilen verilerle karşılaştırılmış ve kadın ve erkek beyinlerinin özellikleriyle ilişkilendirilmiştir.

Çalışmanın sonunda, kız öğrencilerin sözcük öğrenme ve pekiştirme stratejilerini erkek öğrencilerden daha sık kullandıkları ortaya çıkmıştır. Kız öğrencilerin, karar verme stratejilerini, sosyal ve zihinsel stratejileri daha çok kullandıkları ortaya çıkmış, buna karşılık, erkek katılımcıların da ezberleme stratejilerini daha sık kullandıkları görülmüştür. Üstbilişsel stratejilerin kullanımında ise, kadın ve erkek katılımcıların kullanımları arasında istatistiksel anlamda önemli bir fark ortaya çıkmamıştır.

Anahtar Sözcükler: Kadın ve erkek beyni, hatırlama, pekiştirme, öğrenme becerileri ve stratejileri

To My Parents Hafize and İsmail Üster

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CHAPTER I

INTRODUCTION

1.1.Background to the Study

Language is the basic tool by which individuals shape their thoughts and transmit them to others. Among the functions of this tool are analyzing, logical thinking, solving problems and planning (Fromkin & Rodman, 1998).

For centuries, people have been searching for the ability of expressing themselves in a multilingual way. In this way, many students in the traditional language teaching classes of today learn a foreign language sufficient to express themselves. However, very few of them achieve fluency in the language and even less could become bilingual. Therefore, research in the fields of language acquisition and learning have been going on steadily and researchers have been working on *language,* which is a quite complex concept.

Such research for effective language learning as well as the recent developments in the field of language has pushed researchers and educators to examine the relationship between the brain and language out of which is born the theory of "Brain Based Learning." Brain Based Learning is a theory based on how the brain learns naturally. Although it is a new theory, many educators have been utilizing it in the field of teaching language and other subjects effectively and meaningfully to the students in class via Brain Based Learning.

However, it is believed that more specific aspects of language teaching and learning can be included in the studies so that literature can benefit from the research on the human brain, learning and language. Therefore, this present research intends to explore whether males and females learn differently. In other words, this

study aims to study male and female brains and their biological differences in terms of the content of language learning. The structures of male and female brains and the hormones influencing them will indicate ways about their learning patterns, memory and retention so that educators can have ideas about how to approach language teaching by taking into consideration gender-based biological differences.

1.2.The Study

Specifically, this study aims to investigate the gender-based brain differences and vocabulary learning and consolidation strategies of male and female students. In order to identify these differences, a questionnaire was used.

1.2.1. Participants

This study has been carried out on 200 students at TOBB University of Economics and Technology Preparatory class. The students are 18-19 years old and they are equally divided in number for different genders. The students at the Preparatory Program are organized in achievement groups according to the scores they get in TOEFL ITP exam, which they have taken at the beginning of the semester. All of the participants are at Achievement Group A. Therefore, the proficiency levels of the subjects taking part in the study are very close and they have the similar background.

1.2.2. Methodology

The questionnaire used as the tool in this study is adapted from Schmitt and McCarty's *A Taxonomy of Vocabulary Learning Strategies* (1997). Catalan (2003) used the strategies described by Schmitt and McCarty (1997) and under the guidance of that taxonomy of strategies; she designed a questionnaire for her study. This tool has been presented in English in Catalan's (2003) paper. However, considering the proficiency level of the subjects taking part in this study, the

instrument was translated into Turkish so that there is not a place for any kind of misunderstanding for the students influencing the results of the research. Therefore, the tool is translated into Turkish as a process of adaptation.

Before the main study took place, the questionnaire was administered to a smaller population of participants as a pilot study. The participants of the pilot study were 50 male and female students who had the same characteristics as the main population of participants. For instance, they were in Achievement Group A and they had the same background and the same level of proficiency as the main participants of the study. Moreover, they had the same age-level characteristics. After the pilot study, the items of the questionnaire were analyzed and the items which had low reliability and validity values were adapted and replaced with other items. Then, the questionnaire was administered to other 200 students at TOBB Economics and Technology University.

After the questionnaire was administered, the results of male and female students were compared via statistical analysis in order to identify whether males and females use different strategies for discovering the meaning of words and for consolidating the learning. The analysis was carried out through t-test on SPSS.

1.3. Research Questions

This study intends to answer the following research questions.

1. Do males and females use different strategies to discover the meaning of an unknown word?

2. Do males and females use different strategies to consolidate the learning of a word after discovering its meaning?

3. What skills are used more frequently by students in relation to their learning strategy preferences?

a. What skills are used more frequently by female students in relation to their learning strategy preferences?

b. What skills are used more frequently by male students in relation to their learning strategy preferences?

4. What is the interconnection between the findings of the present study and the literature on gender-based brain functioning differences?

a. The relationship between vocabulary learning strategies used by female students and gender-based brain differences

b. The relationship between vocabulary consolidation strategies used by female students and gender-based brain differences

c. The relationship between vocabulary learning strategies used by male students and gender-based brain differences

d. The relationship between vocabulary consolidation strategies used by male students and gender-based brain differences

1.4. Purpose of the Study

This study aims to investigate the gender-based brain differences and vocabulary learning and consolidation strategies of male and female students.

Therefore, it is initially aimed to identify the differences between the male and female brain as well as the hormones influencing the memory and retention. Then the language learning strategies, along with the vocabulary learning and consolidation strategies are studied and are associated with the differences between the male and female brain. The statistical analysis of the data collected through the study will indicate the vocabulary learning and consolidation strategies of male and female students.

1.5. Significance of the Study

The subject of the study is related to the identification of vocabulary learning strategies of learners of English and it adapts these differences into the different genders. Moreover, the results of this study are linked to the male and female brain. That is, the implications of this study are based on the biological facts confirmed by various studies including MRI scans. While making suggestions about male and female students' ways of learning vocabulary, the study will base its findings on the biological fact that since male and female brains are biologically different, male and female students are expected to have different performances on vocabulary studies.

In addition, this study will make suggestions about the different perception patterns of male and female students during learning and it will give clues about how to approach different genders so that both of them can learn in the same way as their brain learns.

1.6. Limitations of the Study

The participants of the study are in 10 groups in the Preparatory Program. However, the first drawback of this might be the bias due to the subject characteristics in the groups. That is, since there are 10 different groups, some measures have been taken for the sake of standardization. In order to minimize such bias of subjects, the subjects in the groups were held equal in their level of proficiency and background knowledge.

This study includes 200 students. The study has implications about the vocabulary retention of male and female students. However, the results of the study cannot be generalized to all students at the other universities or all the gender studies.

Finally, the researcher did not use MRI type of research to see how the male and the female brains function differently.

1.7. Definition of Terms

1.7.1. Recall

When the brain stores a piece of information or experience, it does not make use of a certain place for keeping these pieces. No complete information is stored anywhere in the brain. These memories are reconstructed every time from the disassembled parts which are stored in specialized networks of cells. Therefore, what we know is built on bits and pieces of many aspects of a given thing that is not represented at a single location (Wolfe, 2001). Therefore, our ability to remember is actually a process of reconstruction of these pieces. Recall is an activation of all these separate sites in unity, creating an integrated experience.

There are strategies which make the recalling process easier for the learners, such as including emotions, creation of meaning, creating multiple memory pathways and so on. These factors contribute to the process of reconstructing the pieces to recreate the whole experience or memory.

1.7.2. Consolidation

Consolidation refers to the persistence of the learnt item so that it can be revealed at a later time. In other words, consolidation is the process of making memories more stable and creating stronger representation over time. Through consolidation, the connections are strengthened and stabilized over time and this process can be achieved through rehearsal.

Consolidation is related to storing information in the long term memory. Therefore, the hippocampus and the structures in the medial temporal lobe have

important roles for consolidation since the hippocampus is crucial in the formation of the long-term memory.

1.7.3. Learning Strategies

Learning strategies are steps which students take to enhance their own learning. Strategies enable learners to become active, self-directed and involved during the learning process. According to Oxford (1990), strategies are specific actions taken by the learner to make learning easier, faster, more self-directed and more effective.

1.7.4. Skills

Skills are the specific steps and actions which learners take in order to discover the meaning of a word or consolidate the meaning after discovering its meaning. Skills exist under the sets of direct and indirect strategies.

CHAPTER II

LITERATURE REVIEW

2.0. Presentation

This chapter presents the background research and theories that prepare the ground for the current study. First, the structure of the brain with its interior and exterior parts and their functions are explained. Then, the ways that the brain process information are described, discussing the roles of brain cells and chemical messengers. After that, the relationship between the brain and learning, the brain and language and their implications on gender-based brain differences are explained. Then, memory formation patterns are presented. Afterwards, language learning strategies and vocabulary learning strategies are explained and their classifications are described. In addition, some the findings of some studies regarding the individuals' use of vocabulary learning strategies are presented.

2.1. The Structure of the Brain

The adult human brain is a wet and fragile mass that weighs around 1300-1400 grams. 78% of it is made up of water, 10% is made up of fat and protein constitutes 8% of it.

From the outside, the brain's most distinguishing feature is its folds. The folds or wrinkles are part of the cerebral cortex, which is the outer cover of the brain. Although some minor wrinkles are unique to each brain, several major wrinkles and folds are common to all brains (Sousa, 2001). These wrinkles allow the covering to maximize the surface area, allocating more cells on the surface of the brain.

The brain makes up critical portions of the nervous system and its nerve cells are connected by almost 1 million nerve fibers. This fact gives humans unlimited flexibility for learning (Jensen, 1998).

2.1.1. The Cerebrum

Cerebrum is the largest part of the brain and it constitutes more than 80 % of the brain volume by weight. Cerebrum is divided into two halves named cerebral hemispheres, as the left hemisphere and the right hemisphere. The left side of the body is controlled by the right hemisphere while the left hemisphere controls the right side of the body. The two hemispheres are connected to each other by a neural cable called the *corpus callosum*. The corpus callosum enables the two hemispheres to communicate with each other and to coordinate activities (Sousa, 2001).

The two hemispheres are covered by a thin and folded surface called *cortex*. Most actions, such as thinking, memory, speech and muscular movement are controlled by the areas in the cerebrum.

The major parts of the outside of the brain include the frontal, temporal, occipital, and parietal lobes, the motor cortex and the cerebellum. At the front part of the brain rest the *frontal lobes* which are responsible for planning and thinking. Frontal lobes are the executive control center of the brain as they monitor higher-order thinking and problem solving skills and regulate the emotional system. Moreover, focus occurs in the frontal area since most of the working memory is located in the frontal lobe. Above the ears are the *temporal lobes*, which deal with sound, speech and some parts of long-term memory. *Occipital lobe* is at the back of the brain and it is used for visual processing. *Parietal lobe* is near the top of the brain and it mainly deals with orientation, calculation and some types of recognition. There is a band between parietal and frontal lobes, across the top of the brain, from

ear to ear. This strip is called *motor cortex* and it controls body movements and works with *cerebellum* to coordinate the learning of motor skills (Sousa, 2001). Figure 1 indicates the exterior parts of the brain.

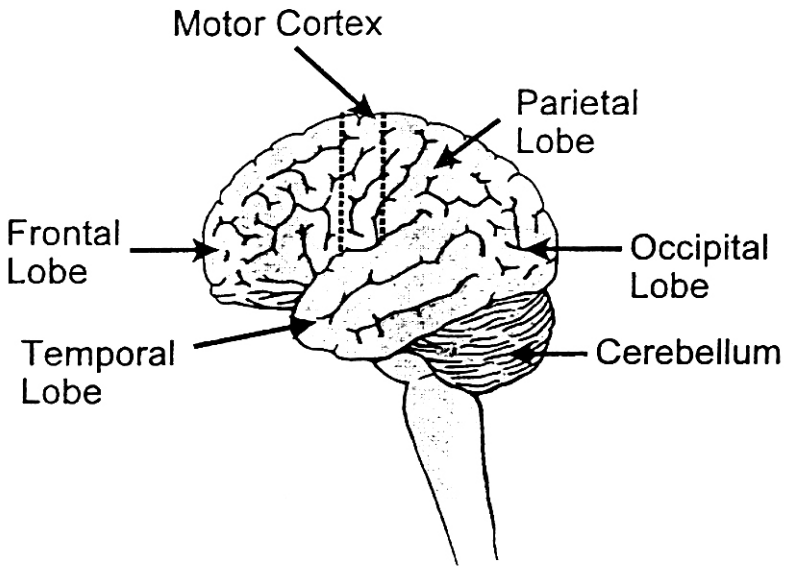

Figure 1. Exterior Parts of the Brain (Sousa, 2001)

Therefore, it can be asserted that such physical divisions also identify different functional divisions as well.

2.1.2. The Brain Stem

The brain stem is the oldest and the deepest area of the brain which evolved 500 million years ago (Jensen, 1998). It is also referred to as the reptilian brain since it resembles the brain of a reptile. The brain stem includes the ends of almost all nerves which go to the brain. Many basic body functions, such as heartbeat, respiration, body temperature and digestion are monitored and controlled here. The

brain stem also includes the Reticular Activating System (RAS), which is responsible for the brain's alertness (Sousa, 2001).

2.1.3. The Limbic System

The limbic system is located above the brain stem and is made up of many structures. Each of these structures carries out a number of different functions. One of these functions is that it regulates emotions. The limbic system also carries out the task of classifying the experiences that the brain stores in long-term memory (Sylwester, 1995). The limbic system is placed between the cerebrum and the brain stem and this fact allows the interaction between emotion and reason (Sousa, 2001).

The limbic system is made up of three parts and they are important for learning and memory.

2.1.3.1. The Thalamus

All sensory information, except smell, coming to the brain goes first to the thalamus and then is directed to other parts of the brain for further processing (Sousa, 2001). Therefore, it informs the brain about what is happening outside the body. Moreover, the thalamus is responsible for all the flow of information which comes from and goes to the frontal lobe.

2.1.3.2. The Hypothalamus

The hypothalamus monitors the internal regulatory systems. In other words, it informs the brain about what is happening in the systems and organs inside the body. For example, when the blood contains too much salt, it is the hypothalamus that initiates a search for water. Also, in case of a threatening situation, the hypothalamus activates a fight-or-flight response to the stressful situation (Sylwester, 1995).

2.1.3.3. The Amygdala

The amygdala is attached to the end of the hippocampus and it plays an important role in emotions. Sylwester (1995) states that it is connected to most brain areas, especially the sensory processing areas. Its principal task is to filter and interpret the incoming sensory information in the context of our survival and emotional needs and then to help start appropriate responses. Thus, it is important as it influences both early sensory processing and higher levels of cognition.

2.1.3.4. The Hippocampus

The amygdala is attached to the hippocampus. The hippocampus is located near the base of the limbic area and deals with memory-related tasks. The hippocampus holds memory of the immediate past and it eventually dispatches the memory to the cortex where it is stored as long-term memory (Wolfe, 2001). People who have suffered serious damage to the hippocampus cannot recall anything in their immediate past or cannot form new long-term memories.

According to Sousa (2001), the hippocampus also works to convert important short-term experiences into long-term memories via electrical signals. This process is essential for the creation of meaning.

In Figure 2, the interior parts of the brain are indicated.

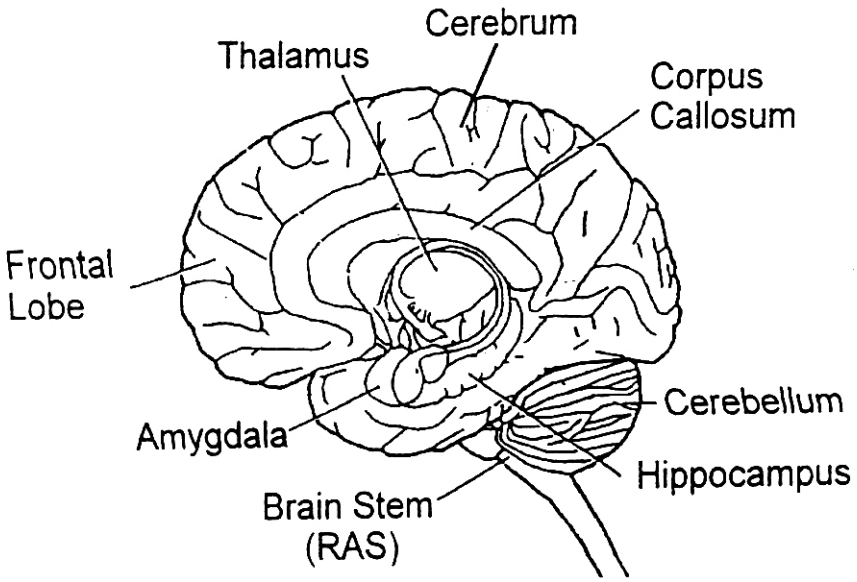

Figure 2. Interior parts of the Brain (Sousa, 2001)

2.2. Brain Specialization

One fascinating characteristic of the human brain is its ability to bring the separate and apparently disconnected activities carried out in certain locations together and to work as a unified whole. In the brain, certain areas are concerned with performing specific tasks. For example, the frontal lobe is responsible for emotional control while the auditory cortex responds to sound input. Sousa (2001) defines this ability of certain areas of the brain to perform exclusive functions and processes as *brain specialization* or *lateralization*.

2.2.1. Hemispheric Specialization

The hemispheric lateralization theory was popularized in the 1970s and it supported an orderly separation of mental functions to either of the hemispheres (Dhority & Jensen, 1998).

The brain has two hemispheres: The left hemisphere and the right hemisphere. The two hemispheres are connected to each other by nerve fibers known as the *corpus callosum,* which has about 250 million nerve fibers (Jensen, 1998). Corpus callosum allows for the connection between the two hemispheres. This interhemispheric connection enables each side of the brain to exchange information. This exchange of information disproves the inaccurate perception that the brain has separate functional areas working independent of each other. In fact, as Dhority and Jensen (1998) express, the brain is a bilateral organ that works interdependently. Each side of the brain processes things differently but they are designed to work as an integrated system as they are connected.

2.2.1.1. The Left Hemisphere

Sousa (2001) defines the left hemisphere as the *logical* brain. It controls the right side of the body. The left hemisphere processes things more in parts and sequentially (Jensen, 1998). It monitors the areas for speech. It evaluates material in a rational way. It understands the literal interpretation of words and detects time and sequence. It also recognizes words, letters and numbers written as words (Sousa, 2001). According to Sylwester (1995), the left hemisphere of most people includes the mechanisms that analyze the individual elements by carefully examining the details.

While early research focused on the left hemisphere dominance in the process of language learning, a modern and more appropriate model offers complex and simultaneous input followed by the processes of analysis and synthesis. In fact, early language development is more of a bi-hemispheric process (Sylwester, 1995).

2.2.1.2. The Right Hemisphere

The right brain is the *intuitive* hemisphere according to Sousa (2001). It manages the left side of the body. It gathers information more from images than from words and looks for patterns. It interprets language through context, body language, emotional content and tone of voice rather than through literal meanings. It works better in spatial perception and is the center of creativity. It also recognizes places, faces and objects.

For most people, the right hemisphere specializes in *synthesis.* Synthesis provides a quick and general sense of what is perceived and how the units are related. It can be called the metaphoric mind because metaphors, graphs, maps, cartoons and so on can be experienced and interpreted in the right hemisphere (Sylwester, 1995).

Although lateralization provides a kind of differentiation of tasks, the corpus callosum enables them to synchronize their activities. For example, the left hemisphere processes the content of language as *what* is said whereas the right hemisphere processes the emotional content of facial expressions, gestures and language intonation as *how* it is said. By processing the related information from different perspectives, the hemispheres collaborate to produce an outcome which is a unified mental experience (Sylwester, 1995).

In addition, the tasks which each hemisphere is engaged with can also be determined based on the level of expertise. For example, although music is generally known to be processed in the right hemisphere, professional musicians process music in their left hemisphere. Also, most of the left-handers use their right hemisphere for language. While analytical tasks, such as mathematics, problem solving and chess, are known to left hemisphere activities, higher level

mathematicians, problem solvers and chess players have more right hemisphere activation during these activities. Also, for many right-handers, the gross motor functions are controlled by the right hemisphere and fine motor is more related to the left brain activity.

What's more, left brain can also be engaged in the perception of emotions although emotions are usually known to be controlled by the right hemisphere. While the right hemisphere recognizes negative emotions faster, the right hemisphere notices positive emotions faster Sylwester (1995) thinks this is because emotions are more related to synthesis than analysis of information. The left hemisphere is more active when people experience positive emotions (Jensen, 1998).

Figure 3 indicates the brain hemispheres with their functions.

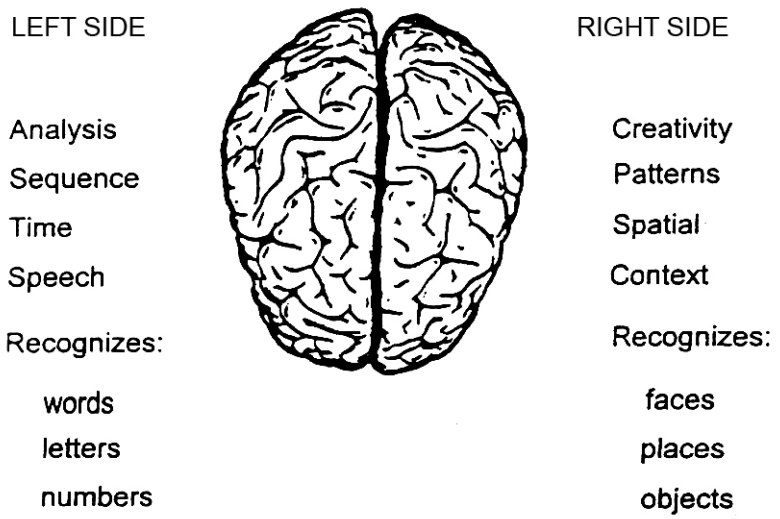

Figure 3. Left and Right Brain Hemispheres (Sousa, 2001)

There are research studies conducted to examine the relationship between brain hemispheres and language. For instance, Mills et al. (2004) researched the

role of infants' brain in learning words and found out that some differences between the vocabulary comprehension levels of infants exist. According to the study, these differences result from lateralization and different hemispheric specialization. That is, the left or right brain dominance influences the speed and time of learning words among infants. In this study, the researchers presented twenty-two normally developing infants from 17 to 21 months of age and presented them with unknown words accompanied by a muppet show. Simultaneously, they examined the infants' brain activity as they were presented with the unknown word. The results indicated that the vocabulary size of an infant is largely related to the left hemisphere of the brain. Also, the experiment indicates that individual experience with words is an important factor in determining the patterns of brain activity invoked during word processing. Mills et al. (2004) state that the experience of the infant with individual words leads to increased cerebral specialization in the brain activity.

This and such research indicate that the study of the human brain has various suggestions and implications regarding the abilities of people and functions of brain facts on those abilities.

2.3. How does the Brain Process Information?

2.3.1. Brain Cells

The human brain is composed of nerve cells, *neurons,* and support cells called *glial cells.* 90 percent of our brain cells are glia while the remaining 10 percent are neurons (Jensen, 1998). As Sylwester (1995) points out neurons are the principal cellular agents of cognition and the glial cells function in key areas of brain development and maintenance. Messages are carried throughout our brain and body from one neuron to another.

2.3.1.1. Glial Cells

Glial cells also referred to as glia, which means "glue," function as the glue which holds the brain together. They have no cell body. There are about 1000 billion of glial cells in the brain (Sousa, 2001).

Glial cells are used by newly-formed neurons while they are moving from the brain area where they were created by cell division to the specific areas where they will carry out their appropriate neural functions. Therefore, glial cells are very important in establishing the general structure of the brain (Sylwester, 1995). The chemical balance within the brain cells must strictly be controlled by the brain since chemical imbalances may result in mental problems. At this point, glial cells have an important role as they form the blood-brain barrier. That is, there are many unnecessary or even dangerous items carried in the bloodstream. Glial cells hinder those molecules to enter the brain.

Another function of glial cells is that they assist in the control of the brain's immune system and metabolize the neurotransmitters in the cerebral cortex. Neurotransmitters are a molecule released by neurons to transmit messages to the other neurons (Sylwester, 1995). In addition, as Sousa (2001) points out some glial cells have a role in regulating the rate of neuron signaling.

2.3.1.2. Neurons

Sousa (2001) defines neurons as the functioning core for the brain and entire nervous system. There are about 100 billion neurons in the brain.

The brain processes messages within an information network which includes the brain, sense organs, muscles, and so on and most of those messages are carried by neuron-to-neuron communication. A neuron continuously receives messages from and sends messages to the other cells (Sylwester, 1995). Therefore, neurons are

responsible for information processing and converting chemical and electrical signals back and forth (Jensen, 1998).

As Jensen (1998) puts it, neurons are different from other nerve cells in the body in that they are responsible for information processing and converting chemical and electrical signals back and forth. Two things are critical about a neuron when compared with other cells in the body. First, according to recent research, although some areas of the brain can grow new neurons, in general nerve cells do not regenerate like body cells. Second, a normal functioning neuron is constantly firing, integrating and generating information. In other words, neurons communicate with each other through an electrochemical process.

Neurons are designed to conduct their function of information transmission and generation. A neuron is composed of a compact *cell body, dendrites,* and *axons.*

Cell Body

In the cell body of a neuron the structures which regulate the cellular functions are contained. A single neuron can remain functional throughout the person's lifetime but it renews itself occasionally as the parts wear out. The cell body uses the nutrients that are brought by the blood to maintain its functions. The cell body also synthesizes the neurotransmitters which are central to its communication with the other cells (Sylwester, 1995).

The cell bodies have no direct contact with each other. However, a neuron may interact with thousands of other cells. This interaction is carried out by separate extensions which keep the neurotransmitter molecules and the information within the neuron's body. These extensions are called *dendrites* and a*xons.*

Dendrites

Dendrites are short, tubular extensions which a neuron cell body contains. Dendrites do not connect with one another, but they are very close to each other, separated by *synapses*. Synapse is a tiny gap which is about a millionth of an inch (Sousa, 2001). Dendrites receive electrical impulses from other neurons through these tiny gaps.

Dendrites receive information from other neurons. They contain many receptors. These receptors are protein molecules which are used to receive the chemical message carried by another neuron's neurotransmitter molecules (Sylwester, 1995).

Axons

Axons are the long fiber extensions which send the neuron's message to the other neurons. Unlike dendrites which are present in large numbers in a neuron, there is one axon per neuron. Dendrites transmit the electrical impulses they have received from other neurons through their axons (Sousa, 2001).

Each axon is covered by a layer called the *myelin sheath*. This sheath shields the axons from the other cells and increases the speed of message transmission. The myelin sheath is white. Therefore, the large area of the brain tissue composed principally of myelinated axons, is usually defined as the *white matter* (Sylwester, 1995).

A neuron collects signals from other neurons through dendrites and then sends these signals through the synapse to be transmitted to the other neurons through the axon.

2.3.1.3. Chemical Messengers

The chemical messengers of the body transmit impulses from one nerve cell to another. They transport a signal from one neuron to another (Gazzaniga, 2002). There are many different types of chemical messengers known.

2.3.1.3.1. Neurotransmitters

Neurotransmitters, as defined by Gazzaniga et al. (2002), are molecules varying in size and chemical compositions, that share some common properties. For example, all neurotransmitters are synthesized by the presynaptic neuron , transported by the axon terminals to be stored and after binding with postsynaptic cell, they are removed by enzymatic action.

The information processed in the neurons is coded into the neurotransmitters. These molecules are formed by two or more atoms. The brain includes carbon, oxygen, nitrogen and hydrogen as the principal atoms. Between 10 and 30 atoms come together and form *amino acids*. Amino acids could be in 20 different types and they are the building blocks of the brain's protein, hormone and neurotransmitter molecules (Sylwester, 1995).

More than 50 neurotransmitters have been identified and more are expected to be identified as the entire system is understood.

The actions of neurotransmitters take place in the synaptic area. They carry out their functions at the *synapse* which is the narrow gap between the axon of a neuron and the dendrites of another neuron. The dendrites have receptors and the message delivered by an axon is transmitted into these receptors. During this process, neurotransmitters are placed between the axon terminal and the receptors of the dendrites. The receptor is generally defined as a lock and the neurotransmitter as a key (Sylwester, 1995). The shape of the neurotransmitter,

or the key, interacts with the shape of the receptor, or the lock. If it is a good match the message is transmitted from one neuron to the other.

There are more than 50 neurotransmitters in the brain but they can be classified into three types according to their chemistry. There are several ways to classify neurotransmitters. They can be classified biochemically as particular substances like *amino acids*, such as aspartate, gamma-aminobutyric acid (GABA), glutamate and glycine; *monoamines,* including dopamine, norepinephrine, epinephrine, serotonin and histamine; and *peptides* of which there are more than one hundred (Gazzaniga, et al., 2002).

Amino Acids

Amino acids are molecular building blocks that form peptides. (Gazzaniga, et al. 2002). Many amino acids can come together to form small and large proteins. For example, human myoglobin contains 153 amino acid molecules.

As Gazzaniga, et al. (2002) express, there are twenty one amino acids, including leucine, lysine, methionine, phenylalanine, threonine, and tryptophan. These could be familiar since their names could be seen on the labels of products in health stores. There are also other amino acids, such as glutamate, that are important in their own right as neurotransmitters.

Glycine and GABA always carry an inhibitory message. The cerebellum, retina and spinal cord as well as many other parts of the brain all use GABA circuits to inhibit signals. Nearly one-third of synapses in the cortex are GABA signals. On the other hand, glutamate and aspartate always carry an excitatory message at the synapse. Pathways that carry these excitatory amino acids are widely distributed throughout the brain. Without them, brain functioning would

cease. Glutamate is used extensively by the hippocampus and is a critical neurotransmitter for memory and learning (Wolfe, 2001).

Four amino acids form one class of neurotransmitters. They are used in the cerebral cortex, which occupies 85% of the mass of our brain.

Monoamines

Monoamines are the chemically modified amino acids. Monoamine transmitters are synthesized in the neurons of the brainstem or limbic system and then they are spread throughout the brain. They help to combine the activities of related brain areas. Dopamine, serotonin and neuropinephrine are examples of the monoamine transmitters.

Peptides

Peptides, or neuropeptides, are the largest and the most complex neurotransmitters. As expressed before, peptides are strings of amino acids. They are composed of 2 to 39 amino acid chains. The majority of the neurotransmitters in the brain is peptides but their concentration is lower than the other two types of neurotransmitters. Endorphin, cortisol and vasopressin are examples of peptides.

Peptides travel throughout our body via the neural networks, circulatory system and air passages. Their function is to modulate our pleasure and pain. Therefore, they strongly influence the decisions we make within the emotionally charged situations. In effect, the changes in the body-brain levels of these molecules allocate our emotional energy. As peptides are important in modulating emotional states and consequent behaviors, they are especially significant for educational policy and practice as well.

2.3.1.3.2. Sex Hormones

Hormones play a major role in growth and development. According to Baulieu and Kelly (1990), during the embryonic and fetal periods, hormones are extensively involved in the differentiation and growth of many organs, including the brain. As well as the neurotransmitters and chemical messengers, sex hormones, estrogen and testosterone, have an important role in the gender-based differentiation of the brain.

Estrogen

The female sex hormone, estrogen, plays an important role in the differentiation of the female brain from the male brain. It also plays a role in the female abilities related to verbal tasks and memory.

Brizendine (2007) refers to estrogen as the best friend of neurochemicals, such as dopamine, serotonin, acetylcholine and noradrenalin. These are the neuroprocessors which control the memory. When the estrogen levels in the female brain diminish, the related neurochemicals are reduced, too (Brizendine, 2007). Especially in the period following the menopause, women who were given estrogen had no loss in memory functions although women, who had no estrogen therapy, had some loss in verbal memory. Women who had estrogen therapy experienced almost no loss in the abilities of determination, evaluation, focusing, verbal tasks, hearing and emotional tasks in the brain.

The relationship between estrogen and the female brain and the neurons has been examined (Brizendine, 2007). The majority of these research studies indicated that estrogen has important roles on the survival, growth and multiplication of the neurons. In some of these research studies, the brains of women who had and did not have estrogen therapy were scanned. It was indicated

that the prefrontal cortex, the parietal cortex, and the temporal lobe had no shrinking in the women who had estrogen therapy. Therefore, it could be stated that estrogen has important roles for the, determination and evaluation abilities; verbal and hearing abilities; and emotional tasks.

In addition, as Brizendine (2007) puts it, the hippocampus is the center which is most sensitive to estrogen. It is also the center of verbal memory. Therefore, the advantage of estrogen enables the female brain to be superior on verbal tasks.

In addition to its roles on verbal tasks and memory, estrogen is related with behavior. As Levine (1972) expresses, in most mammalian species, females exhibit less aggressive behavior. This is because of the fact that estrogen is the inhibitor of the aggressive behavior.

Testosterone

Brizendine (2007) defines testosterone as the facilitator of the mental speed, and muscle and bone growth. It has effects on the sexual centers of the male brain. Testosterone might also be responsible for some of the common male behavior. Levine (1972) states that males exhibit more aggressive behavior than females.

When it comes to the relationship between testosterone and the male brain, Baulieu and Kelly (1990) claim that testosterone slows down the neuronal formation in the left hemisphere. As stated before, the left hemisphere is the center for most of the linguistic functions. Therefore, testosterone's effects on the left hemisphere could explain the disadvantage of males in respect to females when it comes to the verbal abilities. In addition, another explanation of this

disadvantage could be the fact that males lose their cortex much earlier than females (Brizendine, 2007).

In addition, Gage, et al. (2002) report findings related to the influence of testosterone on the male brain similar to that of estrogen on the female brain. They state that testosterone aids memory and protects the brain from memory-impairing disorders, such as Alzheimer's disease. It was found out that compared with healthy men, those with Alzheimer's disease have lower levels of testosterone. It was also found that testosterone supplements improved verbal and spatial memory in a group of men with Alzheimer's disease. However, according to Gage, et al. (2002), scientists say that they need to conduct more research before encouraging people for testosterone supplements for brain aid because it is known that testosterone can be converted to estrogen in the brain. Therefore, it must be ensured that the benefits are directly from testosterone, not from the mechanisms that occur after its conversion from estrogen.

2.3.2. The Communication in the Brain

The communication in the brain is provided through the connections between the neurons. As mentioned before, these connections between neurons are provided through dendrite-axon connections. One single neuron can receive signals from thousands of other cells through its dendrites and its axon can send signals to thousands of other neurons (Jensen, 1994). Neurons are not the end point of information; they only pass it on. Although the axon of a neuron can communicate with other neurons as far as one meter away, they mostly connect with other close-by neurons. The more connections between neurons, the more effective the communication is. Information is carried inside a neuron by electrical pulses and is transmitted across the synaptic gap from one neuron to

another by neurotransmitters. This connection between neurons is continuous (Jensen, 1994). Figure 4 indicates the connection between the neurons.

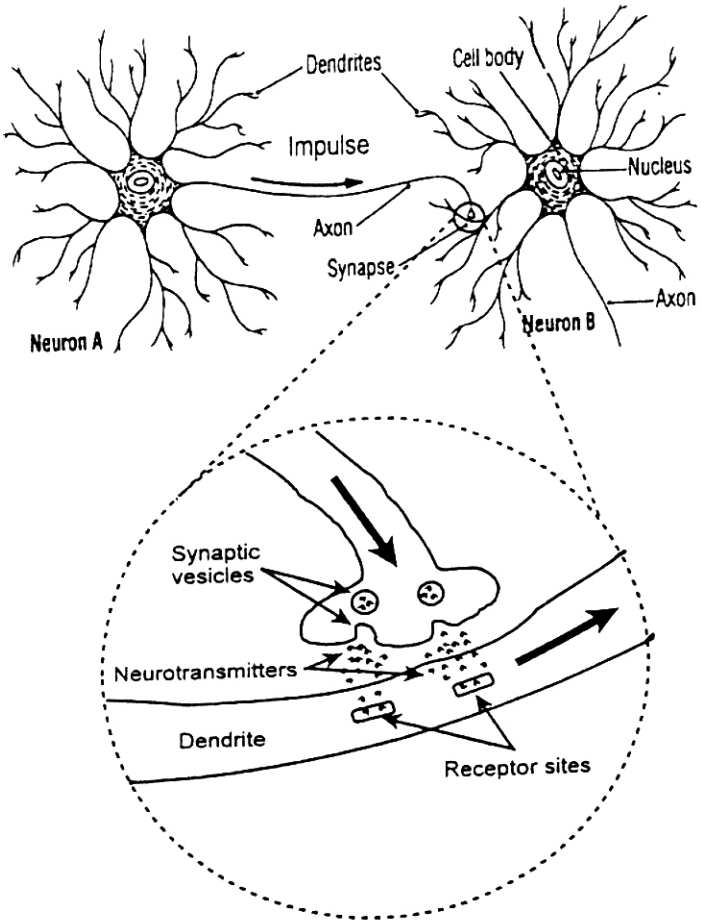

Figure 4. The Connection between Neurons (Sousa, 2001)

2.4. How the Brain Learns

According to Jensen (1998), the best thing that the brain does is learning. The human brain has a limitless capacity to learn each time it receives a new stimulation resulting in a new experience and behavior.

In the brain, the learning process is initiated by some kind of stimulus. It could be an internal stimulus as we do while brainstorming or a new experience like solving a puzzle. This stimulus, then, is sorted and processed in various levels and

regions of the brain. In the end, this stimulus is bound to form a potential, activating the memory.

2.4.1. The Stimulus

People either do what they already know or they do something new. If an earlier learning is repeated, this is called practice. Practice makes neural pathways form more efficiently. However, if a new action is performed or new information is entering the brain to be processed, it is called *stimulation* (Jensen, 1998).

As Sylwester (1995) puts it when the brain gets new stimulation, this stimulation is converted to nervous impulses. It travels to the centers of extraction and sorting, like the thalamus located in the mid-brain. Then, a multisensory convergence takes place and a map is formed in the hippocampus. Signals are distributed to the specific areas of the brain from the hippocampus. When this input is received, signals are transmitted for the dendritic growth and neurotransmitters are secreted at the ends of axons which nearly touch the dendrites of another cell. When the cell body sends an electrical message to the axon, those stored chemicals are released into the synaptic gap. When the chemicals are released to the gap, new electrical energy in the receptors of the opposite dendrite is triggered. Then, the process is repeated to the next cell. In the end, the electrical stimulation is advanced with cell growth through more dendritic branching. These branches enable more connections to be possible which means more potential for learning.

2.4.2. Learning and Change in the Brain

The brain learns as the process of stimulus-process-memory occurs and this process results in learning. However, learning is not only a potential in the brain but it is a physical statement as well. The ability to learn depends on the changes in the brain's chemistry and structure in a process called "neural plasticity" (Cozolino &

Sprokey; in Johnson &Taylor, 2006). Neural plasticity is the changes in the structure of neurons and their relations to one another depending on the experiences gained.

Zull (in Johnson &Taylor, 2006) claims that "learning is change." This is more than a metaphor because the brain changes physically as we learn.

Learning results in a change in the human neocortex. According to Zull (in Johnson &Taylor, 2006), this change in the neocortex takes place when people learn to juggle. The density of the neocortex, the region that senses movement, increases as people learn new skills or pieces of information. This density has been proved to decrease as people forget some of the information they have learned. Zull (2006) refers to this principle as *use it or lose it* and explains it as follows:

> This and many other experiments have shown that increased signaling by cortical neurons generates the growth of more (dendritic) branches, which increases the density of cellular material and enhances their ability to connect with their neurons to form more synapses.(Zull, 2006, cited in Johnson & Taylor, 2006, p. 4-5)

The changes in the neocortex happen only in the parts of the brain which are used. They are caused by the continuous firing of the specific neurons engaged in learning experiences and the chemicals around those neurons.

The cortex is the large sheet of neural tissue at the top of the brain which processes environmental interactions. Those environmental interactions result in the learning process. Even though most of the neurons which the brain will use for its lifetime are provided soon after birth, most of the dendrite-axon connections, which is the core of cognitive learning, develop after birth. This happens as the brain adapts itself to its environment. In the human brain, this post-birth development shows itself in a weight increase in the volume of the brain (Sylwester, 1995). This

weight increase results from the increase in the volume of the cortex as the human goes through new experiences.

There are studies that examine rat brain to investigate the effects of environmental stimulation and deprivation of the development of the brain's cortex (Sylwester, 1995). Brain plasticity researchers study rats because their overall brain development pattern resembles that of humans. The research compares the brains of rats living in different environments. The first groups of rats live alone in a small and plain cage. In the second group there are 12 to 36 rats living together in a large laboratory cage with regularly changed toys and objects to explore. The third group lives in a larger, outdoor seminatural rat habitat. The result of the study indicates that the third group of rats living in the natural environment socially shows the best cortex development and they are followed by the second group with the enriched social cage. However, the rats in the poor and lonely environments showed no cortex development as there was nothing to explore and learn in their environment (Sylwester, 1995).

The social, enriched seminatural environment produces a thicker and heavier cortex, larger neurons, better connection between neurons and better support of glial cells. These factors certainly provide better opportunities for learning and remembering. Researchers emphasize that such enhanced effects continue throughout the rats' lifetime.

According to Cozolino & Sprokey (in Johnson &Taylor, 2006), people are engaged in learning activities, which result in a change in the brain when they are socializing in an environment that provides information to explore.

Today, researchers are exploring more patterns of plasticity in the human brain as the technology to monitor the growth in the specific areas of the brain improves.

2.5. Brain and Learning

The latest technological developments and the growing interest in the human brain and learning urged scientists and educators to work on research in neuroscience and other related fields. These studies have been informing the worlds of science and education as to how the brain naturally learns best. This thought directs learning studies towards a powerful new identity, which is referred to as *Brain Based Learning.* Brain Based Learning principles are based on the premises of learning in relation to the ways in which the brain naturally learns (Dhority & Jensen, 1998). Those principles could be summarized as follows:

1. Learning engages the whole brain. Neuroscientists and educators are very interested in lateralization and localization of the brain activities. However, this does not mean that the brain has separate functional areas. In fact, the brain is a bilateral organ; a complete system made up of parts that operate interdependently. Therefore, education will be more effective as it makes all regions in the brain work in multiple ways. According to Dhority and Jensen (1998), the integration of the brain is far more important than the modularity of it.
2. The brain is a natural meaning-seeker and meaning-maker. Every kind of input coming to the brain undergoes a meaning-making process. The meaning may be related to personal relevance, emotional engagement or the pattern making in context. The information given in separate, meaningless pieces will slow down the learning process. Therefore, the material provided

for learning must be presented in a coherent, relevant and meaningful context to maximize the process. Learning without meaning is unlikely to be recalled and used when necessary.

3. The brain learns best with moderate challenge and high feedback. While very low level of challenge causes the learner to get bored of the material learned, high level of challenge results in a diminishing wish and interest of the learner to learn the material. Since both situations cause the learner to lose interest, the challenge provided should be high enough to keep the learner motivated and low enough not to make the learner give up. Challenge could be provided with new material which provides scaffolding, or through limiting the resources (Jensen, 1998). In addition, the brain works better with continuous feedback. Feedback reduces uncertainty and increases the coping abilities and it lowers the stress responses. Therefore, learners need various levels of feedback as well as the control over the feedback. In order for feedback to be more effective, it must be specific, not general; and it must be provided from multiple sources.
4. Threat and high stress impair learning because they change the chemistry of the brain and the body. In case of stress and threat, a peptide called *cortisol* is released. This triggers some physical reactions including problems in the immune system, tensing of the muscles and increasing blood pressure. High cortisol levels also cause the death of the brain cells in the hippocampus, which is very important for memory formation. Therefore, learning is impaired. Stress also makes learners vulnerable and prone to illnesses. In addition, another reason why high levels of stress spoil learning is that in case of stress and threat, the priorities of the brain change and it directs itself

to its survival and defense. For this reason, a class atmosphere in which the stress levels are low but students can take risks should be created.

5. The primary source of learning is unconscious. Most of our knowledge has not been consciously taught to us because vast amounts of material come into our brain through our senses through the process of acquisition. Our brain is designed to pay attention to only one sense at a time (Dhority & Jensen, 1998). For example, it is impossible to read a book while talking to someone on the phone. However, when the brain is focused on an input, the sense receptors continue to record input from other senses and the brain continues to receive and process them unconsciously. Most learning is made up of these pieces of information processed unconsciously. Therefore, it is really beneficial for the students to have multiple sources of information in class. Multiple sources of information not only increase learner motivation but also support unconscious learning by providing the learners with the opportunity to get the information from many different resources.
6. Emotions are crucial for learning. Emotions are directly related with cognition and they drive attention, memory and meaning. Despite the fact that excessive emotions, negative emotions or traumatic experiences impair learning, the total absence of emotion and feeling is also damaging to reason and rationality. The excitement and love of learning are encouraged when the teaching and learning experiences are engaged with "positive" emotions.
7. Multiple memory pathways facilitate recall of information. Memory is not stored in our brain, but the brain recreates them every time we recall a memory. Thus, we have pathways for pieces of information. In order to make those pathways active any time those pieces of information are needed,

the information needs to be presented through multiple memory pathways. Our brain does not favor textbook, rote and semantic learning. Instead, it works better with implicit learning pathways, such as motor-learning, location changes, music, and rhythm (Jensen, 1998).

8. All learning is mind-body linked. We learn as a complete and integrated system with our mind, soul, feelings, brain and body. Everything is a part of the entire system of the brain which controls it all. Therefore, when learning is integrated with the body, it is easier to retrieve and it lasts longer. Learning is also directly related to the physiological state of the body. The physiological state of the body influences learning positively or negatively. Unless, such physiological factors as eye movements, hunger, thirst, illnesses, respiration rate, etc. are in the controlled level, no effective learning could take place. Therefore, factors such as nutrition, exercise and stress management have to be approached with great care in education.
9. Our brain is a social organ. Therefore, it develops better when it is socializing with others. Our brain is influenced by the socialization process. In order for our brain to actualize its potential and to generate feedback, it needs communication, which is the basic form of expression. The most important form of communication is speech, which is the ability to talk and understand. Therefore, the learners should be allowed and encouraged to interact with each other in class. Interaction and socialization facilitate learning and understanding faster, especially in groups. Activities like cooperation, role-play, drama, discussion, brainstorming and group projects all facilitate the learning process.

10. All brains are unique. The reason for this is related to nurture as well as nature. Genetically, every brain is different from another. However, experience changes the structure of the brain. Moreover, during the lifetime of a person, the brain adapts itself to the person's way of living. During this adaptation process, factors, such as emotions, personality, learning styles and stress are effective. The brain is a complex and self-adaptive system. Every brain adapts itself to the body and environment it is in. Individuals are born with billions of neurons but later, they may lose those neurons for various reasons. Natural cell aging is one reason for the loss of neurons. In addition, the brain loses the unused neurons or directs the unused neurons for other functions which are used more often. For this reason, it is important to acquire skills at an early age.

Informed by the current research on the human brain, educators are beginning to have an insight about the biological basis of what has been believed for years. As we learn more about the brain and neuroscience, more principles of it have been integrated in the educational processes in order to achieve a better policy of teaching and learning. Therefore, educational researchers have been integrating neuroscience, psychology, cognitive sciences and linguistics in their studies and presenting the findings for use in the educational fields. The principles of Brain Based Learning, which are presented above, are also the result of such a study of integrating educational sciences with psychology, biology and neuroscience.

After examining the principles of Brain Based Learning, it is essential to mention the relationship between the brain and language and the locations where language is processed in the brain.

2.6. The Brain and Language

Since the middle of the nineteenth century, there has been a basic assumption that it is possible to find a direct relationship between language and the brain and a continuous effort to discover direct centers where language capacities may be localized.

In the previous parts, it was stated that the brain works in a frame of specialization or lateralization, which is that different human abilities and behaviors can be attributed to specific parts of the brain and the brain works as a unified whole combining the tasks of those specific parts. Language is also lateralized as it can be primarily localized to specific parts of the brain (Fromkin & Rodman, 1998).

It was stated that language skills and our linguistic abilities are centered in the left hemisphere in most people. Two especially important interconnected structures in that part of the brain are Broca's and Wernicke's areas.

Broca's area is located in the frontal lobe of the left hemisphere and it processes grammatical structures and the word production. When it comes to Wernicke's area, it is located in the temporal lobe of the left hemisphere and it links language and thought. In other words, it works for syntax production and comprehension. These two structures are connected by nerve fibers, called *arcuate fasciculus*, which develops at about age two. When it develops, children also develop their language skills and they begin to speak in sentences (Sylwester, 1995).

In 1861, Paul Broca specifically related language to the left side of the brain. He stated that the front part of the left hemisphere is directly related to language abilities. Broca determined this by autopsy investigations after the death of patients with language deficits following a brain injury. He stated that damage to the front part of the left hemisphere resulted in loss of speech whereas damage to right side

did not. The language disorders following brain lesions caused by injury, stroke, tumors, traumas or infections are called "aphasia" (Fromkin & Rodman, 1998).

Today, patients with such damage or lesions in Broca's area are claimed to have *Broca's aphasia*. The speech of Broca's aphasia patients is characterized by awkward speech, word-finding pauses, loss of function words and bad word order. Comprehension level of the daily conversations generally seems to be good. In other words, a person with damage to Broca's area could understand language but could not speak fluently (Sousa, 2001).

In 1874, Carl Wernicke revealed another variety of aphasia also based on the autopsy studies of patients with lesions or strokes in the back part of the left hemisphere. Unlike Broca's patients, Wernicke's patients spoke with good intonation and pronunciation, but they made many lexical errors with ambiguous and nonsense words. They also had difficulty in comprehending speech. Those with damage to Wernicke's area could speak fluently but what they say was quite meaningless (Sousa, 2001). Therefore, the language disorders caused by lesions in this area are called *Wernicke's aphasia* (Fromkin & Rodman, 1998).

Based on the findings of Paul Broca and Carl Wernicke, it can then be inferred that Broca's area, located in the frontal lobe of the left hemisphere, stores grammar, vocabulary, and syntax of one's native language whereas Wernicke's area, located in the temporal lobe of the left hemisphere, is the center of sense and meaning in the native language.

However, spoken language production has been proved by the recent research to be a more complex process. When the brain produces a spoken sentence, it employs not only Broca's and Wernicke's areas but also calls on other neural networks scattered throughout the left hemisphere. For example, nouns and verbs

are processed by different neural networks. The more complex the sentence structure, the more areas are activated and this activation may even include networks and areas from the right hemisphere (Sousa, 2001).

Figure 5 indicates the Broca's and Wernicke's areas in the left hemisphere of the brain.

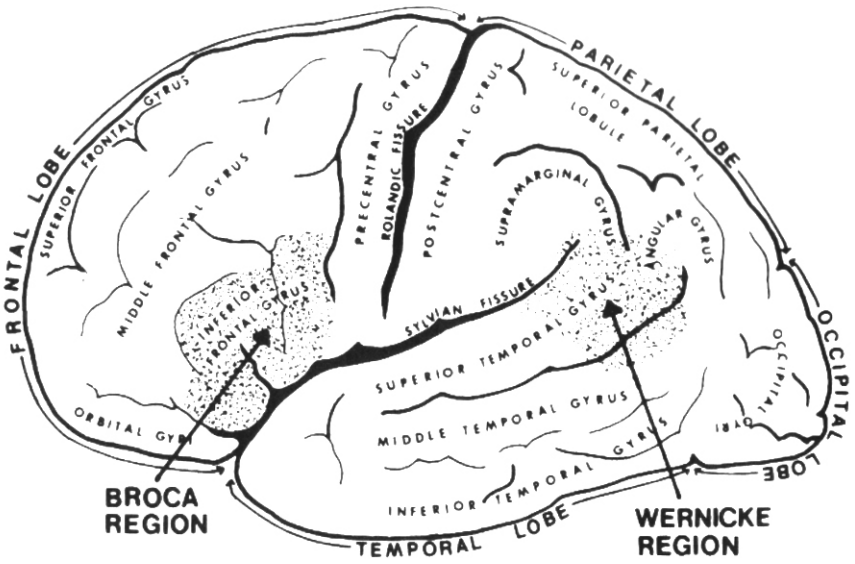

Figure 5. View of the Left Hemisphere of the Brain with Broca's and Wernicke's Areas (Fromkin & Rodman, 1998)

Even though the studies of language loss are not sufficient to fully explain the relationship between the brain and language, they reveal very important findings about the lateralization of language and the locations of the brain where language is processed. Although language is localized in the brain, it is still believed that for effective language learning, it is essential to activate all areas in the brain since the brain works as a unified system.

There are some studies that explored bilingual and multilingual individuals' brains. For example, Halsband (2006) reported that the representation of language in the brains of bilingual and multilingual individuals differ from those of the monolinguals. Halsband (2006) examined the question whether verbal memory processing in two languages is mediated by a common neural system or by distinct cortical areas in the brains of bilingual and multilingual individuals. The subjects were PET-scanned while they were encoding or retrieving word pairs in their mother language or in a foreign language. Finally, the study indicated that during memory retrieval the subjects' brains showed a consistent activation in both languages. In addition, differential activations were found in Broca's area and in the cerebellum. As a result, the direct relationship between brain and language is observed. Also, it is shown that the brain is influenced by the exposure to different languages.

Also, according to another study, there are existing pathways in the brain enhancing language acquisition. For example, Lacerda and Nehme (2001) found that infants have a capacity to perceive phonetics of languages in general. This is encoded in their brain. As a result of their study, it has been shown that infants have sensitivity towards the phonetic contrasts in both native and non-native languages. This well established pathway shows that individuals have a tendency to learn languages thanks to the mechanisms in the brain.

2.7. Male and Female Brain

Actually, more than 99% of genetic code of the male and the female are the same. Of 30.000 genes in the human genome, less than 1% indicates differences between the genders. However, this percentage influences all of the cells in human

body from the nerves, which record pain and happiness, to the neurons, which identify perception, thoughts and emotions (Brizendine, 2007).

When examined, it is seen that male and female brains are not the same. The male brain is %9 larger than the female brain when factors such as body weight and other calculations are considered. However, this does not mean a difference between the cognitive capacities of males and females. Rather, males and females have the same amount of brain cells, except the fact that those neurons are more densely packed in the female brain as if they were compressed in a smaller skull within a corset (Brizendine, 2007). Still, some other differences between the male and female brains are recognized when MRI scans are carefully studied.

The differences between the male and female brains have implications for education as well because they give clear ideas about the different patterns of perception and learning of the two genders. Moreover, since these differences have biological support, they propose different strategies for teaching and personal relations in the classroom.

The biological differences between the male and female brain can be expressed mainly as follows:

1. As Brizendine (2007) puts it, in the male brain, the amygdala, which is fed by testosterone, is larger while in the female brain pre-frontal cortex is larger. Thus, women are able to control their excessive impulses and emotions coming from the amygdala more effectively and they are more active emotionally.
2. The female brain has a larger hippocampus, which is the center of memory. This enables female memory to be more active. Also, as the hippocampus is

larger in the female brain, women are better at emotional tasks, empathy, and language processing as well as memory tasks (Brizendine, 2007).

3. The input that comes from the senses is processed differently in the male and female brain. The way males and females hear, see, feel and evaluate what others think are different. The male and female systems of processing, which are different from each other, are both harmonious and skillful. However, they achieve the same results and the same tasks using different pathways. A team of researchers in Germany had males and females watch abstract 3-D images and they scanned their brains through MRI. There was no significant difference in terms of performance, but some differences were observed in the ways that the male and female brains processed the data. The brains of the females spend more time on forming mental images by triggering brain systems that process visual input. The result of this study indicated that females spend more time than men to get the same results. Therefore, the results meant that the female brain is able to carry out every task that the male brain is. The only difference is that they accomplish those tasks employing different brain systems. Therefore, the male and female brains get the same results for the same tasks but they employ different pathways (Brizendine, 2007).
4. According to Brizendine (2007), in the female brain, the centers of language and hearing have 11% more neurons when compared to those of the male brain. This is reflected in the language performance of men and women in daily life. Men speak with 7000 words per day while women use 20.000 words per day. However, males are better at spatial tasks involving mental rotation rather than verbal skills.

5. Brizendine (2007) states that men use one side of their brain when it comes to emotional tasks and experiences whereas women use both sides. Therefore, neural connections within the emotional centers of the brain are more active and larger in the female brain.
6. The hippocampus is the most sensitive center to estrogen. It is also the center of vocabulary and memory. Therefore, women are better at verbal skills. Brizendine (2007) states a study as evidence to this fact. In this study, women who were given estrogen after menopause had no deterioration in verbal memory as well as decision making, evaluating, focusing abilities; verbal functions, listening abilities and emotional management.
7. According to Sylwester (1995), men restrict language processing to the left hemisphere. Therefore, they have difficulty in verbally expressing their feelings and in recovering language abilities after a left hemisphere stroke.
8. Male brain is larger in total volume. However, this is not an indication of better intelligence since overall larger volume is usually attributed to the volume of the white matter. What makes the difference in intellectual ability is the grey matter (Gur, 1999).
9. The female brain has a higher percentage of grey matter in the left hemisphere which aids language skills. Men have higher percentage of white matter although the distribution of it is largely asymmetrical. For example, the volume of grey matter is more in the left hemisphere of the male brain. This asymmetry makes men better at global and spatial tasks.
10. Females develop earlier and stronger lateralization of the left hemisphere. This gives them superiority on verbal tasks (Harnad, 1976).

11. According to Gur (1999), women have higher proportions of grey matter than men do. Grey matter refers to the neural cell bodies and their dendrites, which communicate with the neighboring neurons in the brain. On the other hand, men have higher proportions of white matter which refers to the longer axons that reach out from neurons to more distant regions in the brain. The reflection of this difference to the abilities of men and women is as follows: Grey matter is where computation takes place while white matter is responsible for communication between groups of cells in different areas of the brain. Therefore, women have higher percentage of tissue devoted to computation and men have a greater proportion of tissue assigned to the transfer of information between distant regions.
12. The corpus callosum, which is a bundle of nerve fibers between the left and the right hemisphere of the brain, is larger in the female brain. The corpus callosum enables the transfer of information between the two hemispheres. Therefore, women are swifter in the process of information and they are faster thinkers (Sylwester, 1995).

Such differences between the male and female brain may have implications on the abilities and perceptions of men and women as well as their skills, including language.

2.7.1. Implications of Gender Differences in terms of Language

The differences between the male and the female brain have implications which indicate a different aspect to look at the relationship between human brain and language. In this respect, females seem a bit more advantageous than males since the female brain structure enables them to perform better at linguistic tasks. For example, according to Brizendine (2007) women are in more need of

socialization and speaking, which can happen through language. Therefore, women are better at linguistic tasks. A reason for this could be that estrogen enables women to be emotionally active, better at communication tasks and empathy (Brizendine, 2007). Moreover, girls can discriminate between the variations in tone and pitch of voice better than boys, which may indicate that female brain is more sensitive to language.

In this respect, Jonas and Jonas (1975) reports Wechsler's (1958) findings that females are superior in vocabulary, identifying similarities and digit symbols while men are superior in arithmetic and picture completion and girls develop language abilities earlier and more effectively while boys are better at non-verbal activities.

Knox and Kimura (1970) conducted a research study to examine sex differences in language ability by means of listening tests and they found that boys are worse at perception of speech and in development of the left hemisphere locus for speech but they have better recognition of non-verbal sounds.

Another study illustrating the differences between the memory performances of boys and girls was carried out by Vernon (1960) who compared males and females in verbal and non-verbal tasks. According to the findings of the study, girls did better on most verbal tests and tests involving rote memory.

According to Jonas and Jonas (1975), boys become subjects to speech disorders, dyslexia and autism more than girls and it is more difficult for them to recover. This might be related to the weakness of the language related centers in the male brain compared to the female brain and the characteristics of the male brain.

It has also been stated that females produce more words than males on average. That could be a reason why girls use more words as they learn while boys often work silently during the learning process. Gurian (2001) explains this by showing examples of group studies in class. He says that females in a learning group use more words than males. The ones who use words in male groups tend to be fewer.

In addition, girls prefer to have things conceptualized with usable everyday language while boys often find jargon and coded language more interesting. They tend to work out codes within their own cognitive process and rely on coded language to communicate (Gurian, 2001).

Gender differences have also implications in relation to the foreign and second language learning. As Klein (2007) expresses learning a foreign or second language is a complex process and research indicates that gender-based differences interact with this process.

According to research, female students complete their foreign language courses at a higher rate than male students. According to statistics, 36% of females and 24% of males completed three or more years of foreign language courses. Also, female students appear to be performing better than their male counterparts on most national foreign language tests (Klein, 2007).

When it comes to the research on gender and reading comprehension abilities in second language, it could be foreseen that females usually score higher on comprehension tests than males thanks to their linguistic superiority. However, in order to keep the boys' attention as well, teachers must provide attention to the topics of the texts chosen. According to a research study cited in Klein (2007), there is a relationship between sex differences in foreign language text comprehension

and the topics of the texts. Females did significantly better on reading passages about human relations, education, care, art and philosophy while males significantly did better on politics, sports, economics and technology. Therefore, what teachers are supposed to do is to select passages from a variety of topics as much as possible to keep attention alive.

These differences can also be adapted to academic skills and teaching-learning strategies to provide better and more appropriate educational opportunities for both genders in language classes. The relationship between gender and use of language learning strategies has implications in the pedagogical context. Klein (2007) stresses the fact that females use more strategies than males and this situation contributes a lot to their superiority in language related tasks and comprehension abilities.

In order to increase the performance of male students in language classes and the benefit that they gain from language classes Klein (2007) offers "strategy training." She reports a study indicating the role of strategy training. In this study 128 university students took part and they were separated as training and control groups. Then, the training group was given strategy training on their second-year German course. At the end of the research, males who had strategy training scored higher on the test than all other groups. As this research indicates, the use of strategies is highly important in the educational context, especially in language learning. Language teachers must be aware of the contributions that strategy training makes to the performance of the males in language classes and take strategy training as part of their curriculum.

According to Klein (2007), strategy training in language classes could be achieved in the following ways:

1. Ask learners to do a language task without any strategy training.

2. Have them discuss how they did it, praise any useful strategies and ask them to reflect on how those strategies facilitated the learning process.
3. Suggest and demonstrate other helpful strategies.
4. Allow time for learners to practice strategies with language tasks.
5. Show how those strategies can be transferred to other tasks.
6. Provide practice.
7. Help students understand how to evaluate the success of their strategy use.

The biological fact that males and females have different brains and so they use different pathways for the same tasks have implications about how to approach different genders, their learning styles and the work they produce in the language classroom. Julé (2004) touches upon this;

> Anatomy is not destiny, as Freud suggested, but a learner's sex -or, more likely, gender- can have profound effects on the ways that learners approach language learning, ways which may in turn affect proficiency. (Julé, 2004. p.19)

There are also fields which gender-based brain differences are related to other than language use and abilities. These include learning styles, skills and academic achievement.

2.7.2. Gender-based Differences in Learning Styles, Skills and Achievement

Gender-based brain differences have implications in some educational fields including learning styles, skills and achievement.

2.7.2.1. Deductive and Inductive Reasoning

Gurian (2001) states that boys tend to be *deductive* in their conceptualizations, starting their reasoning process from a general principle and applying it to individual cases. They also tend to do deductive reasoning more quickly than girls. This is a reason why boys, on average, do better on multiple choice tests. Girls, on the other hand, tend to favor *inductive* thinking, adding more and more to their base of conceptualization. They tend to begin with concrete examples, especially in verbalization and writing. Girls begin with specific examples and build the general theory more often than boys.

2.7.2.2. Logic and Evidence

As Gurian (2001) puts it, girls are generally better listeners than boys. Because female brain is sensitive to words, they hear more of what is said and are more receptive to details in a lesson. On the other hand, boys tend to hear less and more often ask for clear evidence to support the teacher's claim. That is why teachers may need to explain why they make those statements in the lesson.

2.7.2.3. The Likelihood of Boredom

Girls are better at self-managing boredom during instruction. However, boys get bored more often than girls (Gurian, 2001). For this reason, teachers need to provide them with stimulants during the lesson to keep them attentive. The stimulants must be as much and various as possible so that students do not give up learning or act in a way that the class is disrupted.

2.7.2.4. Use of Space

Gurian (2001) states that boys tend to use more space when they learn, especially at younger ages. This is because boys tend to learn by using more physical space than girls do. In fact, this is because they are learning in the way their

spatial brain learns. What teachers must do in this case is to allow them space instead of considering them impolite, rude or out of control, being unaware of how necessary it is for boys to use space.

2.7.2.5. Movement

Girls do not usually need to move around as much while learning. However, movement seems to help boys not only to stimulate their brains but also manage and relieve impulsive behavior. Movement is also natural to boys in a closed space, thanks to their lower serotonin and higher metabolism (Gurian, 2001).

For boys who cannot stop moving in class, stretch breaks and sixty second movement breaks are very helpful. Teachers can also benefit from allowing boys to play with something in their hands, silently. This may help since they are moving while they are learning and their brains are being stimulated.

2.7.2.6. Use of Symbolism

According to Gurian (2001), boys tend toward symbolic texts, diagrams and graphs, especially in upper grades. They like the coded quality better than girls, who tend to prefer written texts.

Both girls and boys like pictures but boys often rely on them while learning because pictures stimulate the right hemisphere, which is where many boys are more developed. On the other hand, girls consider the emotional workings of characters in literature classes.

2.7.2.7. Examinations and Achievement

Francis and Skelton (2005) hold that many boys are underachieving in relation to girls and they exemplify the situation via statistics from the performances of boys and girls in public examinations in England. According to the analysis of performance in public exams by gender, boys scored 70 on average in English

exams while girls scored 79-81. In Mathematics exams, the average score of boys was 71-73 while that of girls was 70-72. In science exams, boys scored 86-87 on average while girls scored 87-88.

According to Francis and Skelton (2005), the explanation for why boys and girls achieve differently in schools is a consequence of hormonal and brain differences. According to their "brain difference" perspective, gender-based patterns of educational achievement are explained by inherent differences between the male and the female brain, which is that the brain is wired differently according to genders. This is why the gender-based brain differences make boys and girls pre-disposed to greater ability at different curriculum subjects. The curriculum areas that are favored by boys are usually mathematics and information technology and by females are English and modern languages. The reasons for this case is that there are different, gender-based learning styles and these are matched with specific school subjects. Boys usually favor a learning style that involves memorization of rules and abstract facts. Alternatively, girls appear to prefer open-ended tasks which are related to real situations, are elaborative and provide a broader context. What teachers must do in this case is to consider the gender differences and their preferred learning styles (Francis and Skelton, 2005).

In the following section, the memory system of the brain will be dealt with so that the way the brain learns and the differences between the male and female brain could be clearer.

2.8. Memory

Memory and recall are critical elements in the learning process including vocabulary learning and retention. Memory is a process rather than a fixed thing, a singular skill or a specific center in the brain. There is no single location for all our

memories but many distinct locations of the brain are implicated with certain memories (Jensen, 1998). For instance, the auditory cortex stores the memories of sound, and the memories of names, nouns and pronouns are reserved in the temporal lobe. Moreover, the hippocampus has been found to become quite active for the formation of spatial memory and explicit memories for speaking, reading and even recall about an emotional event. Also, the amygdala is quite active for implicit and usually negative emotional events. In addition, basal ganglia structures are involved to retrieve the learned skills. The cerebellum is also crucial for associative memory formation as in the learning of motor skills. Also, the peptide molecules, which circulate throughout our body, seem to aid in recalling things at times (Jensen, 1998). So, this is why scientists state that it is better to think of memory as a process rather than a specific location in the brain.

According to Jensen (1998), multiple memory locations are responsible for our best learning and recall. Owing to this specification, someone who loses even 20% of the cortex could still be good at information retrieval.

2.8.1. Memory Formation and Retrieval

The brain uses several memory systems which have some functional organization and operation. The memory networks initiate their operation at the synapse, the tiny gap that neurotransmitters cross from the axons of one neuron to the dendrites of another.

When the sensory system perceives an object or an event, many neurons are activated to form brain networks. Each of these networks processes a different property of that object or event, such as its shape, movement, color or its name. This first activation creates synchronized response patterns and this synchronization

brings together the networks that process each property. Therefore, we perceive the object or image in integrity (Sylwester, 1995).

Memory and retrieval are inseparable. According to Jensen (1998), memory is determined by the kind of the retrieval process that is activated. Each type of memory has a specific type of triggering and when enough right type of neurons fire in the right way, a successful retrieval is achieved. The larger the pattern of memory and trigger is, the bigger the activated neural fields are. For instance, certain words like "family," may activate hundreds of neuronal fields, triggering the retrieval of many other words, like "mother, father, children, home, etc."

The memories are not retrieved like the notes from a book. Instead, most of them are reconstructed and recalled when needed. Jensen (1998) states two theories on how this retrieval process happens. One theory is that we have "indexes" that contain instructions for the brain on how to recall what takes place in the memory. For example, we use mental "indexes" for our word-based recalling and those mental indexes help us find the word we want. For example, a word like *classroom* is linked to some related indexes like *school, students,* and *teacher*. This case is an example of finding collocations of a word within seconds. This theory may also explain why we pronounce a close but incorrect word while we are trying to say something else. The other theory about retrieval is that memories are frozen patterns waiting for a signal to activate them. When they get the appropriate signal, they reappear and retrieved. This theory may explain the reason why we sometimes come up with the answer we need some time later than we need it. Before that the brain may have a lot of information in process competing to retrieve the answer we need.

In order for a temporary memory to be permanent for retrieval, it needs to have long term potentiation. Long term memory develops out of temporary

experiences when the brain determines that the event has an emotional charge and reoccurs (Sylwester, 1995). In other words, memories are permanent for long term use if they have emotional connotation meaning and if they are repeated. Some of the information coming from the sensory organs is evaluated as meaningless and sent away whereas other pieces of information are quickly used and forgotten. On the other hand, another piece of information is kept for later use and placed within existing patterns or neural networks. In order to serve all of these purposes, the brain has developed different memory systems.

2.8.2. Short Term Memory

Sylwester (1995) defines short term memory as "an initial memory buffer that allows us to hold a few units of information for a short period of time while we determine their importance (p.92). Short term memory, which has a limited attentional capacity, has an important survival value because thanks to it we can experience any current situation shifting our attention to situations that could be important for that moment only.

According to Gazzaniga et. al. (2002) short term memory is limited in capacity which could vary in time of seconds to minutes and readily available to our conscious awareness.

Because of the limited capacity of short term memory, it may work better to rapidly combine the related pieces of information into larger units based on similarities, differences or other patterns (Sylwester, 1995). This combining process is called *chunking* and it is important to make short term memory work more effectively. However, chunking does not mean that the pieces of information are stored in memory for long term use. Directing the information to the long term memory requires other processes.

2.8.3. Long Term Memory

Long term memory develops only when it is decided that the elements of the current situation are emotionally significant and probably reoccur. Therefore, long term memory refers to the process of *storing* and *retrieving* information when needed. Gazzaniga et al (2002) refers to long term memory as "information maintained for a significant time" (p. 313)

Long term memory is separated into two distinct groups according to the characteristics of information that is stored.

2.8.3.1. Declarative (Explicit) Memory

Declarative or explicit memory system is formed in the hippocampus and stored in the temporal lobes. The named categories are defined by declarative memory; therefore, it is verbal and conscious (Sylwester, 1995). Declarative memory can be broken down further into other memory types as *episodic memory* and s*emantic memory.*

Episodic memory is related to the specific personal experiences at a particular time and place. Episodic memories are events that are very personal and tied to an episode or context. For example, somebody's memories about a birthday party or falling of a new bicycle as a child are considered episodic memory . Gazzaniga et. al. (2002) define episodic memory as the conscious awareness of the past events and calls it personal autobiographical memory.

Semantic memory, in contrast to the episodic meaning, is more abstract, context-free and often represented by symbols such as words and mathematical symbols. According to Gazzaniga et al (2002) semantic memory refers to the facts and it covers world knowledge, object knowledge, language knowledge and

conceptual priming. Semantic memory includes names, facts, figures and textbook information (Jensen, 1998).

2.8.3.2. Nondeclarative (Implicit) Memory

Nondeclarative or implicit memory is used when previous experiences facilitate performance on a task that does not require intentional recall of those experiences. According to Jensen (1998), implicit memory is at work when our ability to recall something depends on which pathway we access. That is, information is in our brain but we do not know that we *know* it. Gazzaniga et al (2002) explain this process as follows;

> Nondeclarative memory includes forms of memory that are learned and retained even when explicit memory for that knowledge does not exist. (Gazzaniga et al, 2002. p. 315)

For example, skill learning and priming are the works of the implicit memory.

One form of nondeclarative memory is *procedural memory*. It involves learning a variety of motor and cognitive skills. For example, knowledge of how to ride a bike or the acquisition of reading skills are the works of procedural memory. According to Sylwester (1995), procedural long term memory is the automatic skill sequences because they do not rely on conscious verbal recall.

The principal brain mechanism working to form procedural memory tasks are the amygdala, the cerebellum and the autonomic nervous system, which regulates circulation and respiration. In addition, procedural memory tasks also involve the muscle systems.

Another form of nondeclarative memory is *Reflexive Memory.* According to Jensen (1998), our reflective memory is full of associations. These associations could be word associations as well as the basic behavior of our daily life. For example, when you hear somebody saying “hot,” you say “cold;” or when

somebody says “up,” you say “down;” or when somebody reaches his/her hand to shake your hand, your hand also reaches without thinking what to do in that case. Therefore, reflexive memory tasks include such methods of information storage and retrieval.

2.8.4. Recall

There is not a direct relationship between how well people think or learn and how well they remember what they have been taught. Retrieval and recall of the items taught are based on the attention paid to the task during the learning process.

The brain can successfully recall and use episodic memories that are personally important and meaningful. However, it cannot master the context-free semantic and procedural memories effectively (Sylwester, 1995).

Recognition is easier than recall because recognition takes place in a context that is the same as or very similar to the original context. Emotions have important contributions to the recall and retrieval of the items. For example, if the memory has a kind of emotional connotation, the recreation of that emotional setting enhances the recall of that memory and related memories.

According to Sousa (2001), information that has survival value is quickly stored and retrieved when necessary. For example, we always remember that it is dangerous to walk in front of a moving bus or not to touch a hot stove.

Also, the stimuli must address to as many different senses as possible in order for the memory to locate it permanently. When done so, the information could be directed to long term memory more easily and successfully (Blakemore & Frith, 2005).

In conclusion, the best result in relation to learning and recall is now believed to be created by multiple memory locations and systems since memory is

considered to be a process related to the whole brain rather than a specific location in the brain.

2.8.4.1. Latent Learning

In a study on memory and learning, Philips *et al.* (2006) obtained interesting results. They state that in the analysis of memory it is commonly observed that, even after a memory is apparently forgotten, its latent presence can still be revealed in a subsequent learning task. In other words, even after apparent forgetting, a latent (residual) memory persists and can be revealed by facilitated acquisition in a subsequent learning task. Latent learning is considered a notable extension of this idea. As Philips *et al.* (2006) define it, latent learning is the well established phenomenon that latent memory can develop in the absence of apparent original learning.

Philips et al (2006) intended to investigate the mechanisms underlying this latent memory. In order to explore these mechanisms, they used *Aplysia,* which is a kind of marine mollusk. They used Aplysia because it was considered a model system that permits the simultaneous study of memory at the behavioral, cellular and the molecular levels.

The procedure of the research was in the following way: The researchers first asked whether sensitization training in *aplysia* can induce memory that outlasts overt behavioral expression, which is the latent memory. Their experimental strategy consisted of two phases. In *Phase I*, they induced LTM for sensitization of the tail-elicited siphon withdrawal. This optimization of initial forgetting allowed latent memory to be readily explored. At the end of *Phase I* training, they tracked memory retention in aplysia until the animals demonstrated clear forgetting. In *Phase II*, they assessed latent memory by retraining aplysia which had previously

expressed LTM for sensitization and subsequently exhibited two days of forgetting. Following retraining, they tested memory and analyzed the results.

The results showed that sensitization training of the tail-elicited siphon withdrawal can induce a latent memory. Specifically, they found that the prior induction of LTM for sensitization can significantly enhance the subsequent induction of other memories, even after the original memory is apparently forgotten. Moreover, the original LTM training enhances subsequent memory induction in three mechanistically distinct temporal domains, STM, ITM, and LTM. The latent memory induced by LTM training is maintained for at least two days after overt forgetting of the original experience but is gone by four days. Interestingly, they also observed modest but significant latent memory even in the absence of any overt original LTM. Collectively, these data demonstrated the formation of latent memory within a reflex system well suited for the cellular and molecular analysis of this form of learning.

Following this study, various forms of latent learning have been described in a large variety of animals, including humans. Collectively, these studies show that the general phenomenon of latent memory is a common feature of learning and memory.

2.9. Memory Model

For the past several decades, the dominant model of memory has been an information-processing model and there have been many variations of this model as a result of new understanding gained from many fields.

Wolfe (2001) expresses this model as the framework for human memory. This model should be viewed as representation of the functional rather than structural properties of the human memory system. In other words, this model does

not imply that the three categories of memory are located in different areas of the brain nor that they are separate, autonomous systems. Instead, they help us understand the processes by which the human mind encodes, stores, retrieves and integrates new information with previously stored information.

According to Wolfe's (2001) memory model, the starting point to understand learning and memory is *Sensory Memory.* Everything in memory begins as a sensory input from the environment. The role of sensory memory is to take the information coming into the brain through sensory receptors and hold it for a fraction of a second. All information received by sensory receptors needs to be sent to appropriate sensory cortex to be processed. As mentioned before, the thalamus plays a major role in this transfer. The input coming at this stage is a perception rather than a meaningful bit of information. Meaning is assigned to the input later through attention and emotions.

Working Memory is the next step in Wolfe's (2001) memory model. The input coming from the sensory memory is sent to the working memory which allows us to integrate the information coming from the sensory memory with stored knowledge and manipulate the information by thinking about it, talking about it or rehearsing it to ensure that it is stored in the long term memory. Working memory is more than a step between the sensory memory and long term memory, though. It is where information relevant to a current task is both maintained as subject to further processing. The locations of working memory in the brain seem dependent on the task it is given. But, still, many scientists believe that the frontal lobe, especially the prefrontal cortex is the primary location of the activity.

The capacity of the brain for short-term storage and processing of information is limited. Without rehearsal or constant attention, information remains

in working memory for about 15-20 seconds. However, this limitation can be overcome to some extent by chunking information instead of holding them as single bits. As defined by Wolfe (2001) a chunk is any meaningful unit of information. As well as chunking, rote and elaborative rehearsal, using associations, and emotions are ways to increase the capacity of the working memory.

Long-term memory is the last part of Wolfe's (2001) memory model. The information stored in long-term memory is relatively permanent. The capacity of the long term memory is unknown but it is considered to be extremely large. As defined before, procedural (nondeclarative) and declarative memories are the forms of long-term memory that are localized in different neural pathways.

Figure 6 visualizes the described memory model.

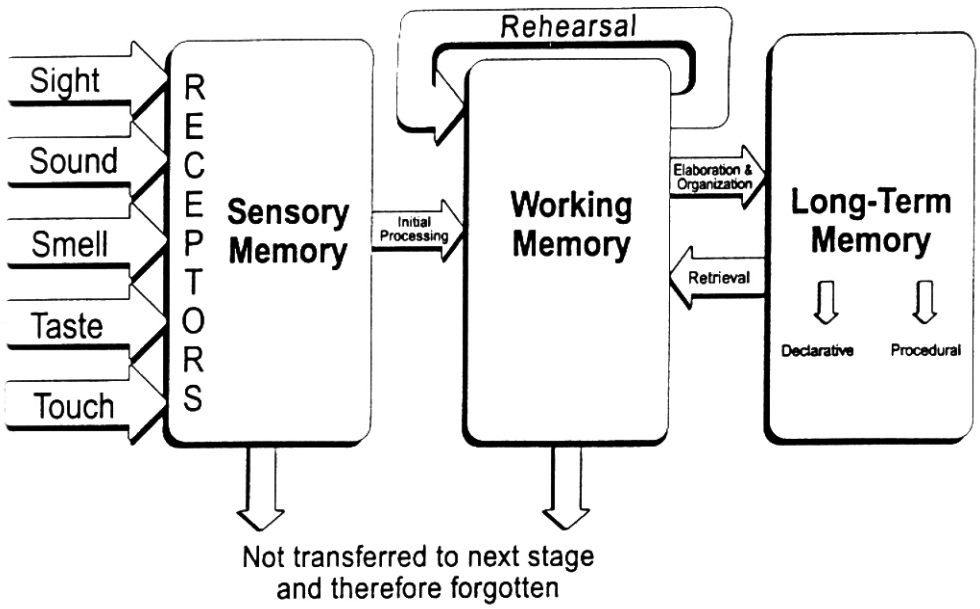

Figure 6. The Information Processing Model (Wolfe, 2001)

While describing her memory model, Wolfe (2001) suggests some strategies so that the transfer of information from the sensory memory to working memory and

from working memory to long term memory can be attained. She suggests some of the most relevant strategies for recall and retention in order to match the instruction to how the brain learns best. She states that there are some strategies which assist students in recalling information. One of them is *mnemonic strategy.* Mnemonic strategies are mostly based on memorizing pieces of information such as, how many days there are in each month. That is why, mnemonic strategies are sometimes criticized as they are nothing more than memorization. In fact, there is nothing emotional or meaningful in this strategy, but in some cases it is useful. For example, at times, we need to have relatively meaningless information; such as the spelling of a word or when to use certain punctuation. At these times, Wolfe (2001) says, mnemonic strategies work very well.

A second group of strategies suggested by Wolfe (2001) help students assist their understanding of concepts as well as remembering the facts. These are using *manipulatives* in various curricular areas in order to understand the concepts better than only read about them. For example, simulations could be used as manipulatives since they take advantage of mind-body connection. Thus, they are powerful tools for not only retention but also understanding.

According to Wolfe (2001), the third and the most powerful strategy combines retention, understanding and students' abilities to apply the concepts they are learning. To accomplish this, teachers include explicit examples of an application. Then, they have the students generate examples of when and how that concept is used or applied in another area.

The conclusion that could be drawn from Wolfe's (2001) strategy suggestions is that a recall strategy works best if it allows for understanding, meaning, emotions, and experiences. Wolfe (2001) offers ways in order to

accomplish these means for recall and retention of the items learned. The first point she recommends to teachers is that project work works well to increase meaning and motivation and when there is motivation, recall is easier. Instead of sitting and listening to the teacher talk, student involvement in a project or experiment is a much better way to learn. Projects and activities should be a way to enhance learning because such hands-on experiences engage more of the senses and use multiple pathways to store and recall information. That's why we remember what we have experienced better than what we have heard or read.

Another way that is suggested by Wolfe (2001) is using simulations and role plays as meaning makers. Since meaning is the basic way for learning, its role for recall and retention is undeniable. Wolfe (2001) states that simulations and role plays are useful strategies to enable the learning and recall of information; especially on tasks that cannot be carried into the classroom through realistic and authentic problem solving and projects. In those cases, simulations and role plays will provide the students with the assistance in comparing and contrasting the simulation with the actual event so they can abstract the general principles from it. In addition, some simulations are highly emotional and this is a benefit for further retention.

Wolfe (2001) also recommends teachers to utilize visual and auditory senses to enhance learning and retention. Individuals remember events not in words but in images and sounds. Therefore, when people mentally see an image or hear a sound, they are activating or reconstructing the neural pathways which were formed when they first experienced that stimulus. These sensory abilities are powerful components of brain functioning and they could be used in the classroom to enhance students' understanding and retention of information. Therefore, using pictures, diagrams, charts and maps as well as using music, rhyme and rhythm are of great

help for learning and retention. These helpers include highly complex neural activities. The mental mechanisms that process music and images are directly related to the other functions of the brain; such as, emotion, memory and language.

2.10. Vocabulary Retention

Words are very important and central to communication despite the fact that we do not even stop to think their importance and value. In this respect, Stahl and Nagy (2006) define people as "… fish that is unaware of the water in which it swims" (p.3) since we are not always conscious of how important words are for us to convey our message while communicating.

One importance of words is that they are the tools used to access our background information, express ideas, and learn new concepts. Stahl and Nagy (2006) relate vocabulary size and IQ because a vocabulary test is often used instead of a full scale test of verbal IQ. Also, a large vocabulary is one of the most important parts of verbal proficiency. In addition, vocabulary knowledge is important because a person who has the knowledge of many words can speak and think more precisely about the world.

Also, vocabulary is critical for some academic tasks as well. For example, vocabulary knowledge is very important for reading comprehension. To understand a passage you read, you need to know the meanings of the words correctly. Stahl and Nagy (2006) mention a sample study carried out to test the relationship between the difficulty of the words in a text and text comprehension. In this research the relationships between vocabulary knowledge and reading comprehension are found to correlate highly (in the 0.85 to 0.95 range).

With regard to the importance of vocabulary, one question appears: "What does it mean to *know* a word?" According to Thornbury (2002), knowing the

meaning of a word is not just knowing its dictionary meaning (or meanings), the learner has to know the words commonly associated with it; namely, its collocations as well as its connotations, its register, and its cultural accretions.

Another description of the meaning of a word is provided by Gairns & Redman (1986). They first define the *conceptual meaning* of a word. According to the conceptual meaning, to understand a word fully, a student must know not only what it refers to, but also where the boundaries are that separate it from words of related meanings. For example, if a language learner is shown three or four examples of drinking vessels, such as a glass, a mug, a cup or even a bowl and calls each of them a "cup," it does not necessarily mean that they know the conceptual meaning of the word "cup." As a second category, they mention *Affective Meaning* which refers to the attitudinal and emotional factors which can be expressed in an item of vocabulary. These are often referred to as "connotations." That is to say, the word may have reference to an identical object or action but the positive or negative emotional connotations attached to each of them might be different. For instance, "Joanna is a single woman" differs from "Joanna is a spinster" in that the word "spinster" has a series of emotional associations which are not the same for the word "single." Therefore, the knowledge of a word requires a view of its connotations.

Another description for what it means to know a word is the type of word knowledge; that is, the distinction between receptive and productive word knowledge. According to Gairns & Redman (1986), *Receptive Vocabulary* is the language items which can only be recognized and comprehended in the context of reading and listening material. This term is also referred to as *Passive Vocabulary.* On the other hand, *Productive Vocabulary* is the language items which the learner

can recall and use appropriately in speech and writing. Productive vocabulary is also called *Active Vocabulary.*

With native speakers receptive vocabulary far exceeds productive vocabulary. An educated speaker is able to understand between 45.000 and 60.000 items in context. However, the productive vocabulary of non-native speakers approaches this figure (Gairns & Redman, 1986).

2.11. Memory and Recall

While the brain is storing information, it does not use a special place for the memory, ready to be recalled any time. Actually, no complete information is stored anywhere in the brain but we have to reconstruct these memories every time. Our experiences are disassembled into parts and stored in specialized networks of cells. In other words, many parts of the brain contribute in a different way to the memory of a single event. Our knowledge is built on bits and pieces of many aspects of a given thing that is not represented at a single location (Wolfe, 2001).

Therefore, our ability to remember is actually a process of reconstruction or reactivation. Since the various elements of past experiences reside all over the brain- in the visual cortex, auditory cortex and other areas- recall is an activation of all these separate sites in unity, creating an integrated experience (Wolfe, 2001).

When it comes to the storage and recall of vocabulary items, Hedge (2000) sees vocabulary knowledge as a scale running from recognition of a word to automatic production through the stages of making better sense of the word and how it might be used in different contexts. However, knowledge of some words will remain at the recognition level and will be called on in reading and listening but never become part of a learners' productive ability. This characterization of vocabulary knowledge is complicated by the phenomenon of *forgetting,* which can

happen quite rapidly if distracting activities or elements interrupt the storing of the word in the long term memory.

As mentioned before, keeping items of verbal learning in short term memory is for brief periods. If any word is to be kept in the short term memory, constant repetition of the item would make it possible. However, some failure in retention will be experienced as the number of the items of chunks increase. Therefore, what is meant by "holding" an item in mind is storing it in the long term memory. Long term memory provides capacity for recall of the item minutes, weeks and even years after the input. Also, unlike short term memory, which has limited capacity, long term memory is limitless and can place any amount of new information (Gairns & Redman, 1986).

2.11.1. Practical Strategies for Recall and Retention

There are some strategies to transfer the items of vocabulary learned to the long term memory. Recent trends stress the need for meaningful activities, as Brain Based Learning does. According to Hedge (2000), more meaningful tasks require learners to analyze and process language more deeply and this engagement helps them to commit information to long term memory. Gairns & Redman (1986) report an experiment by Wilson and Bransford as an interesting insight to this topic. In this experiment, three groups of subjects were used. The first group were given a list of thirty words and told that they would be tested on their ability of recalling those words. The second group were given the same list of words and told to rate each word according to their pleasantness or unpleasantness and they were not told that they would be tested on those items. The third group were given the same list and asked to decide whether the items in the list would be important or unimportant if they were left on a desert island. They were also not told that they would be tested

on their ability to recall those words. The results of the test showed a similar degree of recall between groups one and two while group three recorded the highest rate of recall. Based on these findings, it would be possible to infer that subjects are more likely to retain verbal input if they are actively engaged in a meaningful task that involves some kind of semantic processing and provides a unifying meaningful *theme* to facilitate the organization of items in the memory.

Another strategy to transfer the items of vocabulary into long term memory for further recall is the use of visual images. One advantage of this is that our memory for visual images is quite reliable; that objects and pictures can facilitate memory as they form a pattern for multiple memory pathways. It is easier to recall the image of a concrete item than an abstract one.

Sousa (2001) states that the longer an item is processed the greater the probability that the sense and the *meaning* would be found and thus, retention will occur. He has ideas to consider, especially for teachers, to enhance the long term memory. He states that one way to enhance the retention of items is through motivation. Motivation is an *emotional* response and it is a key to the amount of *attention*. Therefore, the strategies that Sousa (2001) suggests are related to meaning, emotions and attention linked to the task. As the ways to create such motivation, he suggests generating the interest of the learner to the learned material, establishing accountability by convincing the learners that they will be held responsible for the learned material, and providing immediate, specific and corrective feedback on the task. If these premises are established, the retention of the item is highly possible to be enabled.

Finally, items can be stored in long term memory for later retention through repetition and recycling. Items in the memory would gradually fade in time if there

is no repetition or regular practice. Therefore, opportunities should be created for learners so that they can practice what they have learnt.

According to Hedge (2000), factors such as frequency, pronunciation and contextualization influence the acquisition and retention of words.

The best result can be achieved when brain-based strategies can be used and tailored for each individual learner as each brain is unique.

This recall and retention process has implications for different genders as well. As mentioned before, males and females process information differently in their brains since their brains are biologically different from each other. Thus, despite these common features of memory and retention patterns, there will be some differences between the vocabulary retention levels of male and female students.

First of all, since the memory centers, like the hippocampus are larger in the female brain and fed by female hormone estrogen, girls are considered to have a higher level of retention of the learned vocabulary items. Also, because the corpus callosum is larger and stronger in the female brain, girls are considered to make a better and faster association of the words and their conceptual meanings. The reason for this is that the name of a word is located at the left hemisphere while the conceptual meaning of it is at the right hemisphere. Since the corpus callosum makes the information transfer between the two hemispheres possible, it is inevitable that, with their stronger corpus callosum, female students can achieve a faster retention of the words in memory. Also, in the female brain, the centers of language have more neurons than the male brain. This indicates girls' superiority in language related tasks including vocabulary retention. Also, the female brain has more grey matter in the left hemisphere, where language is processed. Therefore,

girls are susceptible to better performance at language related tasks, including vocabulary retention.

The characteristics of the male and female brains and their implications for gender-related skills of language learning have been identified in order to contribute to the achievement levels of learners. The characteristics of their brains and the way their brains learn need to be identified for the students to become more proficient language learners. On the other hand, there are other means of improving the achievement levels of the learners, which are *language learning strategies.* Through language learning strategies can language learners control and improve their own learning.

Brain based learning suggests that learner autonomy and meaning are the keys to greater learning. Therefore, language learning strategies are quite in line with the ways in which the brain learns naturally as well as the recall and retention strategies since they offer learner autonomy and meaningful learning. Language learning strategies are used by students themselves although teachers play an important role in helping students develop and use strategies in more effective ways. For all these reasons, language learning strategies and their implications for education must be studied in detail.

2.12. Language Learning Strategies

According to Oxford (1990), learning strategies are steps taken by students to enhance their own learning. Although language learning strategies have recently been discovered and formally named, they have actually been used for thousands of years.

Learning strategies are important to study because they are tools for active, self-directed involvement of learners and this is essential for improving

communicative competence in a foreign language. Oxford (1990) states that appropriate language learning strategies result in better proficiency and better self confidence.

Strategy, as a term and a concept has become influential in education as *learning strategies*. Learning strategies are defined as the operations employed by learners to help the acquisition, storage, retrieval and use of information. Also, they are specific actions taken by the learner to make learning easier, faster, more self-directed and more effective (Oxford, 1990).

2.12.1. Features of Language Learning Strategies

Oxford (1990) summarizes the main features of language learning strategies as follows:

1. All language learning strategies serve the main goal of communicative competence. In order to develop communicative competence, learners must interact with language using meaningful, contextualized language. Learning strategies help learners participate actively in such authentic interaction and aid the development of communicative competence.
2. Language learning strategies encourage learners for greater self-direction. Self-direction is essential for the active development of ability in a new language.
3. Language learning strategies assign new roles for the teacher. Thanks to language learning strategies, teachers get rid of their traditional roles as the authority figures and controllers in the classroom. New roles of teachers include identifying students' learning strategies, conducting training on learning strategies and helping learners become more

independent. These changes strengthen teachers' roles making them more varied and more creative.

4. Language learning strategies are problem-oriented. They are tools used because there is a problem to solve, a task to accomplish, an objective to meet or a goal to attain.
5. Language learning strategies have an action basis. They are specific actions or behaviors accomplished by students to enhance their learning.
6. Language learning strategies are not restricted to cognitive functions, such as those dealing with mental processing and manipulation of the new language. They also include metacognitive functions like planning, evaluating and arranging one's own learning; and emotional, social and other functions as well.
7. Language learning strategies offer direct and indirect support of learning. Some learning strategies involve direct learning and use of the subject matter. These are known as *direct strategies*. Other strategies, including metacognitive, affective and social strategies contribute indirectly to learning. These are known as *indirect strategies*. Direct and indirect strategies are equally important.
8. Language learning strategies have some degree of observability. They are not always readily observable. For example, the act of making mental associations, which is an important memory strategy, cannot be observed. However, cooperating, a strategy in which the learner works with someone else, can be observed.
9. Language learning strategies have some levels of consciousness. They usually reflect conscious efforts by learners to take control of their

learning. However, after a certain amount of practice and use, learning strategies can become automatic. In fact, making appropriate learning strategies automatic is a desirable thing.

10. Language learning strategies can be taught and modified. This can be done through strategy training, which is an essential part of language education. Strategy training helps learners to become more conscious of strategy use and more skilled at employing appropriate strategies.
11. Language learning strategies are flexible; that is, they are not always in the same sequences or certain patterns. There is a variety and individuality in the way that learners choose and utilize strategies.

2.12.2. Factors Influencing Strategy Choice

There are a lot of factors which influence strategy choice; such as awareness, stage of learning, task requirements, teacher expectations, age, sex, nationality, general learning style, personality traits, motivation level, purpose for learning the language, and so on.

One factor influencing the strategy choice is the degree of awareness. Learners who are more aware of themselves and the process they are in seem to use better strategies.

Also, tasks requirements help determine the strategy choice. For instance, learners will not use the same strategies for writing an essay and chatting with a native speaker.

In addition, teacher expectations related to instruction and testing greatly influence the strategy choice. For example, if the teacher emphasizes grammar learning, students will develop learning strategies, such as analysis and reasoning rather than strategies for communication.

Another factor influencing the strategy choice is age. Older and younger learners use different strategies. Also, nationality and ethnicity influence strategy use. For example, Hispanics seem to use social strategies more than some other ethnic groups. General learning style has also a strong effect on the strategies that the language learner uses.

Motivation is related to language learning purposes, which is another key to strategy use. More highly motivated learners use a significantly greater range of strategies than less motivated learners. For instance, individuals who want to learn a new language for interpersonal communication use different strategies than learners who only want to carry out a graduation requirement.

2.12.2.1 The Role of Gender on Strategy Choice

Finally, another key factor influencing strategy choice is gender. It has been found that males and females employ different strategies in relation to the gender characteristics. Recent studies indicate that females use much different range of strategies than males for language learning. This difference between males and females might also result from the different structures of the male and female brain and hormones secreted.

These characteristics of language learning strategies are useful background for the classification of the strategies. The following section deals with the classification system of language learning strategies in more detail.

2.12.3. The Classification of Language Learning Strategies

Language learning strategies are divided into two major classes: *direct* and *indirect* (Oxford, 1990). These two classes are subdivided into a total of six groups. Memory strategies, cognitive strategies, and compensation strategies are under the

direct strategies while metacognitive strategies, affective strategies and social strategies are under the indirect strategies.

Even if there are different groups, all these strategies are related to each other. Figure 7 indicates the relationship between the strategy groups.

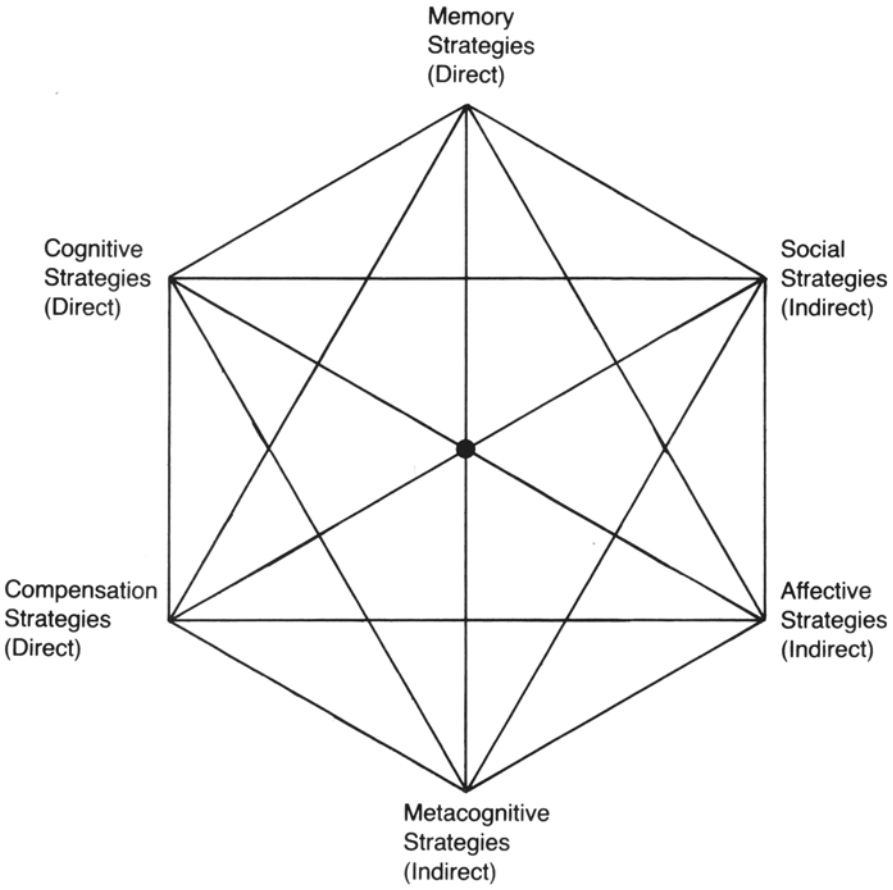

Figure 7. Interrelationships between Direct and Indirect Strategies and the Six Strategy Groups (Oxford, 1990).

Direct and indirect strategies support each other and the six strategy groups interact with and help each other. The first major class, direct strategies, works with the language itself in a variety of tasks and situations. The direct class is composed of memory strategies for remembering and retrieving new information; cognitive

strategies for understanding and producing the language; and compensation strategies for using the language despite knowledge gaps (Oxford, 1989).

The second major strategy class, indirect strategies, is made up of metacognitive strategies for coordinating the learning process, affective strategies for regulating emotions and social strategies for learning with others. Indirect strategies serve such functions as focusing, organizing, guiding, checking, correcting, coaching, and encouraging.

2.12.3.1. Direct Strategies

Oxford (1990) defines direct strategies as language learning strategies which directly involve the target language. All direct strategies require mental processing of the language although each of the three subgroups of direct strategies does this processing differently.

Direct strategies are classified into three groups: Memory Strategies, Cognitive Strategies and Compensation Strategies.

2.12.3.1.1. Memory Strategies

Memory strategies are also called mnemonics. As defined in Cambridge Advanced Learners' Dictionary (2003), mnemonic is something such as a very short poem or a specific word that is used to help a person remember something. They have been used for thousands of years, for example, by orators in ancient times to remember a long speech. Now, memory strategies are still being used as powerful mental tools. Oxford (1990) states that the mind can store 100 trillion bits of information, but only part of that potential can be used if the learner does not get help from the memory strategies.

Memory strategies indicate some principles, such as arranging things in order, making associations, and reviewing. According to Oxford (1990), all of these

principles include *meaning,* which is essential for the learner to make arrangements and associations while learning a new language.

Memory strategies can contribute powerfully to language learning. However, language students rarely report using memory strategies (Oxford, 1990). It might be because language learners do not employ memory strategies, or because they are unaware of the fact that how often they actually employ these strategies.

Oxford (1990) classifies memory strategies in four sets: Creating mental linkages, applying images and sounds, reviewing well and employing actions. Below is the diagram indicating those clusters of the memory strategies.

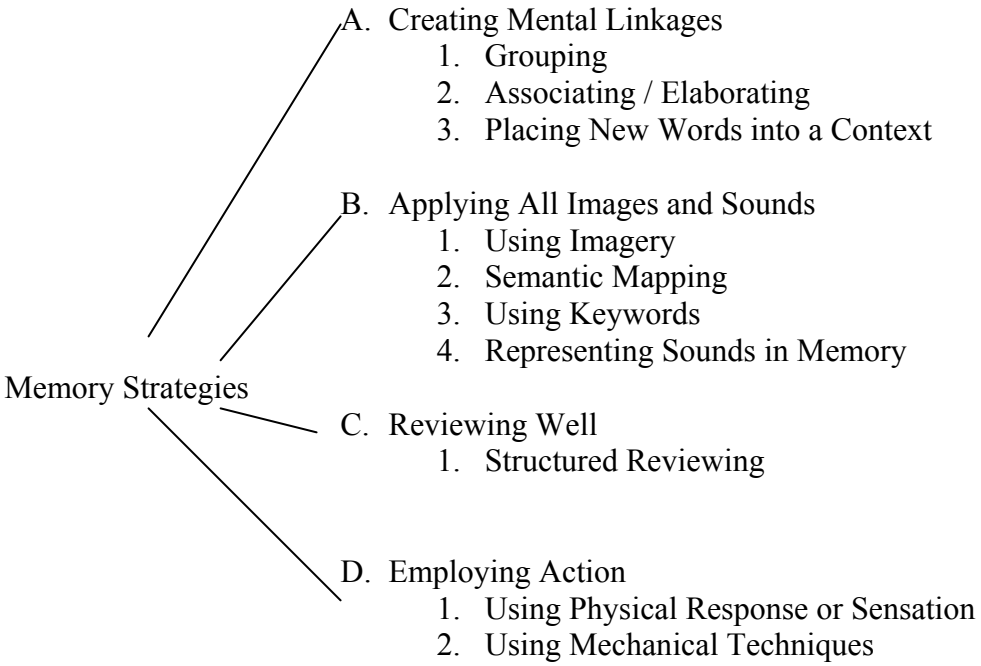

Figure 8. Diagram of the Memory Strategies (Oxford, 1990)

Creating Mental Linkages

In this set, there are three strategies: grouping, associating/elaborating, and using context. They are related to classifying language material into meaning units,

mentally or in writing; relating new information to existing ones or relating one piece of information into another in order to create associations in memory as word-based or as a semantic map; and, finally, placing a word or phrase in a meaningful sentence, conversation or story in order to remember it by linking with a context.

Applying Images and Sounds

Four strategies are included in this set: using imagery, using keywords, semantic mapping, and representing sounds in memory. These strategies are linked to relating new language information to concepts that are already in memory using visual imagery in the mind or in actual drawing, such as the picture of an object; making an arrangement or words into a picture or a diagram which has a key concept at the center and the related concepts around; remembering a new unit by using auditory and visual links; and remembering new language information according to its sounds.

Reviewing Well

This set contains only one strategy; structured reviewing. Structured Reviewing is related to reviewing the new language material in carefully spaced intervals, at first together, and then more widely spaced apart.

Employing Action

The two strategies in this set, using physical response or sensation and using mechanical techniques, both involve some kind of meaningful movement or action. This former one is related to physically acting out a new expression or meaningfully relating a new expression to a physical feeling or sensation, such as warmth; while the latter is linked with using creative techniques, especially by moving or changing something to remember new target information. For example, writing words on cards and moving the cards from one to another.

2.12.3.1.2. Cognitive Strategies

Cognitive strategies are various, from repeating to analyzing expressions or summarizing. However, no matter how various they are, they do have a common function, which is that they enable the learner to manipulate or transform the target language. For this reason, cognitive strategies are essential for learning a new language. According to Oxford (1990), cognitive strategies are the most popular strategies among language learners.

Oxford (1990) indicates that there are four sets of cognitive strategies. They are Practicing, Receiving and Sending Messages, Analyzing and Reasoning, and Creating Structure for Input and Output. Below is the diagram indicating those clusters of the cognitive strategies.

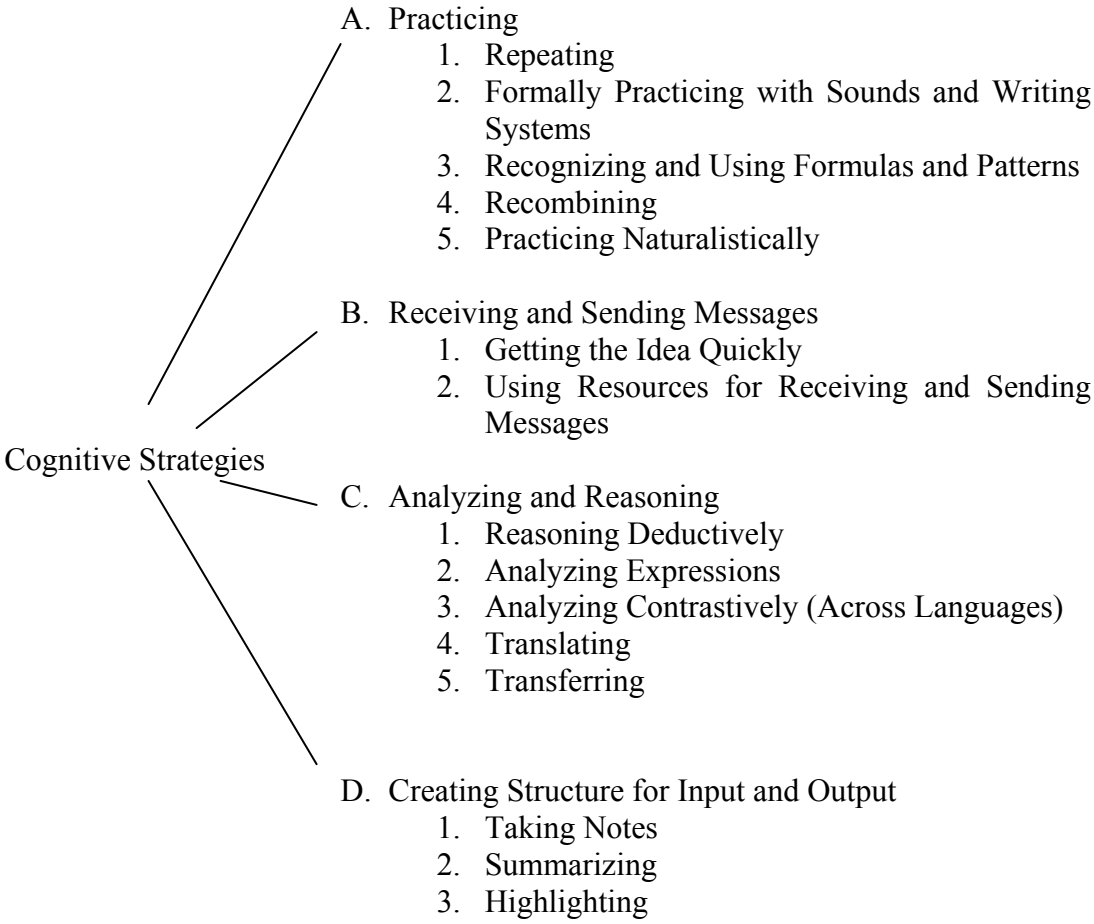

Figure 9. Diagram of the Cognitive Strategies (Oxford, 1990)

Practicing

Strategies for practicing are among the most important cognitive strategies. More practice is usually needed to reach proficiency, which requires many hours of practice. With this fact in mind, practicing strategies take on a special value.

Practicing strategies include repeating, formally practicing with sounds and writing systems, recognizing and using formulas and patterns, recombining and practicing naturalistically (Oxford, 1990). They refer to saying or doing something over and over; rehearsing; practicing sounds and written versions of the target language in a variety of ways; being aware of and using routine formulas and patterns, such as “Hello, how are you?”; combining known elements in new ways to

produce longer sentences; and practicing the new language in natural, realistic settings.

Receiving and Sending Messages

Strategies for receiving and sending messages are necessary tools. They include two strategies, which are getting the idea quickly and using resources for receiving and sending messages.

The former refers to using skimming to determine the main ideas and scanning to find specific details of interest. These help learners understand what they have heard or read quickly.

On the other hand, the latter is related to using print or nonprint resources to understand incoming messages or produce outgoing messages.

Analyzing and Reasoning

Analyzing and reasoning are strategies that are commonly used by language learners. Many learners tend to 'reason out' the new language (Oxford, 1990). This means that they construct a formal model in their minds based on analysis and comparison, create general rules and revise those rules when new information is available. This process, which is enabled by analyzing and reasoning strategies, is very important.

Analyzing and reasoning strategies include such skills as reasoning deductively, analyzing expressions, analyzing contrastively, translating and transferring.

They apply to use general rules and apply them into new target language situations; determine the meaning of a new expression by breaking it down into parts; compare elements of the target language with elements of the native language; convert an expression in the target language into the native language or convert

native language into target language; and finally, directly apply the knowledge of words, concepts or structures from one language into the other.

Creating Structure for Input and Output

Structure is necessary for both comprehension and production in the new language. That's why, strategies which offer ways to create structure are important.

Strategies for creating structure include taking notes, summarizing and highlighting. They are related to writing down the main idea or specific points during instruction as raw notes or in more systematic ways; making a summary or abstract of a longer unit; and using a variety of emphasis techniques, such as underlining or color-coding to focus on important information.

2.12.3.1.3. Compensation Strategies

Compensation strategies enable learners to use the new language for either comprehension or production although there might be some limitations in knowledge. Oxford (1990) states that compensation strategies are intended to make up for an inadequate repertoire of grammar and vocabulary.

Compensation strategies allow learners to produce spoken and written expressions in the new language without complete knowledge since compensation occurs not only in comprehension but also in production. Compensation strategies for production help the learners to keep on using the language. In addition, some of these strategies help learners become more fluent in what they already know. Some other compensation strategies may lead learners to gain information about what is appropriate in the target language. According to Oxford (1990), learners who are skilled in compensation strategies sometimes communicate better than learners who are not.

There are ten compensation strategies which exist under two sets of strategies. These sets are Guessing Intelligently and Overcoming Limitations in Speaking and Writing. Below is the diagram indicating those clusters of the compensation strategies.

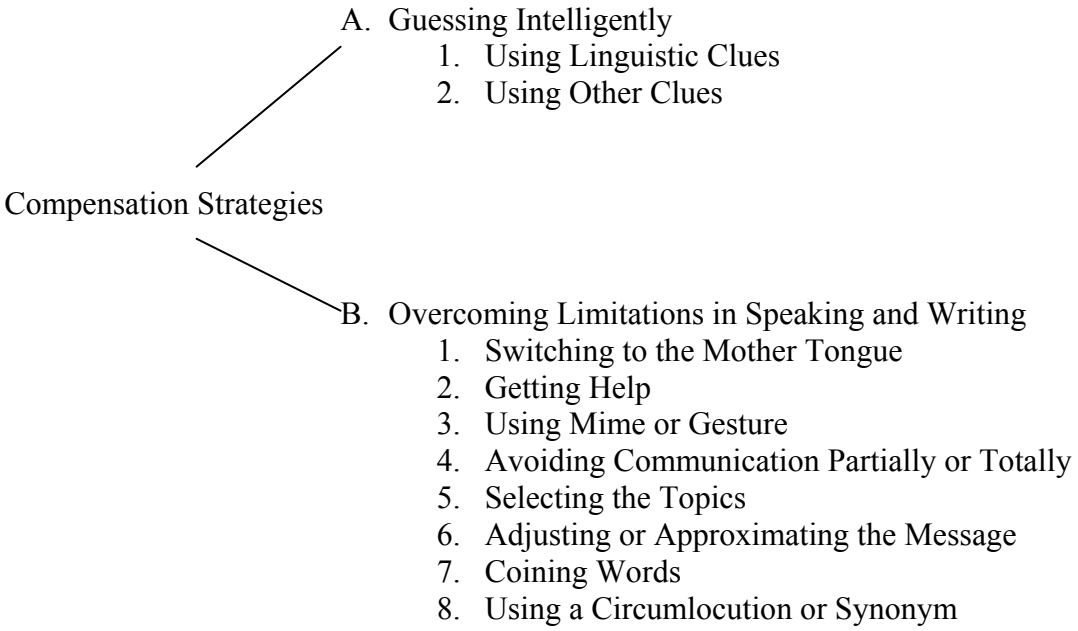

Figure 10. Diagram of the Compensation Strategies (Oxford, 1990)

Guessing Intelligently

The two strategies which are related to guessing intelligently refer to using linguistic and non-linguistic clues to compensate for the missing information. They are related to seeking and using language based and non-language based clues in order to guess the meaning of what is read or heard in the target language, in the absence of complete knowledge of grammar, vocabulary and other language elements.

Among the linguistic clues, the other words in the sentence, type of the word, or previous knowledge of certain words may count. As for the non-linguistic

clues, context, situation, text structure, or visual clues accompanying the text are among them.

Overcoming Limitations in Speaking and Writing

Eight strategies are used for overcoming difficulties in speaking and writing. They are Switching to the Mother Tongue, Getting Help, Using Mime or Gesture, Avoiding Communication Partially or Totally, Selecting the Topics, Adjusting or Approximating the Message, Coining Words, and Using a Circumlocution or Synonym.

They are respectively related to using mother tongue for an expression without translating it; asking someone for help to provide the missing expression; using physical motion, such as mime and gesture; avoiding conversation when difficulties are anticipated; choosing the topic of conversation in order to direct communication; altering the message by omitting some items of information; making up new words to communicate the desired idea; getting the meaning across by describing the concept or using a word that means the same thing.

2.12.3.2. Indirect Strategies

Oxford (1990) refers to indirect strategies as they "underpin the business of language learning." Indirect strategies are called so because they support language learning without directly involving the target language although they go hand in hand with the direct strategies and they are useful in all language learning situations and the four skills of language.

Indirect strategies are divided into three groups: Metacognitive Strategies, Affective Strategies and Social Strategies.

2.12.3.2.1. Metacognitive Strategies

The word “metacognitive” means beyond, beside or with the cognitive (Oxford, 1990). Therefore, metacognitive strategies go beyond cognitive devices and they enable learners to coordinate their own learning process.

According to Oxford (1990), metacognitive strategies are very important for successful language learning. They include skills such as paying attention and linking with already existing knowledge. Such skills are needed by language learners who may sometimes get overwhelmed by the continuous novelty and “newness” of the target language, like unfamiliar vocabulary, confusing rules, different writing systems, etc. Learners can regain their focus, which they may lose due to this newness, through the conscious use of metacognitive strategies.

Despite the importance of metacognitive strategies, learners are reported to rarely or unconsciously use these strategies (Oxford, 1990). They seem to utilize these strategies more infrequently than cognitive strategies. Therefore, it is obvious that learners need to learn more about the role of the metacognitive strategies.

There are eleven skills which exist under three sets of metacognitive strategies. These sets are Centering Your Learning, Arranging and Planning Your Learning and Evaluating Your Learning. Below is the diagram indicating those clusters of the metacognitive strategies.

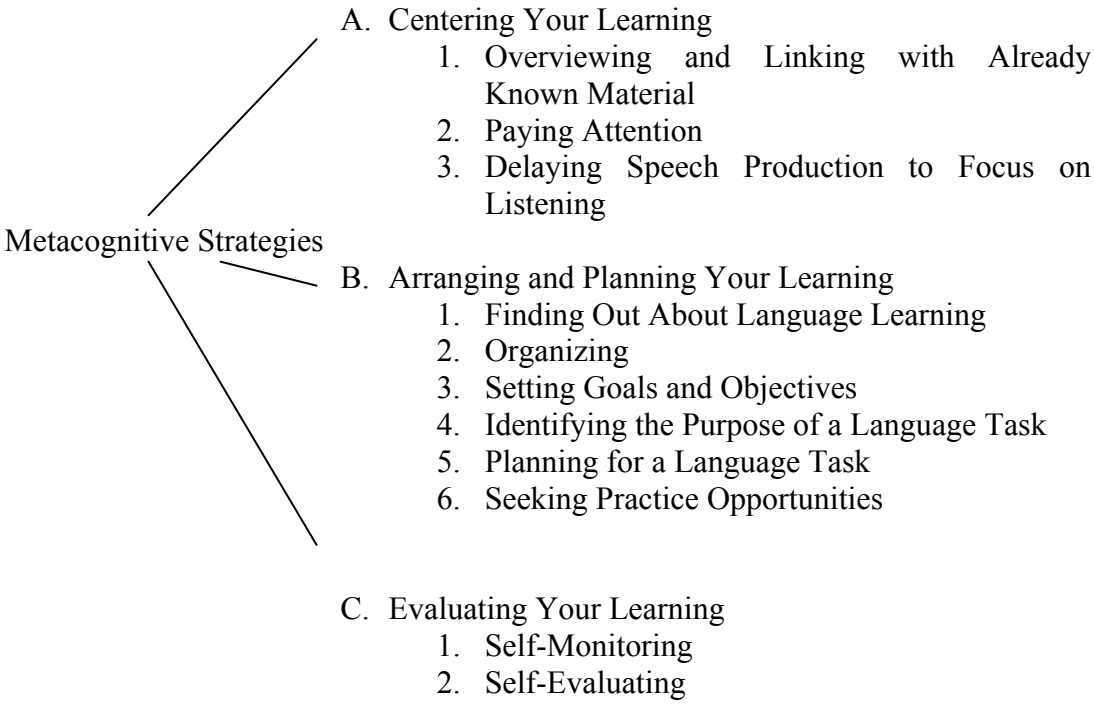

Figure 11. Diagram of the Metacognitive Strategies (Oxford, 1990)

Centering Your Learning

Metacognitive strategies related to centering your learning help learners to direct and center their attention on certain language tasks, activities or materials. Use of these strategies provides the learners with a focus for language learning.

The skills of centering your learning include overviewing and linking with already known material, paying attention and delaying speech production to focus on listening. They are related to overviewing a concept or principle thoroughly and associating it with already known material; making up your mind to pay attention to language material or instruction and ignoring distractors; and deciding to delay speech production partially or totally till listening skills are better developed. This "silent period" is considered essential by some language educators while some others still discuss it (Oxford, 1990).

Arranging and Planning Your Learning

This set of strategies help learners to organize and plan to get the maximum benefit of language learning.

These strategies touch many areas such as finding out about language learning, organizing, setting goals and objectives, identifying the purpose of a language task, planning for a language task, and seeking practice opportunities.

Respectively, they are related to making efforts to find out how language learning works by reading books or talking to other people; understanding and using every possible condition to make the maximum benefit out of language learning and organizing one's own schedule; setting aims for oneself about language learning; deciding the purpose of a certain language task involving any skill; planning for the language elements and functions coming across in a language task or situation; and looking for and creating opportunities for practicing the target language in natural situations.

Evaluating Your Learning

The two skills in this set of strategies help learners to check their language performance.

The skills in this set are self-monitoring, which is related to identifying one's own errors in both understanding and producing the new language; and self-evaluating, which refers to evaluating one's own progress in the target language.

2.12.3.2.2. Affective Strategies

The term "affective" refers to emotions, attitudes, motivations and values (Oxford, 1990). It is impossible to separate the affective factors from language learning. The affective side of the learner constitutes one of the biggest influences on the language learning process. It was also stated before that negative feelings can

hinder progress while positive emotions and attitudes can make language learning more enjoyable and fruitful. Therefore, while learning a new language, learners can gain control over factors related to emotions, attitudes, motivations and values through the use of affective strategies. That is why teachers must consider the emotional atmosphere of the language classroom. Learners must be aware of and equipped with affective factors such as self-esteem, motivation and certain amount of anxiety (Oxford, 1990).

There are ten skills which exist under three sets of affective strategies. These sets are Lowering Your Anxiety, Encouraging Yourself and Taking Your Emotional Temperature. Below is the diagram indicating those clusters of the affective strategies.

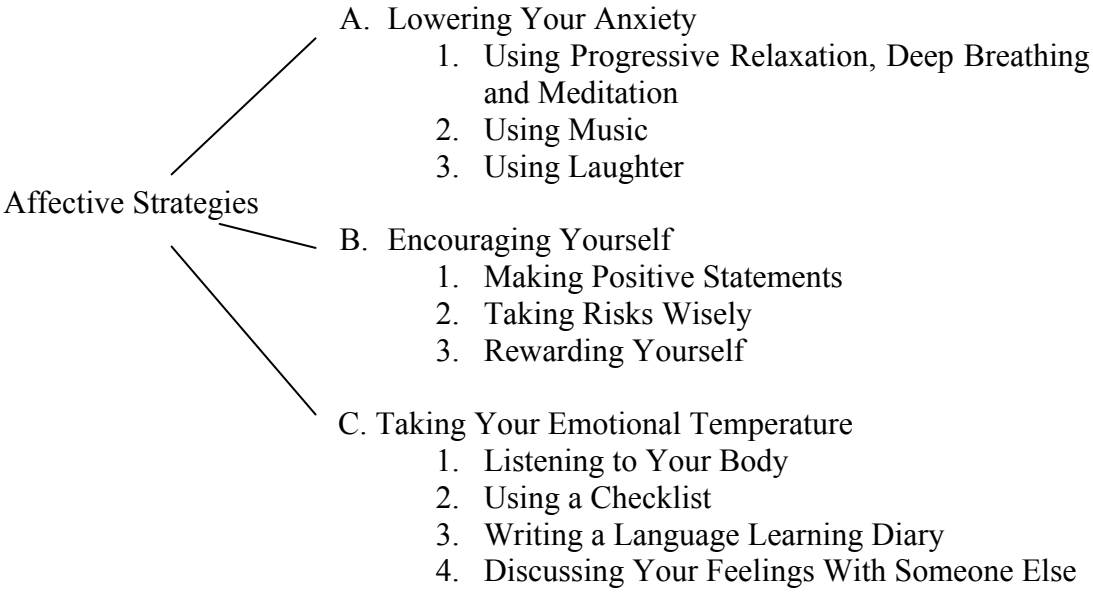

Figure 12. Diagram of the Affective Strategies (Oxford, 1990)

Lowering Your Anxiety

These are the anxiety reducing strategies of language learning. Each of the three skills in this set of strategies has both physical and mental components.

The skills in this strategy are using progressive relaxation, deep breathing or meditation, using music and using laughter. They are good for tensing and relaxing the muscle groups in the body; listening to soothing music and using laughter through watching funny films or reading humorous books as ways to relax while learning the target language.

Encouraging Yourself

The skills in this set of affective strategies are good for self-encouragement of the learner. Oxford (1990) states that self-encouragement is very important and better than expecting appreciation from others since the most crucial motivation is the kind that comes from inside.

Learners can adopt some skills to encourage themselves, such as making positive statements to themselves in order to feel more confident in learning the target language; taking risks wisely in language situations although there is a chance of making mistakes that must be tolerated with good judgment; and rewarding themselves for good performance in the new language.

Taking Your Emotional Temperature

This strategy refers to the skills that help learners to assess their feelings, motivations and attitudes and relate them to language tasks. According to Oxford (1990), unless learners know how they are feeling and why they are feeling that way, they are less able to control their feelings and their affective side. This is important for the learners so that they control their negative feelings hindering language learning.

The skills related to this affective strategy are listening to your body, using a checklist, writing a language learning diary, and discussing your feelings with someone else. They respectively refer to paying attention to signals given by the

body, such as stress, tension, worry, fear or anger; using a checklist to discover feelings and attitudes related to language learning; writing a diary or journal to keep track of events and feelings in the process of language learning; and talking with another person like a friend or a teacher to discover and express feelings about language learning.

2.12.3.2.3. Social Strategies

Oxford (1990) states that language is a form of social behavior. It is the base of communication which occurs between and among people. That is, language learning involves other people. Therefore, social strategies are very important in this process.

There are six skills which exist under three sets of social strategies. These sets are Asking Questions, Cooperating with Others and Empathizing with Others. Below is the diagram indicating those clusters of the social strategies.

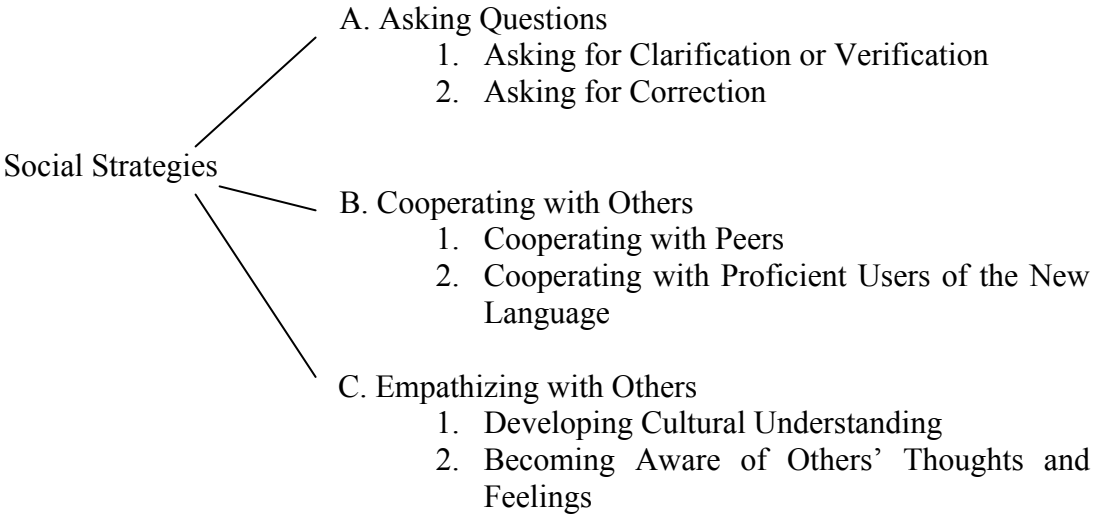

Figure 13. Diagram of the Social Strategies (Oxford, 1990)

Asking Questions

It is crucial to get help from more proficient users of the target language during the language learning process. Therefore, it is an important strategy to ask teachers, native speakers or more proficient peers for clarification, verification or correction.

Asking the speaker to repeat, paraphrase, explain or slow down or asking if a specific expression is correct is of great value during language learning since it provides the learner with feedback. Also, as another skill of asking questions, asking someone for correction in a conversation or in writing is also important for immediate feedback. That is why these skills should be adopted by language learners.

Cooperating with Others

Cooperating with others is considered a social strategy since it involves interacting with others to improve language skills. These skills increase learners' language performance as well as providing them with self-worth and social acceptance.

Cooperating with others can occur in two ways: Cooperating with peers and with proficient users of the new language. Oxford (1990) states that it is good to work with other language learners to improve language skills because it diminishes competitiveness and rivalry. It is also beneficial to work with teachers or native speakers of the target language outside the classroom since it attracts attention to conversational roles in natural settings.

Empathizing with Others

Empathy is the ability to "put yourself in someone else's shoes" in order to understand that person's perspective better. Empathy is essential for successful

communication and social strategies can help learners increase their ability to empathize.

Empathy can be developed better and more easily when language learners use strategies like developing cultural understanding and the relation of the other person in the conversation to that culture as well as becoming aware of others' thoughts and feelings.

Oxford (1990) classifies and explains the language learning strategies in these ways. They were important to discuss since the questionnaire used in this study is based on this taxonomy of language learning strategies. However, since he focus of this study is the strategies used during vocabulary learning, now it is also important to discuss vocabulary learning strategies.

2.13. Vocabulary Learning and Consolidation Strategies

Vocabulary has been an area of interest in the field of language acquisition and teaching in the last decades. The importance of vocabulary in language learning and the role of memory and recall for vocabulary retention have been discussed before. In addition, the efforts of educators to make vocabulary retention easier and more permanent in memory have given birth to the importance of a newly recognized aspect; which is the *strategies for vocabulary learning and consolidation*.

Research about the vocabulary learning and consolidation strategies stemmed from the movement which tries to get language learning away from teacher-oriented perspective to the interest in how the actions of learners affect their acquisition of the language. This perspective led to the interest in how individual learners approach and control their own learning and use of language (Schmitt &

McCarthy, 1997). Therefore, the emphasis has moved onto the language learning strategies which refer to learners' controlling their own learning process.

When it comes to vocabulary learning strategies, Schmitt & McCarthy(1997) point out that in the process of identifying and categorizing language strategies, many studies indirectly dealt with strategies that are applicable to vocabulary learning. However, many learners employ strategies for learning vocabulary. According to a research which Schmitt & McCarthy (1997) report, high school ESL learners indicated more strategy use for vocabulary learning than for any other language learning activity. This might be because of the discrete nature of vocabulary learning when compared to other language activities, such as giving oral presentations and listening comprehension. This discrete nature of vocabulary makes it possible to apply strategies more effectively. This higher use of strategies for vocabulary might also be because of learners' awareness of the importance of vocabulary.

Thus, it could be concluded that strategies for vocabulary learning are good to use since they provide learners with effective recall of the words. However, Schmitt & McCarthy (1997) also emphasize that strategies should not be considered inherently good. They depend on the context in which they are used. The effectiveness of the strategies, then, will be dependent on some variables, such as proficiency level, task, text, language modality, background knowledge, context of learning, target language, learner characteristics, culture and frequency of occurrence of a word.

Once the strategies for vocabulary learning are discussed, the next step is to organize them according to a framework and taxonomy.

2.13.1. Taxonomy of Vocabulary Learning Strategies

Schmitt & McCarthy (1997) refer to Oxford (1990) as being able to capture and organize the wide variety of learning strategies. The part of her strategy system is the most useful.

However, Schmitt & McCarthy (1997) think that Oxford's (1995) classification system may sometimes be insufficient in categorizing vocabulary-specific strategies. For this reason, Schmitt & McCarthy (1997) add Determination Strategies as a new category for Oxford's (1998) classification. Determination Strategies refer to the kind of strategies used by an individual when faced with discovering a new word's meaning without consulting to another person's expertise. In addition to the Determination Strategies (DET), Schmitt & McCarthy (1997) also use the titles of the other strategies in Oxford's (1995) taxonomy; which are Social Strategies (SOC), Memory Strategies (MEM), Cognitive Strategies (COG), and Metacognitive Strategies (MET). Skills related to vocabulary learning are classified under the related strategies.

2.13.2. Discovery and Consolidation of the Meaning of a Word

Schmitt & McCarthy (1997) firstly classify the skills according to two purposes: *Discovering the meaning of a word* and *Consolidating the meaning*. Therefore, it is initially necessary to identify the difference between the terms *discovery* and *consolidation.*

The term *discovery* means coming across a word for the first time and learning its meaning and use. However, the term consolidation refers to the persistence of the learnt or discovered item so that it can be revealed at a later time. Gazzaniga, et al. (2002), define *discovery* as the process of acquiring new

information and *consolidation* as the process of creating stronger representation over time.

After the meaning of a word is discovered following the first encounter with the word, this newly formed memory needs to be more stable. According to Wolfe (2001), this process of making memories more stable is called the consolidation period. It is known that memory is not formed at the moment information is acquired. Rather, it is a dynamic procedure with unconscious processes called consolidation, which continue to strengthen and stabilize the connections over some periods of time. This consolidation process is enhanced by rehearsal. As Wolfe (2001) expresses, when we rehearse what we have discovered, we provide more opportunities for consolidation.

2.13.2.1. The Biology of Discovery and Consolidation

Consolidation seems to be the result of biological changes underlying the retention of learned information. According to Wolfe (2001), considering the importance of the hippocampus in the formation of the long-term memory, it is certain that the hippocampus and of nearby structures in the medial temporal lobe are integral to consolidation. Without the effect of hippocampus, consolidation would not take place.

Gazzaniga et. al. (2002) reports a study indicating the biology of consolidation. The study reported is the case of H.M. who was a young man. He suffered from a form of epilepsy and it was decided that to cure his epilepsy the related part in his brain had to be surgically removed. Therefore, his medial temporal lobe was removed bilaterally. Following the surgery, his epilepsy did improve. However, some time later, he displayed clear problems with his memory. H.M. was no longer able to form new long term memories. He developed a severe

and permanent inability to acquire new information. Although H.M. had normal short-term memory, he performed poorly on the tests that required the acquisition of new long -term memories. The problem was that he was unable to transfer information from short-term memory to long-term memory.

The medial temporal lobe includes the amygdala, the hippocampus and the surrounding parahippocampal and perirhinal cortical areas. Therefore, this evidence suggests that the removal of medial temporal lobe causes dense amnesia and inability to transfer information from short-term memory to long-term memory. This transfer is the process called consolidation. Thus, it is clear that medial temporal lobe and the hippocampus are critical for consolidation of information in the long-term memory.

When it comes to the question what consolidation might entail at the neural level, Gazzaniga et.al. (2002) state that consolidation strengthens the associations between multiple stimulus input and activations of previously stored information. The hippocampus is hypothesized to coordinate this strengthening but the effects are believed to take place in the neocortex. That means, once consolidation is complete; the hippocampus is no longer required for storage and retrieval. In other words, although the memories are stored in the neocortex, the hippocampus is crucial for consolidation.

On the other hand, given the crucial role of hippocampus in encoding memory in the long-term memory, researchers wondered about its role in discovery. The question here is whether the hippocampus becomes active when encoding new information. In order to answer this question, researchers presented subjects with pictures of faces or nonsense patterns and investigated memory performance. Their brains were PET scanned when they first encountered the faces and images. The

researchers observed that the right hippocampal region was activated when the subjects encountered the faces for the first time but not during recognition of the faces. Encoding also activated the left pre-frontal cortex whereas recognition activated the right pre-frontal cortex. Thus, it might be stated that the discovery of new information takes place at the right hippocampal region and left pre-frontal cortex in the brain.

2.13.3. Discussion of the Vocabulary Learning and Consolidation Strategies Taxonomy

After making the terms of discovery and consolidation clear, the taxonomy of vocabulary learning strategies could be understood better.

Below is the table indicating this taxonomy of Schmitt & McCarthy (1997). The skills are classified according to the strategy classification of Oxford (1990) with additions of Schmitt & McCarthy (1997).

Table 1. A Taxonomy of Vocabulary Learning and Consolidation Strategies

Strategies for the Discovery of A New Word's Meaning	
DET	Analyze Part of Speech
DET	Analyze Affixes and Roots
DET	Check for L1 Cognate
DET	Analyze Any Available Pictures or Gestures
DET	Guess from Textual Context
DET	Bilingual Dictionary
DET	Monolingual Dictionary
DET	Word Lists
DET	Flash Cards
SOC	Ask Teacher for an L1 Translation
SOC	Ask Teacher for Paraphrase or Synonym of New Word
SOC	Ask Teacher for Sentence Including the New Word
SOC	Ask Classmates for Meaning
SOC	Discover New Meaning Through Group-work Activity
Strategies for Consolidating A New Word Once It Has Been Encountered	
SOC	Study and Practice the Meaning in a Group
SOC	Teacher Checks Students' Flash Cards or Word Lists for Accuracy

Table 1. (continued)	
MEM	Study Word with a Pictorial Representation of its Meaning
MEM	Image Word's Meaning
MEM	Connect Word to a Personal Experience
MEM	Associate Word with its Coordinates
MEM	Connect Word to its Synonyms and Antonyms
MEM	Use Semantic Maps
MEM	Use Scales for Gradable Adjectives
MEM	Peg Method
MEM	Loci Method
MEM	Group Words Together to Study Them
MEM	Group Words Together Spatially on a Page
MEM	Use New Word in Sentences
MEM	Group Words Together within a Storyline
MEM	Study the Spelling of a Word
MEM	Study the Sound of a Word
MEM	Say the Word Aloud When Studying
MEM	Image Word Form
MEM	Underline Initial Letter of the Word
MEM	Configuration
MEM	Use Keyword Method
MEM	Affixes and Roots (Remembering)
MEM	Part of Speech (Remembering)
MEM	Paraphrase the Word's Meaning
MEM	Use Cognates in Study
MEM	Learn the Words of an Idiom Together
MEM	Use Physical Action When Learning a Word
MEM	Use Semantic Feature Grids
COG	Verbal Repetition
COG	Written Repetition
COG	Word Lists
COG	Flash Cards
COG	Take Notes in Class
COG	Use the Vocabulary Section in your Textbook
COG	Listen to Tape of Word Lists
COG	Put English Labels on Physical Objects
COG	Keep a Vocabulary Notebook
MET	Use English-Language Media (songs, movies, news, etc.)
MET	Testing Oneself with Word Tests
MET	Use Spaced Word Practice
MET	Skip or Pass the New Word
MET	Continue to Study Word Overtime

Source: Schmitt& McCarthy, 1997

2.13.3.1. Discovery Strategies

Determination Strategies

If learners do not know the meaning of a word, they must discover its meaning by guessing from the structural knowledge of the language, guessing from an L1 cognate, guessing from context, using reference materials, or asking someone else. Determination strategies refer to such skills and they facilitate gaining knowledge of a new word (Schmitt & McCarthy, 1997).

Learners may be able to distinguish the new word's part of speech, which can help guessing. They can also obtain clues about its meaning from its root or affixes. Learners can also make use of cognates, which are words in different languages with a common parent root, like the word *mutter* in German and *mother* in English. In addition, context can be of great help to guess the meaning of a word. As well as textual context, pictures, gestures or intonation also play important roles to help the learner infer the meaning of a new word. Another way of finding a word's meaning is the reference materials, such as bilingual and monolingual dictionaries. Finally, word lists, flash cards and vocabulary notebooks can be important tools for discovering meaning although many educators believe that they should be presented in context.

Social Strategies

A second way of discovering a new meaning employs the social strategy of asking someone. Even though teachers are in this position most of the time, peers may also be resources and learners can be introduced to new word through group work.

Getting help from other people have some benefits. For instance, they provide the L1 translation if they know it, give a synonym or a definition by

paraphrase, use the new word in a sentence or any combination of these (Schmitt & McCarthy, 1997).

2.13.3.2. Consolidation Strategies

Social Strategies

Besides the initial discovery of a word, group work can also be used to learn or practice vocabulary. Consolidating vocabulary through social strategies has some benefits. For example, it promotes active processing of information and the social context enhances motivation, cooperative learning, and team activities.

Memory Strategies

Most memory strategies are related to relating the word to some previously learned knowledge. During this relation process, a retrieval plan is developed through encoding and mental imagery. This process helps learners learn faster and recall better since the integration of new material with the existing ones, retrieval cues are provided (Schmitt & McCarthy, 1997).

Memory strategies also cover the use of pictures and imagery. New words can be learned by studying them with pictures of their meaning instead of definitions. According to Schmitt & McCarthy (1997), pairing L2 words with their pictures is better than pairing them with their L1 equivalents.

Likewise, new words can be linked to L2 words which the student already knows. This process involves some kind of sense relationship, as Schmitt & McCarthy (1997) call it. For example, if the new word is *apple,* the learners can relate it to the names of other fruits that they already know, such as *peach,* or *cherry.* This relation can also be provided through synonymy or antonymy. Such word associations provide strong connective bonds.

The learner can also link the words together that have no sense relationships. One way of doing this is memorizing the words through rhymes, like *one is a bun, two is a shoe, three is a tree, etc.* This method of linking unrelated words is called the *Peg Method.* Similarly, a spatial mnemonic can be used to memorize unrelated words. In this method, the learner thinks of a familiar place, like a street, and mentally places the item of vocabulary to be learned on this place. The second item is related to the second familiar location, and so on. This method is called the *Loci Method.*

Another way of consolidating vocabulary through memory strategies is grouping. Grouping is an important way that aids recall. As Schmitt & McCarthy (1997) point, if the words are organized in some way before memorization, recall is improved. Words can also be grouped spatially on a page in some sort of pattern. Such patterns are claimed to be better recalled.

Another kind of memory strategy for consolidating vocabulary involves focusing on the spelling and the pronunciation of the target word. Learners can study the spelling of a word or say the word aloud to focus on the pronunciation. The initial letters of the words could also be a factor in word recognition.

Cognitive strategies

Cognitive strategies in this taxonomy include repetition and using mechanical means to study vocabulary. Written and verbal repetition, like repeatedly writing or saying a word over and over again could be used as strategies to consolidate words.

Word lists and flash cards can also be used for the exposure to a word as well as for review of the words. In addition, taking notes in class and making use of vocabulary sections in the textbooks help learners study target words. They help

learners to create their own personal structure for newly learned words and increase exposure during review (Schmitt & McCarthy, 1997).

Metacognitive Strategies

Metacognitive strategies are used by learners to control and evaluate their own learning. According to the principles of these strategies, it is important to maximize exposure to the target language in order to efficiently acquire it.

According to Schmitt & McCarthy (1997), books, magazines, newspapers and movies in English are perfect resources for exposure. Also, interacting with native speakers increases input. Therefore, it is used as a metacognitive strategy.

2.13.4. The Strategies Used Frequently by Learners

When studying vocabulary learning strategies, it must not be forgotten that they are for the benefit of the learner. Thus, researchers must consider the learner's feelings, and what they think about the benefits of the various learning strategies.

In order to answer this question and identify the frequency that the strategies are used, Schmitt & McCarthy (1997) carried out a study. In this study, they created a survey instrument in order to collect data about the vocabulary learning strategies. This survey instrument was designed under the guidance of the vocabulary learning strategies listed in the taxonomy. Also, the learners were allowed for creativity by encouraging them to offer any additional strategies they could think of. They collected quite a large sample of 600 individuals to provide dependable results.

The survey was carried out in Japan with subjects whose mother tongue is Japanese and they were learning English as a foreign language. 600 students participated in the study and they responded to the questionnaire of the vocabulary learning strategies during class time.

As a result of the survey, it was seen that strategies related to using bilingual dictionary, guessing from textual context, asking classmates, verbal and written repetition and word lists proved to be the most-used strategies while L1 cognates, physical action, semantic maps and flash cards turned out to be the least-used strategies. The list of the strategies and their percentages of use according to the results of this survey were provided in the table below.

Table 2. The Percentages of Use of Vocabulary Learning and Consolidation Strategies

	Strategies for the Discovery of A New Word's Meaning	**USE %**
DET	Analyze Part of Speech	32
DET	Analyze Affixes and Roots	15
DET	Check for L1 Cognate	11
DET	Analyze Any Available Pictures or Gestures	47
DET	Guess from Textual Context	74
DET	Bilingual Dictionary	85
DET	Monolingual Dictionary	35
DET	Word Lists	0
DET	Flash Cards	0
SOC	Ask Teacher for an L1 Translation	45
SOC	Ask Teacher for Paraphrase or Synonym of New Word	42
SOC	Ask Teacher for Sentence Including the New Word	24
SOC	Ask Classmates for Meaning	73
SOC	Discover New Meaning Through Group-work Activity	35
Strategies for Consolidating A New Word Once It Has Been Encountered		
SOC	Study and Practice the Meaning in a Group	30
SOC	Teacher Checks Students' Flash Cards or Word Lists for Accuracy	3
SOC	Interact with Native Speakers	0
MEM	Study Word with a Pictorial Representation of its Meaning	0
MEM	Image Word's Meaning	50
MEM	Connect Word to a Personal Experience	37
MEM	Associate Word with its Coordinates	13
MEM	Connect Word to its Synonyms and Antonyms	41
MEM	Use Semantic Maps	9
MEM	Use Scales for Gradable Adjectives	16
MEM	Peg Method	0
MEM	Loci Method	0
MEM	Group Words Together to Study Them	0

Table 2 (continued)		
MEM	Group Words Together Spatially on a Page	0
MEM	Use New Word in Sentences	18
MEM	Group Words Together within a Storyline	0
MEM	Study the Spelling of a Word	74
MEM	Study the Sound of a Word	60
MEM	Say the Word Aloud When Studying	69
MEM	Image Word Form	32
MEM	Underline Initial Letter of the Word	0
MEM	Configuration	0
MEM	Use Keyword Method	13
MEM	Affixes and Roots (Remembering)	14
MEM	Part of Speech (Remembering)	30
MEM	Paraphrase the Word's Meaning	40
MEM	Use Cognates in Study	10
MEM	Learn the Words of an Idiom Together	48
MEM	Use Physical Action When Learning a Word	13
MEM	Use Semantic Feature Grids	0
COG	Verbal Repetition	76
COG	Written Repetition	76
COG	Word Lists	54
COG	Flash Cards	25
COG	Take Notes in Class	64
COG	Use the Vocabulary Section in your Textbook	48
COG	Listen to Tape of Word Lists	0
COG	Put English Labels on Physical Objects	0
COG	Keep a Vocabulary Notebook	0
MET	Use English-Language Media (songs, movies, news, etc.)	0
MET	Testing Oneself with Word Tests	0
MET	Use Spaced Word Practice	0
MET	Skip or Pass the New Word	41
MET	Continue to Study Word Overtime	45

Source: Schmitt & McCarthy, 1997

This survey of Schmitt & McCarthy (1997) is also used as the tool of data collection in this study. However, the results of the studies are not expected to be close to each other since the contexts are quite different from each other. Because the cultures and the mother tongues of the individuals taking part in two studies are different from each other, the results of the two studies might possibly prove different.

2.13.5. The Relationship between Vocabulary Learning Strategies and Other Factors Including Gender

The variety of learning strategies and, specifically, vocabulary learning strategies have been discussed so far. In addition to all these, there is also one more point to consider while discussing the vocabulary learning strategies. That point is the factors affecting the choice and use of strategies by the learners. In other words, what kind of factors influence learners to choose the appropriate strategy.

According to Goh & Foong (1997), those factors affecting the individuals' strategy choice can vary from proficiency level to culture, age, motivation levels, academic major and gender. There are some studies carried out to identify the relationship between vocabulary learning strategy choice and various factors. For example, Goh & Foong (1997) conducted a study in order to see whether language proficiency and gender influence the use of vocabulary learning strategies. In their study, they worked with 175 Chinese students whose average age was 19. The participants were grouped in three levels of proficiency as High, Medium and Low by using a standardized proficiency test. Then, the students were provided with the Strategy Inventory for Language Learning (SILL), which is developed by Oxford (1989). The SILL instrument included 50 statements grouped into the 6 categories introduced by Oxford (1990). At the end of the study, results from two-way ANOVA showed that both the proficiency level and gender of the students had a significant influence on the use of strategies. It was seen that the high proficiency group used more cognitive and compensation strategies compared with the medium and low proficiency groups. When it comes to the results of the study related to gender, it was seen that female students reported using strategies more frequently than males, especially in determination and affective strategies. Some examples of

compensation strategies that the females outnumber males' use are guessing unknown words, using gestures, making up new words; and the affective strategies used frequently by females are managing negative emotions, encouraging oneself, rewarding oneself, and writing down feelings in a journal.

Nam and Leavell (2006) thinks that increased interest in student-centered learning approaches has led to investigating language learning strategies and their relationship to achievement in second and foreign language acquisition. For this purpose, they reviewed the recent research on the field and came up with some conclusions. For instance, they claim that the results of the recent research about the influence of gender on the choice and use of vocabulary learning strategies have usually favored females as more frequent users of strategies. When looking at the types of strategy use, females show more use of social strategies and conversational or input strategies. Gender differences appear most evident in the use of socially based strategies, such as group learning.

However, Nam and Leavell (2006) also claim that there are other factors influencing strategy use. For instance, such gender difference favoring females may be affected by the culture and the context of language learning. For example, in a study of adult Vietnamese refugees, it was found that males were more likely to use a variety of strategies than females. This is the effect of culture since refugees are a population typically characterized by "survival learning" in which men would be highly motivated to learn English for survival needs, like supporting their family in the new society. Considering the effect of culture on language learning strategy choice, Nam and Leavell (2006) claim that Hispanics use more social, interactive strategies while Asian groups trained in rote didactic settings choose memorization strategies more. Similarly, Gu (2002) reported that males employed more learning

strategies than females in a study carried out in Russia. The result of the study shows that the male-dominant nature of the Russian society might provide the male Russian learners with more opportunities for strategy use.

In spite of some exceptions related to the culture and context of language learning, many other researchers came up with similar results related to the effect of factors, such as proficiency level and gender on the use of learning strategies. For instance, Nam and Leavell (2006) conducted a study for this purpose with 55 ESL students at a Southwestern university. Among the participants there were 11 Beginning, 30 Intermediate, and 14 Advanced learners. In the study, the SILL was used as the instrument to identify the language learning strategies. After the SILL was administered, data analyses were used to calculate overall strategy use. In the end, the study revealed a statistically significant difference in the use of memory and affective strategies compared to cognitive, compensation, metacognitive, and social strategies. Cognitive, compensation, metacognitive, and social strategies ranked high in use while the least preferred strategies were affective and memory strategies. When it comes to the effect of gender in strategy use, it was revealed that a statistically significant difference in the use of affective strategies was found between males and females with females reporting higher use of affective and social strategies. Males favored use of metacognitive and memory strategies most and affective strategies least.

Taguchi (2002) suggested other factors as affecting the strategy use; which are academic major and motivation. Taguchi (2002) proposes that English major students tended to use compensation, social and metacognitive strategies more frequently than did science major students. Also, the researcher reported that highly motivated students used language learning strategies more often than less motivated

students. In the research, Taguchi (2002) recruited subjects using the snowball sampling method. Some Japanese language center students, working-holiday-makers and other contacts at two language centers in Melbourne took part as subjects in the study. The SILL was used as the instrument to identify language learning strategy choice of the subjects. The second criterion to study was the proficiency level. The range of English proficiency levels of the subjects was from "beginner" to "advanced." The beginner and elementary groups were named as low-proficiency group and intermediate and advanced groups were named as high-proficiency group. The third criterion to study was the motivation level. In order to identify the motivation level, a scale questionnaire was used, asking subjects to identify how important nine different possible motivations for learning English were for them. At the end of the study the collected data were analyzed and it was found that there were statistically significant gender differences in overall strategy use in Japan. Female learners reported the use of a wider range of strategies than males did. Females reported to use social, cognitive and determination strategies more frequently than males. This, Taguchi (2002) says, might be a result of the fact that females tend to be superior in verbal aptitude and social orientation than males. When it comes to the effect of proficiency levels on strategy use, the data collected from the subjects showed that there was a significant difference between low and high proficiency groups. The low proficiency group seemed to use memory strategies more frequently. In addition, the data derived about the motivational levels and strategy use indicated that high motivation group used a wide variety of learning strategies including cognitive, compensation, metacognitive, affective and social strategies.

Another study carried out for the same purpose of identifying the relationship between gender and strategy use was carried out by Gu (2002). All second year non-English majors at Beijing Normal University participated in a questionnaire survey on vocabulary learning strategies. The questionnaire employed in this study included 17 statements that asked about the students' beliefs about vocabulary learning and 91 vocabulary learning behaviors. After the questionnaire was administered, T-tests were conducted to capture the differences between male and female students in vocabulary learning strategies. Finally, it was found that male students believed in rote memorization while female students reported more use of cognitive strategies. Female students did more guessing, used dictionary more, took more notes, employed lists, used more contextual encoding of the words and seized more opportunities to use the new words in context. They were more doubtful about memory mnemonics unlike the male participants. Therefore, female students in this study reported more use of the strategies proposed by the questionnaire.

Finally, another study conducted by Rasekh & Ranjbary (2003) aimed to identify the role of metacognitive strategy training for vocabulary learning. For this purpose, the researchers worked with 53 male and female Iranian EFL students taking part in an intensive course of English in Tehran Institute of Technology. The study had two groups and experimental design. At the beginning of the study, the two groups were given a vocabulary pre-test to check the homogeneity of the groups. Then, the two groups received the usual training on vocabulary. However, only the experimental group received explicit instruction on metacognitive strategies for vocabulary learning. At the end of the course, both the control group and the experimental group were given the vocabulary achievement test and the results of the tests were compared to see the effects of the training. Statistical analysis of t-test

showed that the experimental group surpassed the control group in terms of lexical knowledge at the end of the experiment. Thus, the explicit metacognitive strategy training seems to have contributed to the improvement of students' vocabulary learning.

In conclusion, the strategies for vocabulary learning are quite effective on the achievement of learners of English as a second or foreign language. Moreover, those strategies which learners use are affected by the learner characteristics such as gender. This influence of gender on the strategy choice seems to stem from the gender-based brain differences. In this study, it is aimed to identify the vocabulary learning strategies employed by males and females and then relate the differences to the structural differences of the male and female brains which have been explained in detail.

CHAPTER III

METHODOLOGY

3.0. Presentation

This chapter gives information about the overall design of the study, the setting and the subjects, the data collection tools and procedures, and the analysis of the obtained data. In other words, chapter three is about the way the present study was conducted.

3.1. Design of the Study

This study has been an attempt to investigate the learning strategies of EFL students whose native language is Turkish. The study has been carried out on one group of learners. No control or comparison group was chosen. The participants were provided with a questionnaire adapted from Schmitt and McCarthy's (2007) study, which was also used by Catalan's (2003) in her research. Afterwards, their answers were studied to see the dispersion of vocabulary learning strategies with respect to the gender of the students.

3.2. Participants

An already formed participant group was made use of in this study, which helped the researcher maintain the natural educational context as it was. 200 elementary level learners of English took part in the study as participants. The students were attending the preparatory program of TOBB Economy and Technology University in Ankara.

All of the students were at the same proficiency level, which is granted by the Proficiency Exam that was administered at the beginning of the school year by the institution. The research was carried out with all the students of the A group.

Students of the A group had been receiving 30 hours of instruction on English language through the course books *Summit* and *North Star*. They were in their eleventh week of instruction of the preparatory program when the data were gathered.

When it comes to the background of the students, they were mainly graduates of three types of high schools; namely, the Anatolian High Schools, State High Schools and Science High Schools in different parts of Turkey. Most of them received English language instruction in secondary school and in high school. They were not proficient enough to get the required grade in the proficiency exam to be in B level classes or to go directly to their departments. Some of them did not even take the proficiency examination at the beginning of the school year so they had to attend the preparatory program due to the regulations of the university.

3.3. Setting

The researcher is an instructor at the Department of Foreign Languages at TOBB Economy and Technology University in Ankara. That is why, for the purposes of accessibility, and better control over the research conditions and processes, the groups of subjects were chosen from the level she had been teaching through the spring term of 2007-2008 academic year at the institution.

3.4. Research Questions

This study intended to answer the following research questions.

1. Do males and females use different strategies to discover the meaning of an unknown word?
2. Do males and females use different strategies to consolidate the learning of a word after discovering its meaning?

3. What skills are used more frequently by students in relation to their learning strategy preferences?
    a. What skills are used more frequently by female students in relation to their learning strategy preferences?
    b. What skills are used more frequently by male students in relation to their learning strategy preferences?
4. What is the interconnection between the findings of the present study and the literature on gender-based brain functioning differences?
    a. The relationship between vocabulary learning strategies used by female students and gender-based brain differences
    b. The relationship between vocabulary consolidation strategies used by female students and gender-based brain differences
    c. The relationship between vocabulary learning strategies used by male students and gender-based brain differences
    d. The relationship between vocabulary consolidation strategies used by male students and gender-based brain differences

3.5. Instrument

In this research, one instrument was employed. The instrument is a questionnaire that aimed to identify the vocabulary learning strategies of the participants. The questionnaire has been adapted from Catalan (2003) who used the Spanish version of this questionnaire in her study. Catalan (2003) designed this questionnaire from the information reported by Schmitt and McCarthy (1997).

The instrument was translated into Turkish so that there is not a place for any kind of misunderstanding for the students that could influence the results of the research. After the questionnaire was translated, the language and syntax of the

expressions were checked by a Turkish Language and Literature expert. Then, the English and Turkish versions of the questionnaire were compared by a native speaker of English who was also able to understand and speak Turkish.

The instrument included 60 statements related to the strategies of vocabulary learning and consolidation. The first 14 statements are related to vocabulary learning strategies while the next 46 statements are related to vocabulary consolidation strategies. Each item provides the subjects with a statement about their ways of discovering the meaning of a word that they do not know or consolidating the learning of a word after discovering its meaning. The participants are asked to respond to these expressions as "appropriate for me" or "not appropriate for me." At the end of the questionnaire, freedom was also given to the participants by asking them to write down any other strategies that are not included in the questionnaire but they can think of. The participants were expected to respond to the items in the questionnaire by comparing them to their natural habits while they are learning vocabulary.

3.6. Data Collection Procedure

Before the questionnaire was administered to the main group of 200 students, a pilot study was carried out with 50 students of the A group of the same institution. The purpose of this pilot study was to identify any possible problems related to the items or the administration of the questionnaire. Following the pilot study, the data collected were analyzed through SPSS program. The factor analysis and reliability analysis of the tool were studied on the pilot data. Since there were no problems regarding the factor analysis and the reliability analysis, the same tool was used in the main study without any adaptations or modifications (See Chapter IV for details).

In the main study with 200 subjects, the questionnaire was administered to the groups in 30 minutes. Then they were collected by the researcher and the data were analyzed through statistical research on SPSS. The responses of the students were classified and the percentages of the strategies used by males and females were identified through t-test analysis.

3.7. Data Analysis

Data from the participants' responses to the questionnaire were analyzed through statistical research and graphics of percentages to see if there is any statistically significant difference between the vocabulary learning and consolidation strategies used by male and female participants. This analysis was carried out through t-test on SPSS. Through the t-test analysis, the dispersion of the strategies to gender was studied.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

4.0. Presentation

In this chapter, analysis of the data collected through the questionnaire is presented.

The aim of this study was to investigate the gender-based brain differences and vocabulary learning and consolidation strategies of male and female students. Besides, the study also explored the interconnection between the findings and the literature on gender-based brain functioning differences. To be able to answer these questions, the subjects taking part in the study were given a questionnaire so that the strategies they use for vocabulary discovery and consolidation could be identified. The data collected through this protocol were analyzed through t-test analysis on Statistical Package for Social Sciences (SPSS) and then, the results of the analysis were compared to the literature on gender-based brain functioning differences.

To prevent any bias in results, attention was paid so that all the subjects taking part in the study were kept at the same level of proficiency. This situation was ensured by working with the students from the same achievement group according to the institution's division of students. Also, considering that the age and background of the students may influence the results, it was ensured that all the subjects were approximately at the same age and they shared the similar backgrounds.

4.1. Data Analysis Procedure

Several statistical tests and data gathered were used to determine whether the vocabulary discovery and consolidation strategies vary in male and female students

and whether such variation depends on the different biology of the male and the female brain.

First of all, in order to prove the reliability of the instrument used, a pilot study was carried out with 50 subjects before the main study. After this pilot study, the factor analysis and the reliability analysis of the tool was conducted. It was observed that, all the items of the instrument proved reliable and the factor analysis proved that the sub-groups within the instrument were effective. Therefore, none of the items in the instrument were removed or modified for the main study. The tables below indicate the reliability analysis and the factor analysis results of the instrument.

Table 3. Reliability Analysis

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,782	,780	59

According to the reliability analysis, if the value of Cronbach's Alpha is between 0.60 and 0.80, that means the instrument has proved highly reliable. As seen in Table 3, the value of Cronbach's Alpha is ,782 for the instrument in this study. Therefore, the instrument used in this study could be considered reliable.

Table 4. Factor Analysis

	1-Memory	2-Cognitive	3-Determination	4-Metacognitive	5-Social
Q1			0,45		
Q2			0,41		
Q3			0,65		
Q4			0,49		
Q5			0,73		0,30
Q6			0,43		
Q7			0,38		
Q8			0,43		0,31
Q9			0,39		
Q10					0,73
Q11					0,45
Q12					0,51
Q13					0,37
Q14					0,55
Q15					0,47
Q16					0,59
Q17					0,77
Q18	0,47				
Q19	0,58				
Q20	0,74				
Q21	0,47				
Q22	0,36				
Q23	0,74		0,36		
Q24	0,41				
Q25	0,42				
Q26	0,63				
Q27	0,35				
Q28	0,51				
Q29	0,35				
Q30	0,65				
Q31	0,54				
Q32	0,41				
Q33	0,43				
Q34	0,78				
Q35	0,65				
Q36	0,68				
Q37	0,48				
Q38	0,67				
Q39	0,55				
Q40	0,48				
Q41	0,42				
Q42	0,77				
Q43	0,45				
Q44	0,5				
Q45		0,31			
Q46		0,47		0,32	
Q47		0,71			
Q48		0,54		0,35	
Q49		0,46			
Q50		0,55			
Q51		0,64			
Q52		0,56			
Q53		0,57			
Q54				0,55	
Q55				0,75	
Q56		0,32		0,42	
Q57				0,63	
Q58		0,31		0,55	
Q59				0,49	

According to Table 4, Factor 1 was identified as ‘Memory Strategies” and it has 27 items. Memory Strategies as a factor explains 15,74 % of the total variance. Factor 2 was identified as ‘Cognitive Strategies” and includes 9 items explaining 16,27 % of the total variance. Factor 3 was identified as “Determination Strategies” and comprised 9 items explaining 12,23 % of the total variance. Factor 4 was identified as ‘Metacognitive Strategies” and includes 6 items explaining 9,21% of the variance. Lastly, Factor 5 was identified as “Social Strategies” and it has 8 items explaining 14,11 % of the total variance.

The five-factor solution for 59 items accounted for 67,56% of the total variance. A minimum factor loading of .30 was a criterion for considering an item to be part of a factor. As seen in Table 4, all the items are higher than .30. All of the items had significant loadings and according to the degree of loading they are grouped successfully.

After the pilot study, the main study was conducted with 200 students, 114 males and 86 females, using the same instrument as it was used for the pilot study. The distribution of the subjects according to their gender is shown in Figure 14.

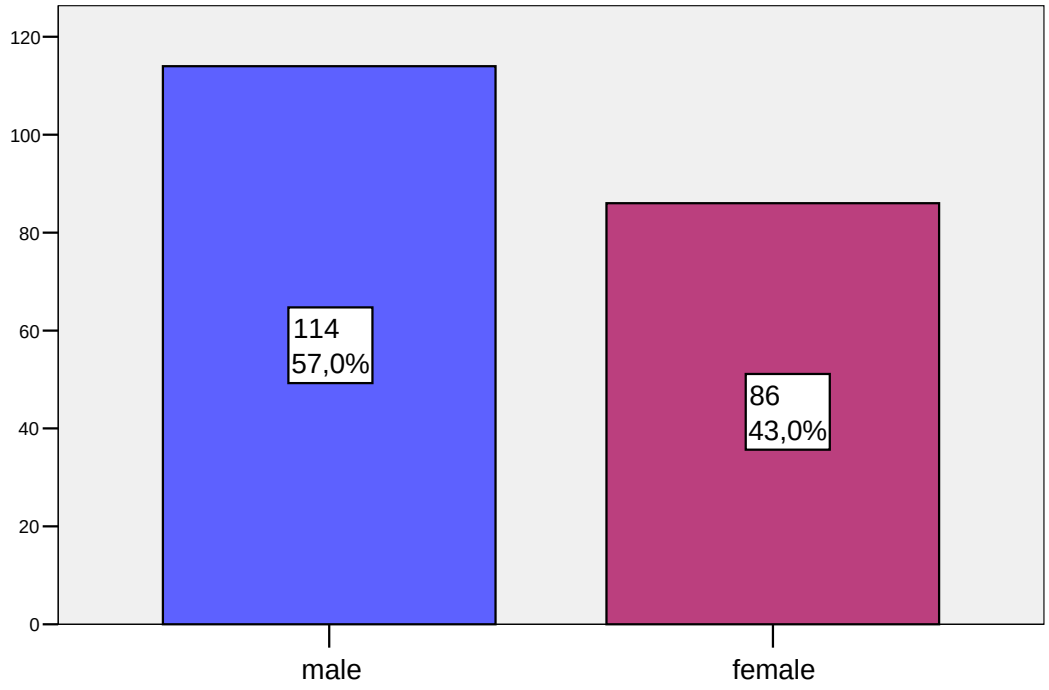

Figure 14. Gender Distribution of the Subjects

The data collected from the study were analyzed through t-test analysis on SPSS in order to determine if there was any statistically significant difference between the responses of the male and female participants for each group of vocabulary discovery and consolidation strategy.

The reason why t-test analysis was used is the fact that there are two independent groups of participants in this study- the males and the females. When there are two independent groups of participants and their values in a study, t-test analysis is used. This method of analysis indicates whether there are any differences between the two groups.

For this purpose, the *mean values*, *standard deviation* and *significance values* which were obtained from the data analysis were examined.

4.3. Analysis of the Findings for Research Question 1

The first research question of this study investigated whether males and females use different strategies to discover the meaning of an unknown word. When the instrument is studied, it is observed that in the items regarding the discovery of vocabulary items, there are two strategy groups, which are Determination Strategies and Social Strategies. The analysis was conducted by using Statistical Package for Social Sciences (SPSS). The statistical significance level was used as $\alpha < .05$ for all the independent sample findings.

4.3.1. Comparison of Determination Strategies Scores of the Male and Female Participants

As it is seen in Table 5, the mean values of females (M=6,22) is greater than the scores of males (M=5,59).

Table 5. Group Statistics of the Male and Female Participants for Determination Strategies

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total socore of determination	male	114	5,59	1,474	,138
	female	86	6,22	1,305	,141

However, only this does not mean that there is a statistically significant difference between the scores of Determination Strategy use of males and females. To examine the difference between two groups, independent t-test analysis was carried out. Table 6 below indicates the results of the independent samples test for determination strategies.

Table 6. Independent Samples Test Results of Male and Female Participants for Determination Strategies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
total socore of determination	Equal variances assumed	1,858	,174	-3,157	198	,002
	Equal variances not assumed			-3,212	192,929	,002

The interpretation of the independent t-test has two stages. First of all, the homogeneity of the variance between the males and females was studied using *Levene's Test for Equality of Variances*. According to this, the Sig. value is .174, which is greater than .05. So we can assume that variances are equal. Then, it is possible to test the hypothesis using the t-test row of results titled *Equal variances assumed* in Table 6. This provides the t value (t=-3,157), the degrees of freedom (df=198). From the table above, it is observed that 'Sig. (2-tailed)' is .002, which is lower than .05. For this reason, it can be concluded that there is a significant difference in determination strategies scores between the males and females.

4.3.2. Comparison of Social Strategies Scores of the Male and Female Participants

As it is seen in Table 7, the mean values of females (M=7,26) is greater than the scores of males (M=4,54).

Table 7. Group Statistics of the Male and Female Participants for Social Strategies

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total score of social	male	114	4,54	1,603	,150
	female	86	7,26	1,108	,119

However, this fact, on its own, does not mean that there is a statistically significant difference between the scores of Determination Strategy use of males and females. To examine the difference between the two groups, independent t-test analysis was carried out. Table 8 below indicates the results of the independent samples test for social strategies.

Table 8. Independent Samples Test Results of Male and Female Participants for Social Strategies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
total score of social	Equal variances assumed	20,151	,000	-13,449	198	,000
	Equal variances not assumed			-14,135	196,623	,000

As observed in Table 8, the Sig. value is .000 which is lower than .05. So we can assume that variances are equal. In addition, the Sig. (2-tailed) value is .002, which is lower than .05. For this reason, it can be concluded that that there is a significant difference in social strategies scores between the males and females.

4.4. Analysis of the Findings for Research Question 2

The second research question of this study investigated whether males and females use different strategies to consolidate the learning of a word after

discovering its meaning. When the instrument is studied, it is observed that in the items regarding the consolidation of vocabulary items, there are three strategy groups, which are Memory Strategies, Cognitive Strategies and Metacognitive Strategies. The analysis was conducted by using Statistical Package for Social Sciences (SPSS). The statistical significance level was used as $\alpha < .05$ for all the independent sample findings.

4.4.1. Comparison of Memory Strategies Scores of the Male and Female Participants

As it is seen in Table 9, the mean values of males (M=18,75) is greater than the scores of females (M=11,93).

Table 9. Group Statistics of the Male and Female Participants for Memory Strategies

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total score of memory	male	114	18,75	4,548	,426
	female	86	11,93	4,286	,462

However, this construct, on its own, does not mean that there is a statistically significant difference between the scores of Memory Strategy use of males and females. In order to examine the difference between the two groups, independent t-test analysis was also carried out. Table 10 below indicates the results of the independent samples test for memory strategies.

Table 10. Independent Samples Test Results of the Male and Female Participants for Memory Strategies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
total score of memory	Equal variances assumed	,579	,448	10,753	198	,000
	Equal variances not assumed			10,843	188,453	,000

According to Table 10, the Sig. value is .448, which is greater than .05. So we can assume that variances are equal. Then, it is possible to test the hypothesis using the t-test row of results titled *Equal variances assumed* in Table 10. This provides the t value (t=-10,753), the degrees of freedom (df=198). From the table above, it is observed that 'Sig. (2-tailed)' is .000, which is lower than .05. For this reason, it can be concluded that that there is a significant difference in memory strategies scores between the males and females.

4.4.2. Comparison of Cognitive Strategies Scores of the Male and Female Participants

As it is seen in Table 11, the mean values of females (M=4,94) is greater than the scores of males (M=3,89).

Table 11. Group Statistics of the Male and Female Participants for Cognitive Strategies

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total score of cognitive	male	114	3,89	2,071	,194
	female	86	4,94	1,893	,204

However, only this does not mean that there is a statistically significant difference between the scores of Cognitive Strategy use of males and females. In the purpose of examining the difference between two groups, independent t-test analysis was also carried out. Table 12 below indicates the results of the independent samples test for cognitive strategies.

Table 12. Independent Samples Test Results of the Male and Female Participants for Cognitive Strategies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
total score of cognitive	Equal variances assumed	4,112	,044	-3,672	198	,000
	Equal variances not assumed			-3,718	190,783	,000

As observed in Table 12, the Sig. value is .044 which is lower than .05. So we can assume that variances are equal. In addition, the Sig. (2-tailed) value is .000, which is lower than .05. For this reason, it can be concluded that that there is a significant difference in cognitive strategies scores between the males and females.

4.4.3. Comparison of Metacognitive Strategies Scores of the Male and Female Participants

As it is seen in Table 13, the mean values of females (M=3,03) is greater than the scores of males (M=2,67).

Table 13. Group Statistics of the Male and Female Participants for Metacognitive Strategies

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total score of metacognitive	male	114	2,67	1,412	,132
	female	86	3,03	1,401	,151

However, this fact, on its own, does not mean that there is a statistically significant difference between the scores of Determination Strategy use of males and females. To examine the difference between two groups, independent t-test analysis was carried out. Table 14 below indicates the results of the independent samples test for metacognitive strategies.

Table 14. Independent Samples Test Results of the Male and Female Participants for Metacognitive Strategies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
total score of metacognitive	Equal variances assumed	,180	,671	-1,832	198	,068
	Equal variances not assumed			-1,834	183,928	,068

According to Table 14, the Sig. value is .671, which is greater than .05. So it can be assumed that variances are equal. Then, it is possible to test the hypothesis using the t-test row of results titled *Equal variances assumed* in the table above. This provides the t value (t=-1,832), the degrees of freedom (df=198). From the table above, it can be concluded that 'Sig. (2-tailed)' is .068, which is greater than .05. For this reason, it can be concluded that that there is not a significant difference in metacognitive strategies scores between the males and females.

The mean values and the standard deviation values of all strategy groups for different genders are presented in Table 15:

Table 15. Comparison of All Strategy Scores of the Male and Female Participants

Group Statistics

	gender	N	Mean	Std. Deviation	Std. Error Mean
total socore of determination	male	114	5,59	1,474	,138
	female	86	6,22	1,305	,141
total score of social	male	114	4,54	1,603	,150
	female	86	7,26	1,108	,119
total score of memory	male	114	18,75	4,548	,426
	female	86	11,93	4,286	,462
total score of cognitive	male	114	3,89	2,071	,194
	female	86	4,94	1,893	,204
total score of metacognitive	male	114	2,67	1,412	,132
	female	86	3,03	1,401	,151

In addition, the t-test analysis results of all strategy groups for different genders can be observed from the table below:

Table 16.Independent Samples t-test Analysis for All Strategies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
total socore of determination	Equal variances assumed	1,858	,174	-3,157	198	,002
	Equal variances not assumed			-3,212	192,929	,002
total score of social	Equal variances assumed	20,151	,000	-13,449	198	,000
	Equal variances not assumed			-14,135	196,623	,000
total score of memory	Equal variances assumed	,579	,448	10,753	198	,000
	Equal variances not assumed			10,843	188,453	,000
total score of cognitive	Equal variances assumed	4,112	,044	-3,672	198	,000
	Equal variances not assumed			-3,718	190,783	,000
total score of metacognitive	Equal variances assumed	,180	,671	-1,832	198	,068
	Equal variances not assumed			-1,834	183,928	,068

4.5. Analysis of the Findings for Research Question 3

The third research question of this study investigated the skills which are used more frequently by male and female students in relation to their learning strategy preferences. In order to answer this research question the percentage of each item in the questionnaire is presented.

In this analysis, the percentages of the male and female participants who responded to the items as "appropriate for me" were studied. In Table 17, the expression "the percentage (%) of success" refers to the percentages of the males and females who responded to the items as "appropriate for me." The items in Table 17 represent the items in the questionnaire respectively. Each item in Table 17 refers to a skill among the five strategy groups of vocabulary learning and consolidation strategies. In essence, they could be grouped as follows: The first nine items represent the skills related to the Determination Strategies. The items numbered between 10 and 17 represent the skills related to Social Strategies. The items numbered between 18 and 44 represent the skills about the Memory Strategies. The items numbered between 45 and 53 represent the skills related to the Cognitive Strategies. Finally, the items numbered between 54 and 59 represent the skills related to the Metacognitive Strategies. The percentages show the percentages of the male and female participants who considered that item appropriate for themselves. As shown, that percent of the male participants considered that item as appropriate and so did the female participants. Table 17 presents the skills represented by these items in the questionnaire with the percentages of selection by the male and the female participants.

Table 17. The Skills and Their Percentages

DETERMINATION STRATEGIES		
	Gender	**% of Success**
1. Analyzing Part of Speech	male	,60
	female	,71
2. Analyzing Affixes and Roots	male	,52
	female	,36
3. Checking for L1 Cognate	male	,80
	female	,79
4. Analyzing Any Available Pictures or Gestures	male	,58
	female	,62
5. Guessing from Textual Context	male	,89
	female	,85
6. Using Bilingual Dictionary	male	,73
	female	,97
7. Using Monolingual Dictionary	male	,56
	female	,63
8. Preparing Word Lists	male	,45
	female	,53
9. Using Flash Cards	male	,48
	female	,77
SOCIAL STRATEGIES		
10. Asking Teacher for an L1 Translation	male	,74
	female	,85
11. Asking Teacher for Paraphrase or Synonym of New Word	male	,71
	female	,93
12. Asking Teacher for Sentence Including the New Word	male	,58
	female	,85
13. Asking Classmates for Meaning	male	,79
	female	,92
14. Discovering New Meaning Through Group-work Activity	male	,39
	female	,90
15. Studying and Practicing the Meaning in a Group	male	,34
	female	,94

Table 17 (continued)		
16. Teacher Checking Students' Flash Cards or Word Lists for Accuracy	Female Male	,97 ,68
17. Interacting with Native Speakers	male female	,32 ,91
MEMORY STRATEGIES		
18. Studying Word with a Pictorial Representation of its Meaning	male female	,43 ,26
19. Imaging Word's Meaning	male female	,83 ,79
20. Connecting Word to a Personal Experience	male female	,70 ,51
21. Associating Word with its Coordinates	male female	,68 ,63
22. Connecting Word to its Synonyms and Antonyms	male female	,79 ,72
23. Using Semantic Maps	male female	,46 ,19
24. Using Scales for Gradable Adjectives	male female	,73 ,24
25. Using Peg Method	male female	,75 ,26
26. Using Loci Method	male female	,75 ,58
27. Grouping Words Together to Study Them	male female	,75 ,34
28. Grouping Words Together Spatially on a Page	male female	,77 ,17
29. Using New Word in Sentences	male female	,75 ,50
30. Grouping Words Together within a Storyline	male female	,56 ,26
31. Studying the Spelling of a Word	male female	,89 ,76

Table 17 (continued)		
32. Studying the Sound of a Word	male	,84
	female	,66
33. Saying the Word Aloud When Studying	male	,75
	female	,65
34. Imaging Word Form	male	,75
	female	,35
35. Underlining Initial Letter of the Word	male	,77
	female	,13
36. Configuration of the Word	male	,80
	female	,14
37. Using Keyword Method	male	,83
	female	,57
38. Remembering Affixes and Roots	male	,77
	female	,33
39. Remembering Part of Speech	male	,81
	female	,63
40. Paraphrasing the Word's Meaning	male	,48
	female	,38
41. Using Cognates in Study	male	,75
	female	,72
42. Learning the Words of an Idiom Together	male	,58
	female	,49
43. Using Physical Action When Learning a Word	male	,37
	female	,28
44. Using Semantic Feature Grids	male	,41
	female	,41
COGNITIVE STRATEGIES		
45. Verbal Repetition	male	,43
	female	,67
46. Written Repetition	male	,54
	female	,65
47. Using Word Lists	male	,64
	female	,73
48. Using Flash Cards	male	,10
	female	,20
49. Taking Notes in Class	male	,74
	female	,81

Table 17 (continued)	male	,65
50. Using the Vocabulary Section in Textbook	female	,80
51. Listen to Tape of Word Lists	male	,17
	female	,22
52. Putting English Labels on Physical Objects	male	,12
	female	,19
53. Keeping a Vocabulary Notebook	male	,51
	female	,66
METACOGNITIVE STRATEGIES		
54. Using English-Language Media (songs, movies, news, etc.)	male	,64
	female	,73
55. Testing Oneself with Word Tests	male	,31
	female	,45
56. Using Spaced Word Practice	male	,51
	female	,57
57. Skipping or Passing the New Word	male	,23
	female	,36
58. Continuing to Study Word Overtime	male	,47
	female	,47
59. Studying the collocations	male	,51
	female	,45

As Table 17 indicates, some skills are used more frequently by males and some others are used more frequently by females. In the study of the analysis, the percentages which are over 70% will be studied since most of the percentages are over 50%.

4.5.1. Skills in Relation to the Determination Strategies

The items in the questionnaire which represent the determination strategies are presented in Table 18. The table below presents the percentages of the items' distribution to the gender of the subjects for determination strategies.

Table 18. Percentages of the Skills in relation to the Determination Strategies

DETERMINATION STRATEGIES		
	Gender	**% of Success**
1. Analyzing Part of Speech	male	,60
	female	,71
2. Analyzing Affixes and Roots	male	,52
	female	,36
3. Checking for L1 Cognate	male	,80
	female	,79
4. Analyzing Any Available Pictures or Gestures	male	,58
	female	,62
5. Guessing from Textual Context	male	,89
	female	,85
6. Using Bilingual Dictionary	male	,73
	female	,97
7. Using Monolingual Dictionary	male	,56
	female	,63
8. Preparing Word Lists	male	,45
	female	,53
9. Using Flash Cards	male	,48
	female	,77

As Table 18 indicates, six of the nine skills in the Determination Strategies are used more frequently by females than males. For instance, 71% of the female students taking part in this study reported to use the skill of "analyzing part of speech" while 60% of the male students reported to use them. Similarly, while 97% of the females reported to "use a bilingual dictionary," 73% of the males reported to use this skill. Finally, 77% of the females reported to "use flash cards" but 48% of the males reported to use flash cards.

The frequent use of these skills by females indicates the common use of determination strategies by females.

4.5.2. Skills in Relation to the Social Strategies

The items in the questionnaire which represent the social strategies are presented in Table 19. The table below presents the percentages of the items' distribution to the gender of the subjects for social strategies.

Table 19. Percentages of the Skills in relation to the Social Strategies

SOCIAL STRATEGIES		
10. Asking Teacher for an L1 Translation	male	,74
	female	,85
11. Asking Teacher for Paraphrase or Synonym of New Word	male	,71
	female	,93
12. Asking Teacher for Sentence Including the New Word	male	,58
	female	,85
13. Asking Classmates for Meaning	male	,79
	female	,92
14. Discovering New Meaning Through Group-work Activity	male	,39
	female	,90
15. Studying and Practicing the Meaning in a Group	male	,34
	female	,94
16. Teacher Checking Students' Flash Cards or Word Lists for Accuracy	male	,68
	female	,97
17. Interacting with Native Speakers	male	,32
	female	,91

As Table 19 indicates, all of the skills in the Social Strategies are used more frequently by females than males. The skills such as "Asking Teacher for an L1 Translation," "Asking Teacher for Paraphrase or Synonym of New Word," "Asking Teacher for Sentence Including the New Word," "Asking Classmates for Meaning," "Discovering New Meaning Through Group-work Activity," "Studying and

Practicing the Meaning in a Group," "Teacher Checking Students' Flash Cards or Word Lists for Accuracy" and "Interacting with Native Speakers" have higher percentages of use by the female participants taking part in this study. They are all above 70% while the male participants reported to use these skills in much less percentages.

The frequent use of these skills by females indicates the common use of social strategies by females.

4.5.3. Skills in Relation to the Memory Strategies

The items in the questionnaire which represent the memory strategies are presented in Table 20. The table below presents the percentages of the items' distribution to the gender of the subjects for memory strategies.

Table 20. Percentages of the Skills in relation to the Memory Strategies

MEMORY STRATEGIES		
18. Studying Word with a Pictorial Representation of its Meaning	male female	,43 ,26
19. Imaging Word's Meaning	male female	,83 ,79
20. Connecting Word to a Personal Experience	male female	,70 ,51
21. Associating Word with its Coordinates	male female	,68 ,63
22. Connecting Word to its Synonyms and Antonyms	male female	,79 ,72
23. Using Semantic Maps	male female	,46 ,19
24. Using Scales for Gradable Adjectives	male female	,73 ,24
25. Using Peg Method	male female	,75 ,26

Table 20 (continued)		
26. Using Loci Method	male	,75
	female	,58
27. Grouping Words Together to Study Them	male	,75
	female	,34
28. Grouping Words Together Spatially on a Page	male	,77
	female	,17
29. Using New Word in Sentences	male	,75
	female	,50
30. Grouping Words Together within a Storyline	male	,56
	female	,26
31. Studying the Spelling of a Word	male	,89
	female	,76
32. Studying the Sound of a Word	male	,84
	female	,66
33. Saying the Word Aloud When Studying	male	,75
	female	,65
34. Imaging Word Form	male	,75
	female	,35
35. Underlining Initial Letter of the Word	male	,77
	female	,13
36. Configuration of the Word	male	,80
	female	,14
37. Using Keyword Method	male	,83
	female	,57
38. Remembering Affixes and Roots	male	,77
	female	,33
39. Remembering Part of Speech	male	,81
	female	,63
40. Paraphrasing the Word's Meaning	male	,48
	female	,38
41. Using Cognates in Study	male	,75
	female	,72
42. Learning the Words of an Idiom Together	male	,58
	female	,49
43. Using Physical Action When Learning a Word	male	,37
	female	,28
44. Using Semantic Feature Grids	male	,41

As Table 20 indicates, all of the skills in the Memory Strategies are used more frequently by males than females. For instance, 83% of the male participants taking part in this study reported to use the skill of imaging word meanings while 79% of the females reported to use this skill. Similarly, 70% of the males reported to connect word to a personal experience as a skill while 51% of the females reported to use this skill. Also, 79% of the males reported to use the skill of connecting the word to its synonyms and antonyms while 72% of the females reported to use this skill and 73% of the male participants reported to use the skill of using scales for gradable adjectives while only 24% of the females reported to use this skill. When it comes to the use of Peg Method and Loci Method, 75% of the males reported to use these skills while, respectively, 26% and 58% of the females reported to use them. Also, 77% of the males reported to favor the skills of grouping the words together spatially to study them, but only 17% of the female participants reported to use this skill. Studying the spelling and the sound of a word are also the skills favored by males. Respectively, 89% and 84% percent of the male participants reported to use them while 76% and 66% of the females seemed to use these skills. In addition, males seem to use mental imaging skills more than females since 75% of the males reported to use this as a skill while consolidating vocabulary meaning. Another example for males' favoring visual aspects is their use of "underlining the initial letter of the word" skill. 77% of the males reported to use this skill while only 13% of the females seem to do so. Finally, use of keyword method and cognates were frequently preferred by the male participants 83% and 75% respectively.

The frequent use of these skills by males indicates the common use of memory strategies by males.

4.5.4. Skills in Relation to the Cognitive Strategies

The items in the questionnaire which represent the cognitive strategies are presented in Table 21. The table below presents the percentages of the items' distribution to the gender of the subjects for cognitive strategies.

Table 21. Percentages of the Skills in relation to the Cognitive Strategies

COGNITIVE STRATEGIES		
45. Verbal Repetition	male	,43
	female	,67
46. Written Repetition	male	,54
	female	,65
47. Using Word Lists	male	,64
	female	,73
48. Using Flash Cards	male	,10
	female	,20
49. Taking Notes in Class	male	,74
	female	,81
50. Using the Vocabulary Section in Textbook	male	,65
	female	,80
51. Listen to Tape of Word Lists	male	,17
	female	,22
52. Putting English Labels on Physical Objects	male	,12
	female	,19
53. Keeping a Vocabulary Notebook	male	,51
	female	,66

As Table 21 indicates, all of the skills of the Cognitive Strategies are used more frequently by females than males. For instance, 73% of the female participants taking part in this study seem to use word lists as a skill of consolidating word meanings while 64% of the male participants reported to use this skill. Also, 81% of the female participants reported to take notes in class as a skill. However, 74% of the males reported to use this skill. Similarly, the female participants seem to benefit from the vocabulary section of their textbooks more than males since 80% of the females reported to use this skill while 65% of the males reported to use this skill.

The frequent use of these skills by females indicates the common use of cognitive strategies by females.

4.5.5. Skills in Relation to the Metacognitive Strategies

The items in the questionnaire which represent the metacognitive strategies are presented in Table 22. The table below presents the percentages of the items' distribution according to the gender of the subjects for metacognitive strategies.

Table 22. Percentages of the Skills in relation to the Metacognitive Strategies

METACOGNITIVE STRATEGIES		
54. Using English-Language Media (songs, movies, news, etc.)	male	,64
	female	,73
55. Testing Oneself with Word Tests	male	,31
	female	,45
56. Using Spaced Word Practice	male	,51
	female	,57
57. Skipping or Passing the New Word	male	,23
	female	,36
58. Continuing to Study Word Overtime	male	,47
	female	,47
59. Studying the collocations	male	,51
	female	,45

As Table 22 indicates, the skills of the Metacognitive Strategies seem to be used more frequently by females although there are not immense amounts of differences in terms of percentages. Only the percentage of the skill "using English-language media" is more than 70% for females. 73% of the females and 64% of the males reported to use this skill.

4.6. Analysis of the Findings for Research Question 4

The fourth research question of this study investigated the interconnection between the findings of the present study and the literature on gender-based brain functioning differences. However, this research question was not tested by

quantitative analysis. Instead, to be able to answer this question the consistency between the findings of this study and the literature will be investigated.

When looked from a broader perspective, females reported to use a wider range of strategies regarding vocabulary learning and consolidation than males. They scored higher than males in determination, social, and cognitive strategies while males scored higher than females only in memory strategies.

This wider result of the study seems to be in consistence with the studies of Goh & Foong (1997), Nam & Leavell (2006), Taguchi (2002) and Catalan (2003), all of whom favored females as more frequent users of strategies.

The reason why females show more use of strategies could be their superiority in verbal and language-related skills over males because of the characteristics of the female brain. As explained in chapter II, in the female brain, the centers of language and hearing have 11% more neurons when compared to those of the male brain. This is reflected in the language performance of men and women in daily life. Men speak with 7000 words per day while women use 20.000 words per day (Brizendine, 2007). Moreover, the female brain has a higher percentage of grey matter in the left hemisphere which aids language skills (Gur, 1999). Also, according to Harnad (1976), females develop earlier and stronger lateralization of the left hemisphere and this gives them superiority in verbal tasks.

4.6.1. The Relationship between Gender and Discovery Strategies

The first question of the study investigated whether males and females use different strategies to discover the meaning of an unknown word. The discovery strategies included *Determination Strategies* and *Social Strategies.*

4.6.1.1. The Relationship between Gender and Determination Strategies

The results showed that females employed determination strategies more often than males.

Determination strategies include skills like analyzing the part of speech, analyzing affixes and roots, checking for L1 cognates, analyzing any available pictures or gestures, guessing from textual context, checking bilingual and monolingual dictionaries, using word lists and flash cards.

When these skills are examined in terms of brain activity, it could be stated that analyzing the part of speech, analyzing affixes and roots, and checking for L1 context are activities related to recall of the existing memory because the students first need to remember their existing information about the part of speech, affixes and roots and L1 cognates and then adapt the new word onto this existing knowledge. This process employs the recall of the items from the long term memory. As stated in Chapter II, this process is related to the retention of the old items and memory recall procedures. Therefore, the reason why female participants scored higher in this part is the fact that the memory centers in the female brain are larger. In other words, as Brizendine (2007) expresses, the female brain has a larger hippocampus, which is the center of memory. This enables female verbal memory to be more active. Also, the hippocampus, as a memory center, is most sensitive to estrogen. It is also the center of vocabulary. Therefore, women are better at verbal skills.

In addition, there are other skills of the determination strategies; such as analyzing any available pictures or gestures, guessing from textual context, and using flash cards. These skills are related to the transfer of information between the two hemispheres of the brain because as stated in Chapter II, the right hemisphere of the brain deals with the visual elements, such as pictures while the left hemisphere

deals with the linguistic elements, such as words and sentences. Therefore, using a picture or flash card, which is related to the right hemisphere, and associating it with a word, which is related to the left hemisphere includes a process of information transfer between the two hemispheres of the brain. When it comes to the reason why females scored higher than males in this part, as Sylwester (1995) expresses, the corpus callosum, which is the bundle of nerve fibers between the left and the right hemisphere of the brain, is larger in the female brain. The corpus callosum enables the transfer of information between the two hemispheres. Therefore, women are swifter in the process of information and they are faster thinkers. Also, as Gur (1999) states, information transfer in the brain is facilitated since women have higher proportions of grey matter than men do. Grey matter refers to the neural cell bodies and their dendrites, which communicate with the neighboring neurons in the brain. Therefore, women have higher percentage of tissue devoted to neural communication, which refers to information transfer.

The finding that females scored higher than males with regard to the determination strategies were in consistence with Taguchi's (2002) and Goh & Foong's (1997) findings that females reported to use determination strategies more frequently than males.

4.6.1.2. The Relationship between Gender and Social Strategies

The results showed that females employed social strategies more often than males.

Social strategies include skills such as "asking teacher for an L1 translation," "asking teacher for paraphrase or synonym of the new word," or "asking teacher for a sentence including the new word," "asking classmates for the meaning of the new

word," "discovering new meaning through group-work activity," "studying the meaning in a group," and "interacting with native speakers."

As understood from their nature, and as the name suggests, these skills are related to the social activity. In chapter II of this study, it was stated that the social activities individuals are engaged in are related to the language abilities and speaking skills since socialization occurs through speaking. This situation could be explained according to the hormonal differences between the male and the female brain. As Brizendine (2007) states, women are in more need of socialization and speaking, which can happen through language. Therefore, women are better at linguistic tasks. A reason for this could be that estrogen enables women to be emotionally active, better at communication tasks and empathy (Brizendine, 2007). Moreover, girls can discriminate between the variations in tone and pitch of voice better than boys, which may indicate that female brain is more sensitive to language. These could be reasons why females reported to be using social strategies more than males.

In addition, the use of social strategies also includes the employment of emotions because individuals need to manage their emotions during the socialization process. Therefore, another reason why females outnumber males in the use of social strategies could be the differences between the functioning of the emotional centers and emotional activities in the male and the female brain. As stated in chapter II, in the male brain, the amygdala, which is fed by testosterone, is more active while in the female brain pre-frontal cortex is more active. Thus, women are able to control their excessive impulses and emotions coming from the amygdala more effectively and they are more active emotionally (Brizendine, 2007). Also, as the hippocampus is larger in the female brain, women are better at emotional tasks,

empathy, and language processing as well as memory tasks. Similarly, men use one side of their brain when it comes to emotional tasks and experiences whereas women use both sides. Therefore, neural connections within the emotional centers of the brain are more active and larger in the female brain (Brizendine, 2007).

The results of this study related to the use of social strategies by males and females seem to be in consistence with Goh & Foong's (1997) study. They found out that female students reported using affective strategies more often than males. In addition, Nam & Leavell (2006) got similar results, which seems consistent with those of this study. According to their findings, females show more use of social strategies. They state that gender differences appear most evident in the use of socially based strategies, such as group learning. Moreover, the findings of Taguchi (2002) indicate that females use social strategies more frequently than males, which is also in consistence with the findings of this study.

4.6.2. The Relationship between Gender and Consolidation Strategies

The second question of the study investigated whether males and females use different strategies to consolidate the meaning of an unknown word. The consolidation strategies included *Memory Strategies, Cognitive Strategies* and *Metacognitive Strategies.*

4.6.2.1. The Relationship between Gender and Memory Strategies

The results showed that males reported to use memory strategies more frequently than females.

Memory strategies include skills such as, "connecting the word with a pictorial representation," "connecting the word with a mental image," "connecting the word with a personal experience," "connecting the word with its coordinates or its synonyms and antonyms," "using semantic maps and scales," "peg method" and

"loci method," "grouping words together spatially or in word lists," "using the word in sentences," "studying the spelling or pronunciation of the word," "underlining the initial letter of the word," "keyword method," "studying part of speech or affixes and roots to remember the meaning," "using cognates," "using physical action," and "using semantic grids."

As it may be seen, the skills of the memory strategies are usually related to organizing some written, physical or mental *spatial* ways to study the meaning.

The fact that males employ memory strategies could be because of this spatial nature of the skills. As stated in chapter II, with respect to the linguistic and social orientation of the female brain, male brain is spatially oriented. As Brizendine (2007) stated in chapter II, males are better at spatial tasks involving mental rotation. Also, as stated by Gur (1999) in chapter II, the female brain has a higher percentage of grey matter in the left hemisphere which aids language skills. Men have higher percentage of white matter although the distribution of it is largely asymmetrical. For example, the volume of grey matter is more in the left hemisphere of the male brain. This asymmetry makes men better at global and spatial tasks.

The findings of this study related to the memory strategies are in consistence with some of the studies reported. For example, Gu (2002) found out that male participants of his study reported to trust rote memorization more. Also, according to Nam & Leavell's (2006) study, males favored the use of memory strategies most and affective strategies least.

4.6.2.2. The Relationship between Gender and Cognitive Strategies

The results showed that females reported to use cognitive strategies more frequently than males.

Cognitive strategies include skills such as “verbal and written repetition,” “word lists and flash cards,” “taking notes in class,” “using the vocabulary sections of the textbook,” “listening to tape of words,” “putting English labels on objects,” and “keeping a vocabulary notebook.”

As it is seen, the skills of the cognitive strategies are usually related to being exposed to language in auditory, visual and written terms. When studied in terms of brain-related factors, such activities are related to the left hemisphere of the brain. As stated in chapter II, the left hemisphere monitors the areas for speech, evaluates material in a rational way and understands the literal interpretation of words. Also, the left hemisphere has some dominance in the process of language learning. Therefore, the fact that females outnumber males in the use of the cognitive strategies could be related to the female left brain. As expressed in chapter II, according to Gur (1999), the female brain has a higher percentage of grey matter in the left hemisphere which aids language skills. Also, according to Harnad (1976), females develop earlier and stronger lateralization of the left hemisphere and this gives them superiority in verbal tasks. In addition, it could be stated that auditory skills, such as verbal repetition and listening to tape of words, reflect the advantage of the female brain. It has been stated in chapter II that in the female brain, the centers of language and hearing have 11% more neurons when compared to those of the male brain. This is reflected in the language performance of men and women (Brizendine, 2007).

These conclusions are confirmed by some of the research reported in chapter II. For example, in Knox and Kimura’s (1970) study that examined sex differences in language ability by means of listening tests, they found that boys are worse at perception of speech and in development of the left hemisphere locus for speech but

they have better recognition of non-verbal sounds. Also, Vernon (1960), who compared males and females in verbal and non-verbal tasks, found out that girls did better on most verbal tests.

In addition, other skills of the cognitive strategies include some kind of being visually exposed to language, such as flash cards and word lists, putting English labels on objects, and keeping a vocabulary notebook. In relation to this fact, it was stated in chapter II that the ways males and females hear, see, feel and evaluate what others think are different. In other words, they achieve the same results and the same tasks using different pathways; which was confirmed by MRI research. In the research, males and females watched abstract images and their brain activity was examined. Finally, it was found out that the female brain spent more time on forming mental images by triggering brain systems that process visual input (Brizendine, 2007). Therefore, the findings of this study related to the use of cognitive strategies could be confirmed by such research.

The results of this study are in consistence with the findings of Gu (2002), which proposed that male students believed in rote memorization while female students reported more use of cognitive strategies. Female students took more notes, employed lists, used more contextual encoding of the words and seized more opportunities to use the new words in context.

4.6.2.3. The Relationship between Gender and Metacognitive Strategies

The results showed that there is not a statistically significant difference between the use of the metacognitive strategies for males and females.

The metacognitive strategies include skills, such as using songs, films, news, etc. in English, using word tests and spaced word practice, skipping the new word, studying the word overtime.

The reason why there is not a significant difference in the use of the metacognitive strategies could be related to the nature of these skills. First of all, using English language media is an activity favored by students at the age of the participants of this study. Both males and females enjoy listening to songs in English, watching American-made movies or series and reading magazines and newspapers in English. In addition, all of the students participating in the institution have regular word practice activities and word tests in their quizzes and mid-term exams. Therefore, metacognitive strategies are adopted by most of the participants. Through these regular tests, the students, in a way, study the word overtime. Consequently, in the setting of this study, these skills are adopted by both male and female students.

It was stated in chapter II that actually males and females do not use different structures but they achieve the same results and the same tasks using different pathways. In other words, the input that comes from the senses is processed differently in the male and female brain. The research concerning this fact indicated that females spend more time than men to get the same results. It also meant that the female brain and the male brain are able to carry out the same tasks. Therefore, the male and female brains get the same results for the same tasks but they employ different pathways (Brizendine, 2007). Therefore, the reason why there was not a significant difference between the use of the metacognitive strategies might be that males and females eventually get the same results.

In the research reported in chapter II, there are different findings related to the use of the metacognitive strategies by males and females. For example, Nam & Leavell (2006) found out that males favored metacognitive strategies more whereas Gu (2002) found out that females reported more use of metacognitive strategies.

The data collected in this current study aimed to respond to some research questions. The research questions and the findings of this study are presented below.

The first research question of this study was "do males and females use different strategies to discover the meaning of a word?" Discovery strategies are grouped under two titles as "determination strategies" and "social strategies." According to the results of the group statistics for male and female participants, the mean value of the female participants who reported to use determination strategies was 6,22 while the mean value of the male participants was 5,59. In addition, the mean value of the female participants who reported to use social strategies was 7,26 while the mean value of the male participants was 4,54. These findings reveal that males and females use different strategies to discover the meaning of a word.

The second research question was "do males and females use different strategies to consolidate the learning of a word after discovering its meaning?" Consolidation strategies are grouped under three titles, which are "memory strategies", "cognitive strategies" and "metacognitive strategies." According to the results of the group statistics for male and female participants, the mean value of the female participants who reported to use memory strategies was 11,93 while the mean value of the male participants was 18,75. In addition, the mean value of the female participants who reported to use cognitive strategies was 4,94 while the mean value of the male participants was 3,89. Finally, the mean value of the female participants who reported to use metacognitive strategies was 3,03 while the mean value of the male participants was 2,67. However, according to the results of the independent samples test, there was not a statistically significant difference in metacognitive strategies' scores between the males and females.

When looked from a broader perspective, females reported to use a wider range of strategies regarding vocabulary learning and consolidation than males. They scored higher than males in determination, social, and cognitive strategies while males scored higher than females only in memory strategies.

The third research question of this study was "what skills are used more frequently by students in relation to their learning strategy preferences?" It investigated the skills used by male and female students. The results of the findings are presented according to the strategy groups. First of all, among the determination strategies, female students reported to use skills such as "analyzing part of speech," "checking for L1 cognate," "guessing from textual context," "using a bilingual dictionary," and "using flashcards" while male students reported to use skills such as "checking for L1 cognate" and "guessing from textual context" only.

The skills reported to be used among the social strategies were not the same for male and female students. Among these skills, female students reported to use "asking teacher for L1 translation," "asking teacher for a paraphrase or a synonym of the new word," "asking teacher for a sentence including the new word," "asking classmates for meaning," "discovering the meaning through group work activity," "studying the meaning in a group," "teacher checking students' flash cards or word lists for accuracy," and "interacting with native speakers." In short, females reported to use all skills of social strategies frequently. On the other hand, among social strategies, males reported to use skills such as " asking teacher for L1 translation," "asking teacher for a paraphrase or a synonym of the new word," and "asking classmates for meaning."

The males and the females taking part in this study reported to use different skills among the memory strategies as well. Males reported to use skills such as

"imaging word meaning," "connecting word to a personal experience," "connecting word to its synonyms and antonyms," "using scales for gradable adjectives," "using peg method," "using loci method," "grouping words together to study them," "grouping words spatially on a page," "using new word in sentences," "studying the spelling and sound of a word," "saying the word aloud," "imaging word form," "underlining the initial letter," "configuration of the word," "using keyword method," "remembering affixes and roots," "remembering the part of speech," and "using cognates." On the other hand, females did not report to use as various skills of the memory strategies as males. They reported to use skills such as "imaging word meaning," "connecting word to its synonyms and antonyms," "studying the spelling of a word," and "using cognates."

According to the findings of this study, the skills among the cognitive strategies used frequently by males and females were also different. Females reported to use skills such as "using word lists," and "taking notes in class" while males reported to use "taking notes in class" only.

Finally, among the metacognitive strategies, females reported to use the skill "using English-Language media" while male participants did not reported to use any of these strategies frequently enough.

Last, but not least, the fourth research question of this study was "what is the interconnection between the findings of this present study and the literature on gender-based brain functioning differences?" When the literature and the findings of this study were compared, it was found that the findings of this study are in consistence with many other studies conducted. To summarize briefly, females reported to use vocabulary learning and consolidation strategies more frequently and in more diverse ways. This finding is in consistence with the studies of Goh &

Foong (1997), Nam & Leavell (2006), Taguchi (2002) and Catalan (2003), all of whom favored females as more frequent users of strategies. This is because of the fact that the female brain is superior in verbal and language-related skills over males.

In addition, the finding that females use determination strategies more than males is because the skills among the determination strategies are related to the recall of the items from long term memory and female brain has larger and more active memory centers (Brizendine, 2007).

The results of this study that females employ social strategies more than males are related to the socially-oriented nature of the female brain (Brizendine, 2007).

Similarly, another result pointed out that males use memory strategies more than females; this is because the skills of memory strategies that are utilized while studying are related to spatial intelligence and the male brain is spatially oriented (Brizendine, 2007).

The results of this study that demonstrated the use of cognitive strategies by females more than males is related to the fact that the skills of cognitive strategies are related to exposure to language in visual and auditory terms (Oxford, 1990). These skills are related to the left brain activity and female brain has higher percentage of grey matter in the left hemisphere and this aids language skills (Gur, 1999).

Finally, this study also found out that there is not a statistically significant difference between males and females in the use of metacognitive strategies. This might be due to the nature of the skills among the metacognitive strategies, which are employed by both male and female students. Also, as Brizendine (2007) puts it,

males and females get the same result even though they employ different pathways in their brains. This fact may also have a role on this finding.

CHAPTER V

CONCLUSION

5.0. Presentation

This chapter consists of the summary of the study, discussion of the findings, pedagogical implications and recommendations for further research.

5.1. Overview of the Study

This study investigated gender-based brain differences and vocabulary learning strategies of male and female students. It examined whether there was a statistically significant difference between the vocabulary learning and consolidation strategies that male and female students use and whether these differences are related to the biological differences between the male and female brain. The study was carried out with 200 students of the A-level classes, that is, beginner level classes, at the Department of Foreign Languages at TOBB University of Economics and Technology because at the time of the research, the researcher worked at TOBB University of Economics and Technology, and taught that specific group of students.

The data was collected through a questionnaire which was designed based on the vocabulary learning and consolidation strategies taxonomy of Schmitt and McCarthy (1997) which was used in Catalan's (2003) study. Firstly, a pilot study was carried out with 50 students of the A group of the same institution and the results were analyzed through SPSS in order to find out the reliability analysis and the factor analysis. After the piloting, the main study was conducted with 200 subjects. Afterwards, the responses of the participants were studied to see the

dispersion of vocabulary learning strategies with respect to the gender of the students.

The data collected were then analyzed through t-test method on SPSS to see whether the vocabulary learning and consolidation strategies that the students adopt vary according to their gender.

5.2. Discussion

The first research question of this study investigated whether males and females use different strategies to discover the meaning of an unknown word. The findings revealed that males and females use different strategies in order to discover the meaning of an unknown word. The discovery strategies are separated into two groups as "determination strategies" and "social strategies." The findings of the present research showed that both determination and social strategies are used more frequently by females. Males prefer to use these strategies less than females.

The second research question of this study investigated whether males and females use different strategies to consolidate the learning of a word after discovering its meaning. The findings revealed that males and females use different strategies in order to consolidate the learning of a word after discovering its meaning. The consolidation strategies are separated into three groups as memory strategies, cognitive strategies and metacognitive strategies. According to the results of this study, males use memory strategies more frequently than females whereas females use cognitive strategies more often than males in order to consolidate the learning of a word. When it comes to the use of metacognitive strategies, there was not a statistically significant difference between their frequency of use by males and females.

The third research question aims to identify the skills used by male and female students in relation to their learning strategy preferences. In order to answer this research question, the distribution of the skills as preferred by males and females was studied. It was found out that among the determination strategies, the skills such as “analyzing part of speech,” “using a bilingual dictionary,” and “using flash cards” were reported to be used more often by females while skills such as “checking for L1 cognate” and “guessing from textual context” were reported to be used often by males.

In addition, among the social strategies, females reported to use skills such as “Asking Teacher for an L1 Translation,” “Asking Teacher for Paraphrase or Synonym of New Word,” “Asking Teacher for Sentence Including the New Word,” “Asking Classmates for Meaning,” “Discovering New Meaning Through Group-work Activity,” “Studying and Practicing the Meaning in a Group,” “Teacher Checking Students' Flash Cards or Word Lists for Accuracy” and “Interacting with Native Speakers” frequently. On the other hand, despite not reporting to use these skills frequently, males seemed to favor skills such as “Asking Teacher for an L1 Translation” and “Asking Classmates for Meaning.”

According to the results of this study, males seem to use skills of memory strategies more frequently than females. They reported to use skills such as “Imaging Word Meanings,” “Connecting Word to a Personal Experience,” “Connecting the Word to its Synonyms and Antonyms,” “Using Scales for Gradable Adjectives,” “Peg Method,” “Loci Method,” “Grouping the Words Spatially on a Page,” “Studying the Spelling and the Sound of the Word,” “Mental Imaging,” “Underlining the Initial Letter of a Word,” “Keyword Method” and “Using Cognates” more often. However, among the memory strategies, the skills which

females seem to favor were “Imaging Word Meaning,” “Connecting the Word to its Synonyms and Antonyms” and “Using Cognates.”

In addition, the skills among cognitive strategies were found to be used by females more frequently. Females reported to use skills among the cognitive strategies, such as “Using Word Lists,” “Taking Notes in Class” and “Keeping a Vocabulary Notebook.” On the other hand, males seem to favor the skill “Taking Notes in Class” among the cognitive strategies.

Finally, as there is not a statistically significant difference between the males’ and females’ use of the skills among the metacognitive strategies, both males and females reported to use the skill “Using English Language Media,” more often than the other skills among the metacognitive strategies.

The fourth research question of this study investigated the relationship between the skill and strategy preferences of males and females and their gender-based brain differences according to the literature suggested. It was found out that females use a wider range of strategies in order to discover and consolidate the meaning of an unknown word. With regard to the literature in the field, the reason for this situation is linked to their superiority in verbal and language related tasks over males owing to the more developed language centers in the female brain (Brizendine, 2007).

Females reported more use of determination strategies and their skills. It was stated that the skills in relation to the determination strategies are related to the recall of existing memory. Therefore, females employ these skills and strategies most likely because, as Brizendine (2007) puts it, memory centers in the female brain, such as the hippocampus are larger and more active in the female brain. Also, it is sensitive to estrogen.

In addition, females reported more use of the social strategies and skills in relation to them. The skills of the social strategies require interaction with other people, such as the teacher or peers, so they involve social activity. The reason why females reported to use these strategies more often than males is most likely that females are better at the socialization process owing to their improved language skills and ability to use their emotions effectively since socialization process includes the employment of language skills, emotions and empathy (Brizendine, 2007). Most likely, this is because females are able to use and control their emotions better owing to their pre-frontal cortex, which is more active than that of the male brain.

According to the results of this study, males reported to use memory strategies and the skills in relation to them more frequently. As expressed in the previous chapter, the skills in relation to the memory strategies include spatial, physical or mental patterns of organization to study the meaning (Oxford, 1990). According to the biological facts, male brain is spatially oriented and therefore, males are better at spatial tasks (Brizendine, 2007). For this reason, this superiority of the males in the use of the memory strategies and their skills could be explained by the characteristics of the male brain.

Furthermore, females reported to use cognitive strategies and their skills more frequently by males in the present study. The skills in relation to the cognitive strategies include "written and verbal repetition," "using flash cards," "listening to recorded words," "keeping vocabulary notebooks" and "keeping word lists." These skills are related to exposure to language in visual and auditory terms (Oxford, 1990). This may be because left hemisphere has an important role in the language related tasks and the female brain has more percentages of grey matter in the left

brain (Gur, 1999). In addition, the female brain is sensitive to hearing and language more than the male brain (Brizendine, 2007). Thus, these facts may explain the females' preference for the cognitive strategies and their skills.

Finally, it was found that there is not a statistically significant difference between the males' and females' use of metacognitive skills and strategies. It was considered that the reason for this is the nature of the skills in relation to metacognitive strategies. They include "using spaced word practice," "using English language media" and "studying word over time." Such skills are favored by both the male and female students. As Brizendine (2007) puts it, males and females eventually get the same result although they use different pathways in terms of brain activity. This fact may explain that there is not a significant difference between males' and females' use of metacognitive strategies.

It was also found out that the results of this current study are consistent with most of the studies conducted in the field as detailed in the previous chapter.

The results of this study are expected to provide a new perspective for instructors and offer suggestions to improve pedagogical implications.

5.3. Pedagogical Implications

The findings of the present study showed that strategies for discovering and consolidating word meanings vary according to the gender of the students. Although gender studies have been discussed in the literature, the relationship between gender and vocabulary learning and consolidation strategies could be considered a new topic in the field and is worth attention. In addition, the most important point that this study indicated is the fact that strategy employment vary because of genders, which is rooted in the different ways of processing of the male and female brain.

The different biology and differential distribution of hormones of the male and the female brain have serious pedagogical implications.

The first point to consider in pedagogical terms is to consider the gender differences during the learning process. The results of this study does not intend to make educators gain a bias for certain genders, but it intends to encourage educators to look for ways to facilitate learning in both boys and girls and to help them learn in relation to their gender-based brain differences.

To start with, when the characteristics of the male brain are considered, there are some implications to take into account in the classroom. For example, teachers must not keep verbal instructions too long since boys might lose attention since their brain is not oriented for long speech. Also, they must allow physical movement and physical activity for boys who mostly are physically oriented. Providing space for boys in classroom conditions would also be a helpful implication of male brain characteristics. In addition, activities such as storytelling and writing in the classroom to help the male brain develop imaginative and verbal skills. Moreover, teachers must be trained in terms of the male hormonal distribution and stages of brain development in order to empathize with boys' behaviors, especially in the middle school. Also, in order to develop social skills that the male brain seems to lack at certain ages, teachers must increase employment of group work and pair work to help boys socialize. Keeping expectations high with a moderate level of challenge would also help boys improve in academic field and maturity. Also, emotional development activities to make them gain empathy and emotional realizations might be helpful for boys. By improving classroom conditions, teachers may assist the male brain to develop better.

There are also some implications to take into account in the classroom when the characteristics of the female brain are considered. For example, teachers must support their instruction with manipulatives and objects to avoid too many abstractions which are favored by the male brain. To help the female brain, there must be some visual elements such as charts and written material. Also, to help girls develop spatial skills, activities like puzzles must be provided in the classroom. On the other hand, allowing the girls to tell stories and use their imagination would encourage creativity. Especially, during learning, subjects such as mathematics or science, educators need to provide females with more hands-on materials and continuous feedback to help them with the spatial skills. Also, in order to take advantage of the socially oriented female brain, educators must include peer-teaching and group learning activities as well as providing female role-models for the girls to internalize. In addition, girls need to be encouraged for physical activity and movement. Including emotions in the instruction will also help girls to internalize the subject and feel attachment owing to the emotionally active female brain characteristics. According to what the results of this current study suggest, classrooms can be shaped for the female brain in such ways.

Another point that the results of this study indicate is the use of learning strategies to benefit from the learning process. It has been stated that the use of strategies enables learners to gain more self-control and conscious command of their own learning process. Therefore, educators must take time to understand the language learning strategies as well as making them a part of their instruction. They must realize that boys and girls in their classroom have different mental processes during vocabulary learning and they must consider these facts while planning their lessons. Various opportunities to employ these strategies in the teaching process

need to be created so that students from both genders can find their pattern of learning in consistence with the ways their brain learns best. Educators also need to make their students realize the different strategies they may employ and create chances for them to practice those. Only in this way is it possible to make the strategies a part of instruction and help learners make use of them as conscious mental processes to create autonomy. In this respect, strategy training also appears as an important factor to include in the syllabus. Gurian and Ballew (2003) state that different brains of male and female students profoundly influence the nuances of their learning. He stresses that brain-based research is going to be used for the good of the classroom teaching and influence schools globally.

In conclusion, the results of this study may help teachers reconsider their roles as being the figures to help learners initiate the strategy process rather than being the figures that explain and present every piece of information to the learners. Also, teachers can help learners more consciously by finding out why males and females tend to employ different strategies and what those differences stem from. The brain research included in this study makes the findings more credible in pedagogical terms.

In addition, with the help of this study, teachers may consider strategy training an important part of the education process and attract students' attention to the process of employing strategies consciously to create autonomy.

5.4. Suggestions for Further Research

Several suggestions for further research emerge from the findings of this study. First of all, for more generalizable results, the number of the participants could be increased. With a larger sample, the results would prove more reliable and more generalizable.

The instrument used in this study presented the participants with two choices of response as “appropriate for me” and “not appropriate for me.” However, in order for the results to be more easily obtained and for the data to be more easily analyzed, the instrument could include a “likert scale.”

This study sought the relationship between gender-based brain differences and vocabulary learning strategies. Further research may be conducted on the relationship between gender-based brain differences and other skills, such as reading, writing, speaking or listening abilities.

5.5. Conclusion

The aim of this study was to investigate the possible relationship between differences of the male and female brain and vocabulary learning strategies of male and female students. It was found that females employ more strategies during the vocabulary learning process. Females reported to use determination, social, and cognitive strategies more than males while males reported to use memory strategies more than females. There was not a statistically significant difference between the use of metacognitive strategies by males and females, though. It was also found based on the brain research that these differences stem from the gender based brain differences.

This study may be considered an initial step to encourage instructors to revise their roles in the classroom and to provide more opportunities for the students to employ strategies during the learning process. This study is also an initial step to encourage instructors to consider brain facts and gender based brain differences as well as the roles of these factors for the learning process.

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APPENDICES

APPENDIX A

THE INSTRUMENT

Sevgili Öğrenciler,
Aşağıda, İngilizce öğrenirken bilinmeyen kelimelerin anlamlarını bulmak için kullanılan
bir takım stratejiler sıralanmıştır. Lütfen maddeleri dikkatlice okuyunuz ve İngilizce
öğrenirken kelimelerin anlamlarını bulmak için kullandığınız stratejileri işaretleyiniz(X).
Teşekkürler.

A. Bilmediğiniz bir sözcüğün anlamını tahmin etmek için genellikle ne yaparsınız?

1.	Sözcüğün türünü (isim, sıfat, zarf, fiil, v.b) incelerim.
2.	Sözcüğün kökünü ve eklerini incelerim.
3.	Sözcüğün, Türkçe bir sözcüğe benzeyip benzemediğine bakarım. (Örneğin, analyze-analiz)
4.	Varsa, sözcüğü açıklayan resimleri ya da vücut hareketlerini analiz ederim.
5.	Sözcüğün geçtiği cümle ya da metinden anlamını çıkarmaya çalışırım.
6.	İngilizce-Türkçe sözlükten sözcüğün anlamına bakarım.
7.	İngilizce-İngilizce sözlükten sözcüğün anlamına bakarım.
8.	Sözcükleri, İngilizce-Türkçe kelime listeleri sayesinde öğrenirim.
9.	Öğretmenin gösterdiği resimler, şimşek kartlardan ve posterlerden sözcüğün anlamını çıkarırım.
10	Öğretmenden, sözcüğün Türkçe karşılığını söylemesini isterim.
11	Öğretmenden, sözcüğü yine İngilizce olarak ama farklı bir şekilde söylemesini ya da İngilizce eş anlamlısını söylemesini isterim.
12	Öğretmenden, sözcüğü İngilizce bir cümlede kullanmasını isterim.
13	Sözcüğün anlamını sınıf arkadaşlarıma sorarım.
14	Arkadaşlarımla grup çalışması yaparak sözcüğün anlamını tahmin etmeye çalışırım.

B. Bir sözcüğün anlamını öğrendikten sonra zihninize yerleşmesi için genellikle ne yaparsınız?

15	Bir arkadaşımla ya da grup halinde, derste ve ders dışında sözcüğün anlamını tekrar eder ve alıştırma yaparım.
16	Bir kelime listesi yaparım.
17	Yeni sözcüğü ana dili İngilizce olan yabancılarla konuşurken kullanmaya çalışırım.

18	Yeni sözcüğü, sözcüğün anlamını tasvir eden resimler, imajlar ya da çizimlerle tekrarlarım.
19	Zihnimde sözcüğe uygun bir imaj oluşturarak sözcüğün anlamını tekrar ederim.
20	Sözcüğün anlamını bir deneyimimle ilişkilendiririm.
21	Yeni sözcüğü, alakalı olduğu diğer sözcüklerle ilişkilendiririm. (Örneğin, "apple" sözcüğü "orange, peach," v.b. sözcüklerle alakalı olabilir.)
22	Yeni sözcüğü, eş ya da zıt anlamlılarıyla ilişkilendiririm.
23	Anlamca ilişkili sözcüklerle şemalar ya da kelime ağaçları hazırlarım.
24	Derecelendirilebilen sıfatlar için ölçekler hazırlarım. (Örneğin, cold-colder-coldest)
25	Yeni sözcüğü, yazılış ve söyleniş açısından kendisiyle kafiyeli olan başka sözcüklerle ilişkilendiririm. (Örneğin, two is a shoe, three is a tree, four is a door, v.b.)
26	Yeni sözcüğü, bildiğim bir yerle ilişkilendiririm.
27	Sözcükleri çalışırken onları anlamca, türce, v.b. şekillerde gruplandırırım.
28	İlgili sözcükleri bir kağıt ya da defter üzerinde geometrik şekiller, ok işaretleri, üçgenler, kareler, daireler, v.b. şekiller kullanarak gruplandırırım.
29	Sözcüğü, İngilizce bir cümlede kullanırım.
30	Sözcükleri, anlamlı şekilde bir araya getirerek ya da hikayeleştirerek çalışırım. (Örneğin, öğreneceğim kelimeler fish, like ve cat ise, her birini ayrı cümlelerde kullanmak yerine "cats like fish." şeklinde cümleler kurmaya çalışırım.)
31	Sözcüğün yazılışına çok dikkat ederim.
32	Sözcüğün telaffuzuna çok dikkat ederim.
33	Çalışırken sözcüğü yüksek sesle söylerim.
34	Sözcüğün yapısını analiz ederim.
35	Sözcüğün baş harfinin altını çizerim.
36	Sözcüğü daha iyi ezberlemek için hecelerine, harflerine ya da belli bölümlere ayırarak düzenlerim.
37	Sözcüğü, anlamca farklı olsa da söyleniş olarak Türkçe bir sözcükle ilişkilendiririm. (Örneğin, conserve-konserve)
38	Sözcüğün kökünü ve eklerini hatırlamaya çalışırım.
39	Sözcüğü, türüyle (isim, sıfat, zarf, fiil, v.b) ilişkilendirmeye çalışırım.
40	Sözcüğün İngilizce açıklamasını başka bir şekilde söylemeye çalışırım.
41	Sözcüğü, Türkçe'deki benzer yapı ve anlama sahip olan sözcüklerle ilişkilendiririm. (Örneğin, tomato-domates)
42	Deyimleri, sanki deyimin tümü bir kelimeymiş gibi öğrenirim.
43	Yeni sözcüğü öğrenmek için vücut hareketlerimi ya da fiziksel aktiviteyi kullanırım.
44	Anlamca genelleme ve örnekleme yapar, anlamca benzer olan kelimeleri aynı grup altında toplarım. (Örneğin, man, woman = human beings, ya da domestic animals = cat, dog)

45	Sözcüğü, sesli olarak tekrar ederim.
46	Sözcüğü, birkaç defa yazarım.
47	Sözcük listeleri yapar ve bu listeleri tekrar ederim.
48	Anlamı pekiştirmek için, sözcüğü tasvir eden resimlerle kartlar hazırlarım.
49	Derste, sözcükle ilgili notlar alırım.
50	Kitabımdaki sözcük bölümlerini gözden geçiririm.
51	Sözcük listeleri içeren kayıt, kaset ya da CD'ler dinlerim.
52	Nesnelerin üzerine İngilizce adlarının yazdığı kartlar ve etiketler koyarım.
53	Bir "sözcük defteri" tutarım.
54	Medyadaki İngilizce yayınları kullanırım. (Örneğin, şarkılar, filmler, haberler, v.b)
55	Öğrendiklerimi, sözcük testleri ile kontrol ederim.
56	Öğrendiğim sözcükleri tekrar etmek için boşluk doldurmalı kelime alıştırmaları yaparım.
57	Yeni sözcüğü kullanmaktan kaçınırım; onun yerine başka sözcükler kullanırım.
58	Zaman içerisinde sözcüğü sürekli tekrar ederim.
59	Yeni sözcüğü, aklıma getirdiği diğer sözcükleri kullanarak öğrenirim. (Örneğin, snow: winter, cold, white, coat, v.b.)
60	Bu listede yer almayan diğer stratejileri kullanırım. Örneğin, ……..…… ……...…… ……...… …… ……...