

THE ROLE OF EPISODIC AND SEMANTIC MEMORY
ON EXAM PERFORMANCE AMONG
FRESHMEN AND SENIOR STUDENTS IN PSYCHOLOGY

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ABSTRACT

THE ROLE OF EPISODIC AND SEMANTIC MEMORY ON EXAM PERFORMANCE AMONG FRESHMEN AND SENIOR STUDENTS IN PSYCHOLOGY

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The aim of this thesis was to examine the role of episodic and semantic memory on exam performance, while considering type of the question and age at two time points; right after the exam and five weeks later. Freshmen and senior students were asked to complete a questionnaire consisted of exemplar questions from final exams, and they were asked whether they remembered the specific learning episode corresponding to episodic memory, or they knew the information without remembering the learning episode corresponding to semantic memory. Participants were assessed right after final exams at Time 1, and after five weeks at Time 2. We found that the use of episodic memory was significantly higher for senior students. Moreover, greater episodic memory use at Time 1 and age predicted higher accuracy for factual questions, while age did not significantly predict accuracy for applied questions. Furthermore, freshmen and senior students' use of episodic memory decreased from Time 1 to Time 2 both for factual and applied questions. While considering the change in the use of semantic memory, only senior students' use of semantic memory for applied questions increased after 5 weeks. Finally, we looked at the use of episodic and semantic memory at Time 2, regarding their relation to exam performance. We found that the use of episodic and semantic memory at Time

2, and age predicted greater accuracy for factual questions whereas none of the variables significantly predicted exam performance for applied questions. The findings were discussed in line with limitations, contributions and implications.

Keywords: episodic memory, semantic memory, exam performance, factual questions, applied questions.

ÖZ

PSİKOLOJİ BÖLÜMÜ BİRİNCİ VE DÖRDÜNCÜ SINIF ÖĞRENCİLERİNİN EPİZODİK VE SEMANTİK BELLEK KULLANIMININ SINAV BAŞARISI ÜZERİNDEKİ ROLÜ

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Bu tezin amacı epizodik ve semantik bellek kullanımının sınav başarısı üzerindeki rolünü soru çeşidi ve yaş faktörlerini de göz önünde bulundurarak sınavdan hemen sonra ve beş hafta sonra olmak üzere iki farklı zaman diliminde incelemektir. Üniversite birinci ve dördüncü sınıf öğrencileri final sınavından örnek sorulardan oluşan bir anket doldurmuşlardır ve katılımcılara soruları yanıtlamalarını sağlayan bilginin kaynağı sorulmuştur. Yani epizodik bellek ile ilişkili olarak o bilgiyi öğrendikleri anı hatırlıyorlar mı, yoksa semantik bellek ile ilişkili olarak o bilgiyi öğrendikleri anı hatırlamadan sadece biliyorlar mı? Öğrenciler final sınavından hemen sonra ve sınavdan beş hafta sonra çalışmaya katılmışlardır. Sonuçlar gösteriyor ki, dördüncü sınıf öğrencilerinin epizodik bellek kullanımı birinci sınıf öğrencilerinden daha fazladır. Ayrıca, birinci zaman dilimindeki epizodik bellek kullanımı ve yaş olgusal sorularda daha fazla doğru cevapla ilişkiliyken, yaş uygulamalı sorularda doğru cevap sayısını yordamamaktadır. Ek olarak, birinci ve dördüncü sınıf öğrencilerinin olgusal ve uygulamalı sorulardaki epizodik bellek kullanımı beş hafta içerisinde azalmıştır. Semantik bellek kullanımındaki değişikliğe baktığımızda, sadece dördüncü sınıf öğrencilerinin uygulamalı sorulardaki semantik bellek kullanımı beş hafta içerisinde artış göstermiştir. Son olarak, ikinci zaman dilimindeki epizodik ve semantik bellek kullanımının sınav başarısıyla olan ilişkisine

bakılmıştır. İkinci zaman dilimindeki epizodik ve semantik bellek ve yaş olgusal sorularda doğru cevap sayısını yordarken, hiçbir deęişken uygulamalı sorular için doğru cevap sayısını yordamamıştır. Bulgular kısıtlamalar, katkılar ve implikasyonlar doğrultusunda tartışılmıştır.

Anahtar Kelimeler: epizodik bellek, semantik bellek, sınav başarısı, olgusal sorular, uygulamalı sorular.

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CHAPTER 1

INTRODUCTION

The use of episodic memory in classroom context is widely examined by memory and education researchers (Conway, Gardiner, Perfect, Anderson, & Cohen, 1997; Herbert & Burt, 2004; Leichtman, Pillemer, Bemis, Bauer, & Malahy, 2011). A number of studies found that remembering episodically in classroom context helps later retrieval, and there is another line of research that focuses on consequences of remembering semantically, especially for later retrieval (Conway et al., 1997; Herbert & Burt, 2004). In the literature, studies focusing on episodic and semantic memory systems assessed how participants respond while thinking about the source of a particular piece of information. Episodic memory was found to be more associated with “remember” responses, whereas semantic memory was found to be more associated with “know” responses. More specifically, when people report that they remember the specific moment at which they learned about a phenomenon, they use episodic memory system. When they report that they know the item but they do not remember a specific moment of learning it, they use semantic memory system (Tulving, 1985). Therefore, remember/know paradigm corresponds to episodic and semantic memory systems.

Another line of research investigated whether and how remember-to-know shift occurs, which concerns the ways students store information across time; and if it happens, how remembering semantically affects later retrieval (Herbert & Burt, 2001; Herbert & Burt, 2003). Remember-to-know shift offers an idea that information shifts from episodic memory to semantic memory system in time. People use episodic memory system when they recall a piece of information if the knowledge has been recently acquired. After a while, that piece of information transfers to semantic memory system, that is to say people know that information without remembering the moment that they learned it (Herbert & Burt, 2001; Herbert & Burt, 2003; Herbert & Burt, 2004).

The current study aims to investigate the role of different memory systems (namely, episodic and semantic) on exam performance, while considering class differences in university setting. To reach this goal, freshmen and senior students majoring in psychology department were compared in order to see whether they use episodic or semantic memory system to answer an exam question, at two different time points (right after the exam, and 5 weeks after the exam). The main concepts of the study are remember/know paradigm and remember-to-know shift. In order to propose a better understanding about these paradigms, we laid out the literature about episodic and semantic memory systems, and how the use of these systems is examined in related literature, below.

1.1 Memory Systems

Memory is one of the essential parts of human cognitive system (Tulving, 1972). Researchers in the field categorized human memory system into two distinct categories, namely as implicit (or nondeclarative) and explicit (or declarative) memory systems (Bauer, Larkina, & Deocampo, 2010). Implicit memory system consists of learning through classical conditioning, gaining skills and habits, and memories recalled by priming. Its development starts earlier than the explicit memory system (online from the time of birth), and it is more resistant to change. Moreover, change in behavior or performance can be apparent whereas the memory processes that lead to the change cannot be consciously recognized in implicit memory system. Explicit memory system, on the other hand, develops later -around the age of 2- (Markowitsch & Welzer, 2010), and consists of consciously recalling memories related to events or acquired knowledge. It is more open to change and making mistakes in recalling the content and details of the piece of information retrieved (Bauer et al., 2010).

Explicit memory system also has subcategories, including episodic and semantic memory systems. Conscious awareness, which makes the distinction between

implicit and explicit memory, is also a factor contributing to the distinction of episodic and semantic memory. Being consciously aware of the details of an event (i.e. time, place, how it happened) is a part of episodic memory system (Tulving, 1993). This type of awareness is called as *autonoetic awareness* because people have a sense of self while remembering their personal past (Tulving, 1985). Semantic memory system consists of general knowledge without sense of self, and therefore it is associated with *noetic awareness* (Wojcik, Moulin, & Souchay, 2012). Knowing a piece of information, but not remembering the specific source of that information (a specific moment in time that one learned that piece of information) is a typical example of how the semantic memory system works (Pillemer, 1998). For instance, one may *remember* what color of a dress and the moment that she decided to buy that dress that she wore to her graduation party, whereas she may not remember a specific moment when she learned what her mother's name is, although she *knows* her mother's name. The first one is a typical example to an episodic memory, one point in time event and concerns remembering something, whereas the latter one is a typical example of a semantic memory, when someone knows something but does not remember the source or time of learning it (Pillemer, 1998).

While considering the relationship between episodic and semantic memory systems, there are three views in the literature. Squire (1992) suggested that pieces of episodic memory are necessary for acquiring general knowledge, namely as semantic memory. According to the second view, which is exactly the opposite of the first one, episodic memory system is developed from semantic memory system, because having general knowledge is necessary for remembering the past events (Tulving, 1993). From the developmental perspective, the latter view seems more logical because semantic memory system starts to develop before the development of a sense of self, which is required for the development of episodic memory system (Tulving, 2002). The third view, which offers double dissociation, is supported by the studies conducted with patients with impaired memory systems. Graham, Simons, Pratt, Patterson, and Hodges (2000) examined episodic memory performance of the patients with semantic dementia and found that semantic memory

impairments do not lead to impairment in episodic memory system. Therefore, they claimed that the idea of episodic memory system is derived from semantic memory system is not the case. Although the impairment in one system does not lead to impairment in the other system, it cannot be concluded that they work independently. As long as they work flawlessly, they influence each other. For instance, the more knowledge is stored in semantic memory, the better performance can be observed in episodic memory (Schneider, Körkel, & Weinert, 1989). Furthermore, the information can be transferred from one system to the other one. Since transfer from episodic memory to semantic memory is the main focus of this study, these two memory systems will be explained further in detail in the following sections.

1.1.1 Episodic Memory

Episodic memories are mostly one-point-in time memories (Pillemer, 1998) and the system of episodic memory is defined as remembering a past event, in which the person is aware of the time, place and other specific features of that particular experience (Tulving, 1993). Tulving (2002) suggested two important components of episodic memory; the first one is being aware of the specific details of the event, and the second one is *autonoetic* consciousness, through which people become aware of themselves in remembering process. In that sense, episodic and autobiographical memory concepts are used interchangeably, because both of them require the feeling, or sense of self. However, Fivush (2011) suggested that those components of episodic memory are separate, and episodic memories are only composed of remembering specific details of an event, whereas autobiographical memories require the feeling of self. This division allows the existence of episodic memory system in other species and in human infants, because there is no need for a sense of self for episodic memories.

On the other hand, the occurrence of autobiographical memories are possible only when people have the feeling of continuous self, in other words they can link themselves in the past, the present and the future (Fivush, 2011). Conway (2001) also

proposed a distinction between episodic and autobiographical memories. According to his suggestion, episodic memories consist of recently occurred experiences, which endure for a short time. Their functions are to remind what to do in the period that people are actively dealing with a task. Autobiographical memories, on the other hand, consist of the memories that have greater emphasis on the self, and therefore are encoded in a deeper way, and can be recalled even after for a long time. Their functions are to create continuous information about the self, which is represented in the past, the present and in the future.

Both Conway and Fivush stressed the importance of the self in autobiographical memories different than episodic memories. However, in this study, the term episodic memory is used as Tulving suggested it, because one of the main concerns of the study is episodic and semantic memory division, which was firstly put forward by Tulving (1972). Therefore, episodic memories provided by our participants are meant to be autobiographical memories, as well, as accepted by numerous researchers (Pillemer, 1998; Sahin & Mebert, 2013; Wang, 2001).

1.1.1.1 The Development of Episodic Memory

There is a mass body of research that focused on the factors that affect the development of episodic memory (Reese & Fivush, 1993; Leichtman, Pillemer, Wang, Koreishi, & Han, 2000; Wang, Leichtman, & Davies, 2000; Wang, 2006). Before laying out the design of the current study, we want to provide a detailed literature review on those factors, such as sense of self, mother-child conversations, gender differences, cross-cultural differences, and functions of autobiographical memories, which might be helpful in providing a better picture about the nature of episodic memory system.

Starting from the age of 2, children show the ability to recall an event occurred in the past, and this ability becomes fulfilled through developmental course (Markowitsch & Welzer, 2010). In an exploratory study, twenty eight children whose age range

was 2-4 were participated, and the researchers wanted to investigate the emergence of episodic memory in young children. Participants were visited in their homes, and they were asked to play a game. After two days, researchers revisited their homes and asked about their memories about that event. In addition, events that occurred six months and one year earlier were also examined. The results showed an expected developmental pattern. All children remembered the recent event, which occurred two days earlier. Events occurred six months earlier were remembered by 40% of the 2-year-olds; by 62.5% of the 3-year-olds; and by all of 4-year-olds. While considering the events occurred one year earlier, 10% of 2-year-olds; 37.5% of 3-year-olds; and 70% of 4-year-olds remembered those events. Additionally, when children were asked to arrange those events in a time line, only 4-year-olds showed the ability to arrange the events in a chronological order (Markowitsch & Welzer, 2010). Those findings show that even 2-year-olds can episodically remember the events that occurred recently. As they get older, they become capable of remembering events that were dated even earlier. The ability to organize the events in a chronological order, which concerns temporal understanding, is a more challenging task than simply remembering an event happened recently, especially for very young children. Therefore, it requires a more developed episodic memory system, which has been supported by many researchers (Piaget, 1976; Pillemer, 1998).

Another study focuses on understanding self in the past, which is an important function of autobiographical memories. In the study, researchers placed a sticker on 2, 3, and 4-year-old children's head, while playing a game. They videotaped the duration of playing game. Then, children watched those videos, in which they were playing the game while they had a sticker on their heads. Researchers suggested that if the child made a move to remove the sticker on his/her head, s/he understands that the sense of self is continuous, and the self in the past is related to the self in the present. They found that none of 2-year-olds attempted to remove the sticker, while 25% of 3-year-olds and 75% of 4-year-olds did the attempt to remove the sticker, while watching themselves on the video (Povinelli, Landau, & Perilloux, 1996).

These findings showed that even though 2-year-olds have the ability to remember themselves in recent past, they could not use episodic memory system in a completely functional way. Acquiring more developed episodic memory system and using it in an efficient way increases with age, and the accompanied sense of self also develops and matures as a function of time.

1.1.1.1.1 The Effect of Mother-Child Conversations on Episodic Remembering

As mentioned above, episodic memory system develops through age, and children with older ages represent more complex developmental patterns of episodic memory. Regardless of environmental factors, hippocampus, which is located in temporal lobe, is responsible for encoding and retrieving memories, and while it gets more mature, children's episodic memory system develops (Schacter, 1996). However, age is not sufficient and the sole factor to explain the differences occurred in episodic memory development. There are a number of factors that contribute into the memory characteristics that children exhibit. One of the main factors is the socialization pattern between the child and the main caregiver, who is mostly the mother. Children's ability to recall a past event at younger ages mostly depends on the quality of the assistance provided by mothers, such as asking direct questions (Bemis, 2008; Sahin-Acar & Leichtman, 2014). Researchers investigating episodic memory development mainly ask participants to remember a specific event, and assess participants' narratives. Narratives are written or spoken sentences composed of actions related to the event, and the structure of the event can be understood by the narratives (Fivush, 2011). Then they examine those narratives and come up to conclusions about participants' level of episodic memory development. For instance, Fivush and Fromhoff (as cited in Bemis, 2008) examined 2.5 year-olds' narratives in order to investigate the role of maternal conversational styles on children's episodic memory development. While examining mothers' practices of conversing with their children about past events, they came up with two different styles of parent-child conversations. They found that *elaborative* conversations consist of describing the event, providing evaluations about the event, and encouraging children to continue

the conversation. On the other hand, *repetitive* conversations consist of asking the same questions about the event while not giving further information, making few evaluations, and finishing the conversation or changing the topic if the child does not want to continue the conversation. Through these different styles of conversations, children's episodic (or autobiographical) memory system develops. Children whose mothers are considered as highly elaborative provide more detailed and longer narratives compared to the children whose mothers are considered as repetitive (Fivush & Fromhoff, 1988 as cited in Bemis, 2008).

In memory development literature, mothers' different styles of conversations with their children, and the effects of those styles on children's episodic memory development is one of the most studied topics by the researchers. Leichtman, et al. (2000) carried out a study in a preschool with children who are 4-5 years old. Children experienced an unexpected event at school, and their mothers, who were not with their children during the time that the event occurred, talked with their children about that event at the end of the day at school. The conversations were recorded in order to assess mothers' use of elaborations and repetitions. Researchers conducted an interview with children three weeks later. Their findings showed that elaborative conversations with mothers led children to talk longer about the event, and to provide higher amounts of accuracy (correct details) about the event (Leichtman et al., 2000).

1.1.1.1.2 Gender Differences in Episodic Memory Development

Memory researchers, who focus on examining maternal conversational styles, also focused on the gender differences in episodic memory development. They examine mothers' conversational styles since developmental differences occur mostly due to parental practices. For instance, Reese and Fivush (1993) investigated parents' reminiscing styles while talking to their daughters and sons. They were focusing on both the gender of the parent and the gender of the child. They found that regardless of the gender of the parent, parents had more elaborative style of conversations with

their daughters compared to their sons. As a result of parents' greater tendency to talk high in elaborations with their daughters, and girls tended to spend more time on conversations than boys (Reese & Fivush, 1993). In another study focusing on gender differences, researchers compared 4-5 year-olds and 7-9 year-olds. They also made a comparison between girls and boys regarding their episodic memories about the moment that they learned a new piece of information. They found that regardless of age, girls remembered learning moments more frequently than boys. While examining the narratives about learning moments, girls provided longer narratives than boys (Bemis, Leichtman, & Pillemer, 2011).

In addition to studying with children, adults also participate in the studies focusing on gender differences in episodic memory system. Pillemer, Wink, DiDonato, and Sanborn (2003) interviewed older adults whose age range was 68-79 about life histories, and found that women reported more specific episodes than men. Moreover, in episodic memory literature, asking adults about their earliest childhood memories is a common technique. It was shown in the literature that women's earliest childhood memories were dated earlier compared to men (Pillemer, 1998). Maternal reminiscing style is one of the most important contributing factors to gender differences in earliest childhood memories. Nelson and Fivush (2004) mentioned about the possible underlying reasons for the role of reminiscing styles. Since higher elaborations lead to more organized memories, they become more accessible to recall. Furthermore, mothers' greater use of elaborations provides children to understand the self in time. Last of all, through discussing about the past, children become capable of creating an actual personal past.

These studies show that females are in an advantageous condition regarding episodic memory development, because their parents spend much more time while conversing with them, and they use more elaborative reminiscing style. Therefore, studies about gender differences demonstrate that different levels of elaboration result in different patterns of episodic memory development.

1.1.1.1.3 Cultural Differences in Episodic Memory Development

Cross-cultural research in autobiographical memory development mainly looks at the different patterns of socialization across cultures and it also emphasizes the role of elaborative reminiscing style used by the main caregivers. Autobiographical memories are the products of cultural values, which shape parental practices (Fivush, 2011). From the sociocultural perspective of episodic memory development, the studies comparing the conversational styles of American and Chinese mothers concluded that American mothers use higher elaborations than the Chinese mothers do, due to different cultural practices (Wang et al., 2000; Wang, 2006). Independently oriented cultures, such as American culture have the emphasis on the importance of expressing oneself, therefore mothers encourage their children more frequently to talk about themselves, and also they provide evaluations for their children. On the other hand, interdependently oriented cultures, such as the Chinese culture, have the emphasis on group relations, therefore Chinese children are encouraged to talk about themselves less than American children are. Chinese mothers also do not give many evaluations to their children. While considering the reflections of mothers' conversational styles to their children, American children provide new information more frequently than the Chinese children do during conversations (Wang et al., 2000).

Like gender differences, earliest childhood memories have also been studied to investigate the cultural differences. Sahin and Mebert (2013) compared American and Turkish college students' earliest childhood memory characteristics. They found that the age that belongs to American students' earliest childhood memories was lower than the age that corresponds to Turkish students earliest childhood memories. Similarly, Wang (2001) found that American college students' earliest childhood memories occurred 6 months earlier than Chinese student's memories. She also revealed that while American students were mentioning about themselves, they emphasize personal characteristics whereas Chinese students had a tendency to describe themselves with social roles.

The studies in episodic memory development literature show that being elaborative towards children while talking about past events leads them to be more capable of providing information about the past. As children become more competent with episodic memory system through age and their mothers' efforts, they promote and adopt their mothers' elaborative styles in return. When mothers become more elaborative, they further enhance episodic memory development. This reciprocal and dialectical relationship between mothers and children show the salience of elaborative style in episodic memory development (Reese, Haden, & Fivush, 1993).

1.1.1.2 The Importance and Functions of Episodic Memory

Researchers examine and explore the factors contributing to the development of episodic memory, since episodic memory development occurs in a parallel fashion with other developmental issues, and also they influence each other during developmental process. Language development is one of the key elements that are in relation with the occurrence of autobiographical memories. Fivush (1998) stated that language is not necessary, but a useful instrument for encoding, organizing and retrieving memories. It provides those processes to occur independently from physical cues, so they become easier. More importantly, language is important for talking about past events (Fivush, 1998). Mother-child reminiscing, which is crucial for episodic memory development, cannot be actualized without the use of language. Farrant and Reese (2000) deepened the role of language in mother-child reminiscing by finding that mothers of children who had more enhanced expressive language skills became more elaborative in their conversations about past events. Through the bidirectional relationship between mothers and children, mothers' greater use of elaborations led children to be more skilled in terms of the use of episodic memory system, which also means that those children to be more skilled in using linguistic and memory characteristics (Farrant & Reese, 2000).

Autobiographical memories are important for the development of self-related concepts, such as self-definition, self in relation, and self-regulation (Fivush, 2011). Since episodic memories create a continuous sense of self, which connects the self in the past, to the present, and the future, it provides people a template to define themselves in a continuous way. In addition to self-definition, episodic memories have relational components. While individuals are remembering past events, they mostly focus on social and emotional aspects of those events in relation to others. They also share their memories with significant others; therefore the relational components become important both in the past and in the present.

Last of all, Fivush (2011) mentioned the role of autobiographical memories in self-regulation. In a study conducted by Laible (2004), mothers' elaborative reminiscing about emotional events predicted better outcomes in children's socioemotional and sociomoral developments, 6 months later.

Researchers study remembering one-point-in time memories not only to examine episodic memory system, but also to examine how people remember the information they learned in different contexts. Bemis et al. (2011) found that children started to remember the moments that they learned new information as early as 4 or 5 years of age. While comparing 4-5 year-old children with 7-9 year-olds, she found that older children provided longer narratives than the younger ones. As expected for gender differences, girls' narratives were longer than boys'. For the content of the narratives, boys and younger children reported more visual narratives in which children were looking at visual material, such as a picture or map. On the other hand, girls and older children reported more active learning process, in which children had active participation in a learning task (Bemis et al., 2011). Those results showed that younger children and boys, whose episodic memory systems are not as developed as the older ones and girls, do not focus on the details of what they experienced and create episodic memories easily.

1.1.1.3 Use of Episodic Memory in Classroom Context

One line of research about use of episodic memory concerns learning in classroom context and retrieval during the exams (Conway et al., 1997; Herbert & Burt, 2004). While examining adolescents and young adults, high school and college students remember learning episodes in the exams as a common method of answering the questions. In a study, college students from psychology department were shown to choose the option of remembering a specific moment that they learned the information more than they did for the option of just knowing the answer for traditional lecture-based courses such as developmental or social psychology (Conway et al., 1997). In another study, college students taking a final exam in Chemistry Department in the US were given exemplar questions from the exam, and were asked about the source of their knowledge (remember vs. know). Results showed that the majority of the college students (82.3%) used episodic memory, while answering at least one of the exam questions (Leichtman et al., 2011). In another study, in which the participants were Turkish high school students in a high school in İzmir, Turkey, researchers found students who had taken a biology final exam showed the frequency of using episodic memory changing between 19.7% and 45.3% for different questions (Sahin & Leichtman, 2011). Herbert and Burt (2004) conducted a study to find out the role of episodic memory in exam performance, by manipulating the level of episodic features of the course materials. In episodic rich condition, students were given the material that was consisted of specific and distinctive information about the related topic, so they can remember episodes from learning process. In episodic poor condition, the material was consisted of general information about the topic, and did not have distinctive features. The results of the study showed that students in episodic rich condition had a better performance in exams, both 2 days, and 5 weeks after learning sessions occurred. They also benefited from their awareness of remembering specific and distinctive features of course material during the process of schematizing the knowledge (Herbert & Burt, 2004).

After thoroughly examining the development and use of episodic memory system across different characteristics and context, a detailed literature review on the characteristics and use of semantic memory system is presented, in the section below.

1.1.2 Semantic Memory

Semantic memory system is defined as encoding and recalling general knowledge about the world, and it consists of mental representations about the acquired information, in which people can work on and form relations (Tulving, 1993). Different from episodic memory, it does not include specific moments about the experienced events, but it generally includes a state of “knowing” a piece of information, or phenomenon (Tulving, 1972). For instance, a 2-year-old child who saw “a dog in the yard” can remember the dog later, without being aware of the specific moment that s/he had seen that dog, if s/he did not consider that moment of learning as a significant moment, and that consequently s/he could not encode that specific episode by his or her perspective. In that case, episodic memory system does not work, but with the help of semantic memory system, in which the knowledge about world is stored, the child can still know the relevant information regarding the dog, or the dog itself (Wheeler, Stuss, & Tulving, 1997).

One of the first attempts to explain semantic memory system by developing a model was proposed by Quillian (1966). He proposed a model of semantic memory system, in which there are “nodes”. Every piece of information we know constitutes a node, and these nodes are connected to each other with “associative links”. The links between the nodes may be either *direct* or *indirect*. Therefore, links have different levels of “depth”. More specifically, *direct links* indicate deeper level of connections than *indirect links* do. If one *node* has a direct link to another *node*, then directly connected *node* is named as a *type node*. On the other hand, if one *node* has an indirect link to another, then indirectly connected *node* is named as a *token node*. Each *node* can only have one *type node*, while there may be several *token nodes*.

Nodes and different level of *links* can be demonstrated by considering a meaning of a word. For instance, a word in our knowledge (i.e. semantic memory) is a *node*. The meaning of it, which has a direct *link* to the word, constitutes a *type node*. Other words, which are in relation to the word, constitute *token nodes*. Therefore, when we think of a word, we can both remember the meaning of it directly, and the words related to that word indirectly.

Although this model has important aspects to explain semantic memory, researchers continued to propose different theories in order to explain semantic memory. Collins and Loftus (1975) extended Quillian's model, and suggested that when a *node* is activated, its activation progresses through links to the other nodes. The strength of activation is decreasing, while diverging from the first activated node. When the nodes have more common features, they have connected to each other with more links. Moreover, the links that have been activated more frequently become more accessible in later activation processes. In other words, if a piece of information is remembered and used repeatedly, the likelihood of remembering it increases.

These first models that aimed to explain how semantic memory system works show that pieces of information in semantic memory are not stored independently from each other. Instead, they are learned in relation to each other, and with every piece of new information, the existing schemas about the older ones are "accommodated", as Piaget once argued (1976). In other words, there are connections among the pieces of information that is learned concerning different levels of strength. Different studies showed that semantic memory system is mostly created by integrative learning, and that semantic memory is a cumulative system.

1.1.2.1 The Development of Semantic Memory

Semantic memory development starts before the development of episodic memory, since children can remember the facts they learned before they can remember their personal experiences (Tulving, 1993). The signals of semantic memory system can

be observed through the studies examining infants' relationships between objects. For instance, children's ability to think about the objects that are not in the visual field is named as *object permanence*, which appears as early as 8 months (Berk, 2009), and regarded as a sign of semantic memory (Wheeler et al., 1997). In a study examining 9-month-old infants' imitation skills, it was found that 9-month-olds can imitate the actions they saw a day ago (Meltzoff, 1988). Their ability to imitate the actions cannot be regarded as procedural memory, because children did not practice those actions until the assessment. Therefore they remember them by the help of semantic memory system, which enables recall without the presence of the objects (Wheeler et al., 1997).

In the literature, one of the main arguments about semantic memory development is that it starts in infancy and reaches the structure of adult semantic memory system by the end of preschool years, but the amount of knowledge stored in the memory increases by age (Murphy, 2002). Yet, Chi and Ceci (1987) reviewed the studies about children's semantic memory development, and concluded that the structure of semantic memory shows development also after preschool years. One of the main differences between younger and older children is that younger children focus mostly on perceptual categories, whereas older children show the ability to understand abstract categories. Moreover, younger children have fewer connections between the concepts, and these connections are also weaker. As children get older, the semantic memory system develops by changing the structure of it, or by restructuring it. Restructuring occurs by two ways, which are quantitative and qualitative. In quantitative restructuring, as children learn new information, the items stored in semantic memory increases, and thus the number of connections also increases. In qualitative restructuring, by activating the connections, they become stronger. Furthermore, children become more capable of forming more abstract connections and making hierarchical organizations among learned items. As a result, they use semantic memory in a more efficient way by further use of it (Chi & Ceci, 1987).

In line with Chi and Ceci's ideas, Markovits, Fleury, Quinn, and Venet (1998) proposed that younger children's inability to understand complex conditional reasoning tasks occurred due to not having a well-developed semantic memory system. In order to understand and solve conditional reasoning tasks, children are needed to recall similar information to the task from semantic memory. Hence, by remembering the information they acquired previously, they can interrelate it to the new task. When 8 and 11-year-old children were compared, researchers found that 11-year-olds did better on more complex forms of conditional reasoning tasks. Older children benefit from having more information stored in semantic memory, and also being more flexible in activating weaker connections. Markovits et al. (1998) concluded that conditional reasoning ability develops while children are investigating their own knowledge accumulation.

1.1.2.2 The Importance and Functions of Semantic Memory

While considering both types of memory systems, episodic memory system cannot be thought independent from semantic memory system, because remembering a specific episode requires recall from semantic memory, as well. For instance, while we are reminiscing, we use language as an instrument, and we need to remember a word's meaning, which would be retrieved from semantic memory (Wheeler et al., 1997). In addition to remembering words, we benefit from semantic memory while remembering an episode, if we have limited capacity due to dealing with another task simultaneously. Sherman and Bessenoff (1999) examined how participants' use of episodic memory system is affected by different conditions while remembering lists that consisted of behaviors. In the first phase, participants were given a list of friendly, unfriendly, and neutral behaviors. In the second phase, they were given similar list of behaviors, but in this phase those behaviors belong to a man named Bob. The behaviors were grouped as stereotype-consistent and stereotype-inconsistent. In the third phase, the list of behaviors appeared in a computer screen one by one, and they were asked to choose whether the appeared behavior belongs to Bob. In the third phase there were two conditions, in which participants had to

remember an eight-digit number or they did not. The aim of distracting participants was to investigate how they are influenced by their stereotypes, which are pieces of information stored in semantic memory, while recalling the lists stored in episodic memory. The results showed that the participants in distracted condition made mistakes according to their stereotypes while remembering the behaviors that belong to Bob. The researchers claimed that the use of episodic memory requires more effort than the use of semantic memory. Therefore, when individuals are in a situation that they cannot make a sufficient effort, they do not rely on episodic memories, and rather they recall information from semantic memory instantly. Consequently, their episodic memories are shaped by their semantic memories.

The studies targeting the patients with damaged brain regions also show the importance of semantic memory in the use of episodic memory. It was shown in the literature that the frequency of impaired episodic memory while the semantic memory system is intact, is much more greater than the frequency of impaired semantic memory while episodic memory is intact (Smith & Lah, 2011). This finding supports the idea that the existence of semantic memory is important for the episodic memory system, whereas episodic memory is not a necessity for the semantic memory system. Furthermore, Schneider et al. (1989) examined episodic memory performance of children who play soccer, and found that expert children did better on memory test than the novice ones. This finding also supports the idea that the greater use of semantic memory results in better episodic memory performance.

Semantic memory is also important and required for language development. Words, their meanings, and the relations between them are stored in the semantic memory system, and this information helps individuals to use language as a communication tool (Tulving, 1972). For instance, people try to understand the meaning of a text while reading it, and they benefit from semantic memory system during the understanding process by recalling the meaning of words, and the relations between them. Semantic memories also enable people to make conceptual and grammatical decisions while reading a text (Quillian, 1966).

1.1.2.3 Use of Semantic Memory in Classroom Context

In addition to language, semantic memory system is also important in the education area, because students do not always remember the specific moments that they learned a new piece of information, rather they use the information by recalling from semantic memory (Conway et al., 1997; Herbert & Burt, 2004; Leichtman et al., 2011). For instance, students from psychology department were tested after they completed an exam in a Research Methods course, and the participants chose “know” option more than “remember” option for that courses, in which students were given knowledge in a broader sense (Conway et al., 1997). Leichtman and her colleagues (2011) also asked college students about their answers in the exam and how they know the piece of information that helped them to solve the exam questions. They found that knowing the information without remembering the learning moment is a second frequently reported option for the exam questions in a nutrition course (30.6% of the participants selected “know” option). Thus, in addition to remembering specific learning episodes, storing acquired knowledge in semantic memory system is a useful source in educational settings.

1.2 The Role of Different Memory Systems on Education

The studies examining the role of memory systems in classroom context show that remembering the specific moment that new information is learned (i.e. using episodic memory system) and just knowing the answer but not remembering a specific moment or a related episode (i.e. semantic memory system) are the most common strategies that are used to answer the questions in the exams. However, just examining the frequency of using those strategies is not sufficient in terms of showing how the students who remember or know the piece of information that helped them to answer a question, benefit from using *remember* or *know* strategies. Thus researchers also focus on students’ performance in the exams, in order to find out the efficiency of using those memory systems.

The use of episodic memory system in educational settings has become an important research topic in the last few decades. Martin (1993) mentioned how episodic memory had been ignored in earlier years. Most of the researchers focused on the role of semantic and procedural memory systems in the educational area. Knowing information was regarded as remembering it, which was accepted to be sufficient in terms of explaining exam performance. The role of remembering subjective experiences in the learning process was disregarded, since remembering personal events was not necessarily considered as knowing by researchers, and they did not think that it would make any specific affect on academic performance. Some studies examined the role of personal experiences on learning process, yet episodic memory was viewed as less important than semantic memory in general. Moreover, episodic memories were thought as difficult to remember unless they have distinct features, because similar experiences can be confused in memory (Martin, 1993).

After researchers started to investigate the role of episodic memory on classroom experiences, they found valuable findings regarding the use of different memory systems in classroom context. In an observational study carried out with elementary and middle school children, Nuthall and Alton-Lee (1995) found that most of the children (60-75%) who provided correct answers for the questions reported related experiences in classroom context in the immediate assessment. On the other hand, 10-15% of the children made inferences from their knowledge while answering the exam questions. When students were tested again 12 months later, remembering specific episodes of learning process decreased to 55%, and making inferences increased to 25% (Nuthall & Alton-Lee, 1995). Although the ratios changed across time, which shows that a remember-to-know shift, remembering learning episodes still remained as an important way of answering the questions correctly. Other studies replicate the importance of episodic memory in classroom context. Leichtman et al. (2011) found that college students who remembered a specific learning episode showed the best performance on the exam by answering 92.1% of the questions correctly. Students who knew the answer but did not remember the learning episode

were second by answering 88.6 % of the questions correctly. Herbert and Burt (2004) also found similar patterns, which revealed that college students who answered the questions correctly reported remember and know options highly in the first assessment. However, their main focus was on manipulating the material used in teaching process as episodic rich and episodic poor. They found that students in episodic rich condition showed a significantly better performance, which demonstrates the importance of using episodic memory in classroom context. Another finding from their study was that students in the episodic rich condition showed greater “remember-to-know shift” from first assessment to the second one, which was done 5 weeks later. This finding shows the importance of both episodic and semantic memory use in classroom context, because using learning episodes to make inferences and generate a general knowledge in the long-term seems to be the best strategy in learning and retrieval processes (Conway et al., 1997, Nuthall & Alton-Lee, 1995).

Due to having a few studies examining the role of episodic and semantic memory on education in the literature, drawing a precise conclusion about their efficiency is not possible. Additionally, those studies targeted similar age groups and did not examine the developmental patterns of using episodic and semantic memory systems. Therefore, the current study aims to compare different age groups in young adulthood, in terms of their use of episodic and semantic memory systems in classroom context, and the effect of this use on exam performance- or accuracy in answering exam questions.

1.3 The Role of Age on Remembering

The studies examining the role of age on memory performance mainly focus on the developmental changes in brain. Cykowicz (2000) reviewed the studies examining brain regions related to memory development by event-related potentials (ERP). It was found that frontal cortex is related to determining the source of information (a component of episodic memory), because damage to frontal cortex resulted in

problems in determining the source of information while recognition of the information intact (a component of semantic memory). While considering recognition of information, it was found that the related brain region is medial temporal lobe. The maturation of frontal cortex does not finish until late adolescence, which means that the development of episodic memory shows longer developmental course than semantic memory (Cycowicz, 2000).

Ofen, Kao, Sokol-Hessner, Kim, Whitfield-Gabrieli, and Gabrieli (2007) found similar results during the assessment of declarative memory with functional magnetic resonance imaging (fMRI) technique. They investigated the activation of medial temporal lobe, which includes hippocampus, and lateral prefrontal cortex with the participants aged between 8 and 24. To assess declarative memory, researchers focused on whether participants a) remembered the scene, which they had seen before the assessment, b) knew the scene but not remembered the details of it, or c) forgot the scene. It was found that the ratio of remembering the scene increased with age, whereas the ratio of knowing the scene did not change. The researchers interpreted these results as the maintenance of the maturation of lateral prefrontal cortex between these ages, whereas the completion of the maturation of medial temporal cortex until the age of 8 (Ofen et al., 2007).

Those studies reveal that the maturation of prefrontal cortex continues until late adolescence and young adulthood, and therefore the development of episodic memory system continues during those periods. On the other hand, the maturation of medial temporal lobe is completed in childhood, and therefore semantic memory system does not show distinctive developmental patterns after childhood period.

In addition to developmental changes in brain, experience is also related to the age differences in memory performance. One of the experiences, which lead to enhancement in memory, is testing. It was found in the related literature that one single testing about the material taught in the class provides a significant improvement in memory -especially for retrieval- compared to no testing condition.

Moreover, following tests also provide an improvement in students' memory performances (Roediger & Karpicke, 2006). Testing is important for enhancement of memory, because it motivates and requires individuals to actively remember a piece of information (Roediger, Agarwal, Kang, & Marsh, 2010). Practice is another type of experience, which is related to improvement in memory. Noack, Lövdén, Schmiedek and Lindenberger (2013) designed an intervention study in order to enhance younger and older adults' memory performances. They adjusted how many times participants would receive presentations about the task regarding their performance in pretest. After the training, both younger and older adults showed improvement in their performances (Noack, Lövdén, Schmiedek, & Lindenberger, 2013).

Although those studies which examine testing and practicing effects focus on specific issues in specific contexts, it can be generalized in the sense that more frequent exposure to testing and practicing, as a result of becoming older, should lead to enhancement in memory performance in general (the studies examining declines in the memory performance of the people in old adulthood are not in consideration). However, differences in the experience level, as an indicator of age, do not fully explain the differences in memory performance of individuals. There are also individual characteristics that lead to differences in use of memory systems.

1.4 Other Individual Characteristics Associated with Using Memory Systems

In line with the role of experience on memory, students' frequency of studying for their exams is a factor contributing to differences in memory systems. There are many studies focusing on the individual differences in terms of academic performance, but not many specifically looking at their effects on using episodic vs. semantic memory in classroom context. One of the few studies looked at whether college students study regularly, or they start to study a couple of days before the exam and found that those show noticeable differences among students (Roediger & Karpicke, 2006). Therefore, in the current study, we looked at several different

individual differences, especially regarding memory practices and studying habits. One of the first individual factors that we planned to examine is the length of studying before an exam, as in Roediger and Karpicke's study (2006).

Students also differ in their preferences to study in a group or alone. Some of them benefit from studying in small groups by telling the information to each other, discussing about their own knowledge and ideas, and in turn they show better performance. Their motivations are also influenced from studying in a group that they emphasize group success rather than creating a competitive atmosphere (Springer, Stanne, & Donovan, 1999). In that sense, studying alone or in a group might influence students' memories of studying episodes.

Satisfaction with the major in college is another factor related to students' studying motivations and their accomplishment. In Turkey, students tend to make decisions about their majors by considering unemployment possibilities, and therefore some of them become unsatisfied with their departments (Doğan, Saraçlı, & Saraçlı, 2005). In a study conducted with Turkish college students, greater major satisfaction predicted higher cumulative grand point average (Kümbül Güler & Emeç, 2006). Other than Turkey, several studies showed that major satisfaction is related with greater achievement (Guan, Shiye, Liu, & Yum, 2006; Nauta, 2007) and self-efficacy in making decisions about career (Nauta, 2007). Hence, the role of major satisfaction on the use of memory systems in classroom context is another concern of the current study.

Last of all, since the examination of using different memory systems in educational settings is the focus of the study, how much importance individuals attach to memories, will be explored. Sahin and Mebert (2013) found that there are cultural differences in giving importance to memories. More specifically, US college students gave higher scores than Turkish students in memory importance. They suggested that among the several factors that lead to differences in the memory characteristics of different cultures, giving different levels of importance to memories might be one of

them. Consequently, students' level of importance given to memories will be assessed in order to find out how differences in memory importance are associated with using specific type of memory in the exams.

Above and beyond the effect of individual characteristics in using different memory systems, we mainly wanted to examine the role of *type of the question* on the use of episodic and semantic memory, and their relation to the accuracy of the answers. Questions are classified as factual or applied according to how students use their knowledge to answer them. Factual questions consist of the recall of concepts directly from the learned material, or differentiating the related example from unrelated examples. On the other hand, applied questions assess the ability of applying the knowledge on different conditions, which requires transfer of knowledge onto different contexts (Sugrue, 1995). Studies in the literature showed question type has an effect on students' exam performance. More specifically, they performed better on factual questions compared to applied questions (Yonker, 2011). Furthermore, it was suggested that students' level of learning approach (*deep* vs. *surface*) might be influenced by the type of the question, as well (Wilson & Fowler, 2005). Thus, we wanted to consider the effect of the type of the questions on use of different memory systems. In addition, there are a few studies looking at the relationship between the use of memory systems, and the accuracy of the answers in an exam but to the best of our knowledge, none of the studies look at the interplay of those in addition to age difference and the type of the questions asked. Below is a detailed design of the current study.

1.6 Current Study

There are only a few studies that examined the frequency of using episodic or semantic memory in classroom context, and whether using a specific memory system would affect the accuracy in answering questions in the exams. Moreover, to the best of our knowledge, no research looked at whether age at remembering would play a role in which kind of memory is used in classroom, or how it affects the accuracy of

the answers. Additionally, also no research examined the interplay of those relationships while considering the type of the question (factual vs. applied) in the exam. As stated in the previous sections, using episodic memory increases accuracy in the exams, but would it still be the case when a) the type of the questions, b) age of the college students, and c) a time delay between measurements are considered? This study specifically aims to figure out the effect of those factors on exam performance, or accuracy of their answers in the exam.

More specifically and in scope of the existing literature, the current study aimed to examine through using which memory system college students learn new information, whether the use of episodic memory causes any difference between younger (freshmen) and older (senior) college students, and between factual and applied questions, and how using a certain kind of memory in classroom would reflect onto their exam performance (accuracy of the answers) for factual and applied questions. To investigate those relationships, freshmen and senior students participated in the study right after taking their final exams, and five weeks after the exam (please see the method part for the detailed explanation of the procedure).

For the first assessment (at Time 1, right after the exam), the main hypotheses are as stated below:

1. Regardless of participants' class (age), students would give greater number of *remember* responses than *know* responses in factual questions. In addition, senior students would report greater episodic memory use in factual questions than freshmen students.
2. Regardless of participants' class, students would give greater number of *know* responses than *remember* responses in applied questions. Moreover, senior students would report greater episodic memory use in applied questions than freshmen students.

3. For the accuracy of the given answers for the exam questions, greater use of episodic memory than knowing the answer without using episodic memory would be related to greater accuracy regardless of students' grade (We did not hypothesize about the relationship between episodic and semantic memory use and accuracy for factual and applied questions distinctly).
4. Greater memory importance and major satisfaction would predict higher number of words and self-related words in the narratives.
5. Senior students would report higher number of words and self-related words than freshmen students.
6. Greater memory importance would predict higher number of *remember* responses than *know* responses.
7. More frequency of studying would be associated with less episodic memory use.

For the second assessment (at Time 2, five weeks after the exam), the specific hypotheses are as stated below:

1. Regardless of participants' class, students would give more *know* responses in the second assessment than in the first assessment both for factual and applied questions.
2. Regardless of participants' class, students would give less *remember* responses in the second assessment than in the first assessment both for factual and applied questions.
3. The shift from *remember* to *know* responses would be greater for senior students than for freshmen students both for factual and applied questions.

4. Both *remember* and *know* responses at Time 2 would predict greater number of accurate answers (Once again, we did not hypothesize about the relationship between episodic and semantic memory use and accuracy for factual and applied questions distinctly).

CHAPTER 2

METHOD

2.1 Participants

The participants of the study were 104 college students who are majoring in Psychology at Middle East Technical University (METU). Half of the participants were freshmen students (47 female, 5 male) who were registered in Introduction to Psychology I course, and half of them were senior students (46 female, 6 male) who were registered in Clinical Psychology course. The majority of the participants were females, because there are only a few male students in psychology department. The age range of the freshmen students was 18-22 ($M = 19.63$, $SD = .84$), and the age range of the senior students was 20-25 ($M = 22.31$, $SD = .78$). There was one participant whose age was 50 among senior students, who was excluded from the study.

While considering socioeconomic statuses (SES) of the participants, the monthly income level of their parents was asked. For freshmen students, 1.9% ($N = 1$) of the participants reported 0-750 Turkish Liras (TL), 17.3% ($N = 9$) reported 750-1500 TL, 3.8% ($N = 2$) reported 1500-2000 TL, 11.5% ($N = 6$) reported 2000-2500 TL, and 13.5% ($N = 7$) reported above 3000 TL. For senior students, 3.8% ($N = 2$) of the participants reported 0-750 Turkish Liras (TL), 17.3% ($N = 9$) reported 750-1500 TL, 3.8% ($N = 2$) reported 1500-2000 TL, 21.2% ($N = 11$) reported 2000-2500 TL, and 40.4% ($N = 21$) reported above 3000 TL. The majority of the participants belonged to middle and upper-middle class, and freshmen and senior students came from similar SES backgrounds.

At Time 1, which was right after the final exam, participants were recruited through contacting with the instructors and the teaching assistants of the courses. At Time 2, the teaching assistant (who was responsible for both courses) helped us to contact

with the same students again. For the second assessment at Time 2, thirty seven of the freshmen students (71.15%) and forty seven of the senior students (90.38%) participated in this study. Participation was completely on voluntary basis. Both freshmen and senior students got bonus credit for their participation in the first assessment, and only freshmen students got bonus credit for their participation in the second assessment.

2.2 Materials

In the first assessment at Time 1, a questionnaire in which there were exemplar final exam questions and single-item questions were used in the study. Right after they completed their exams, students handed out a questionnaire including four exemplar questions, which they had already answered in the final exam a few minutes before the first assessment. Those four exemplar questions were chosen from similar difficulty levels both for freshmen and senior students by the help of the course instructors and the assistant. Two of the questions were factual questions, in which students were expected to use a specific piece of knowledge without making any inferences (e.g., The primary method of collecting data used by structuralists and functionalists was A. introspection B. correlational analysis C. empirical research D. meta-analysis). The other two were applied questions, in which students were expected to use their knowledge by making inferences applying onto an example (e.g., Identify the defense mechanism illustrated in the following example: Chad always teases and annoys his kid brother Nathan, after he himself is bullied and picked on by his older brother Sam. A. projection B. reaction formation C. displacement D. identification). All questions were multiple-choice questions.

In the Questionnaire, students were specifically asked about; a) which specific answer they had chosen during the exam for each question, and b) about how they had learned the necessary piece of information which helped them to answer the questions. In addition, we gave them options following each exemplar question, consisted of; a) remembering a specific learning episode, b) knowing the answer but

without remembering a specific learning episode, c) guessing, or d) “other”. If the participants reported that they remember a specific learning episode, then they were asked to write about that specific learning moment as detailed as possible. If they chose the “other” option, they were also asked to describe and specify that option in an answer box given below that choice. These four options following the question were originally developed by Conway et al. (1997), which we adopted and used in the current study. In the original study of Conway, there were four options, as “remember”, “know”, “familiar”, and “guess”, which were used in other research, as well (Herbert & Burt, 2004). In more recent studies, the option of being familiar was replaced by the “other” option, in which participants were asked to specify the nature of the “other” answer (Leichtman et al., 2011; Sahin & Leichtman, 2010). The more recent version was used in the current study. All questions were asked for each of the four questions in the exam, and in both final exams for freshmen and senior students.

After asking how students learned the information they used in order to answer the questions in the exam, single-item and independent questions about individual characteristics regarding studying and memory habits were asked. We specifically asked them how important memories are in general to them, the satisfaction level for the department, studying strategies (whether they prefer studying alone or in a group), and how much time they spend on studying for the exams (whether they study regularly or one day before the exam), in this order. Those single-item questions consisted of 5-point Likert scales. For memory importance, “1” was equivalent to “not important at all” and “5” was equivalent to “very important”. For satisfaction level, “1” was equivalent to “not satisfied at all” and “5” was equivalent to “very satisfied”. For studying strategies, “1” was equivalent to “only alone”, “3” was equivalent to “both alone and in group”, and “5” was equivalent to “only in group”. For the frequency of studying, “1” was equivalent to “one day before the exam”, “3” was equivalent to “a couple of days before the exam”, and “5” was equivalent to “regularly everyday”. Last of all, participants were asked to recall a moment in which they learned a new piece of information about that specific course, and to write about that moment as detailed as possible. (See Appendix A for the

Turkish version of the first questionnaire for freshmen and See Appendix B for the Turkish version of the first questionnaire for senior).

In the second assessment at Time 2, participants were given the same exemplar questions from the final exam five weeks after the first assessment. The same two follow-up questions, in which students had been asked to report the answers they provided in the exam and how they learned the necessary piece of information that helped them to answer those questions, were asked again at Time 2. The four options were exactly the same for each question. The single-item questions about studying and memory characteristics that had been asked at Time 1, were not asked for the second time. (See Appendix C for the Turkish version of the second questionnaire for freshmen and See Appendix D for the Turkish version of the second questionnaire for senior).

2.3 Procedure

Ethical approval from METU Human Subjects Ethics Committee was obtained in the beginning of January 2014. Data collection took place right after the final exams of Introduction to Psychology I and Clinical Psychology courses at the end of January 2014. Therefore, freshmen and senior students participated in the study separately, in the classroom that the final exams took place. Questionnaires including sample questions from the current exam and single-item questions were distributed to the participants, right after taking the final exam in the first assessment at Time 1. Filling out the questionnaires lasted approximately for 10 to 15 minutes. After completion of the questionnaires, students were informed about the participation for the second time five weeks later. Their phone numbers and e-mail addresses were obtained in the informed consents, and they were notified about the time and place of the second assessment three days before the second assessment. In order to keep attrition rate at the minimum level, an incentive was offered to the participants. One of the participants who came for the second assessment was determined by drawing lots, and the winner gained a mini tablet PC.

Providing confidentiality of the participants is a concern for time-series studies. Questionnaires and informed consents were numerated before being distributed to the participants. After the completion of questionnaires, informed consents and questionnaires were collected separately, by the main researcher and an undergraduate assistant. After completion of data collection, undergraduate assistant prepared a list that was constituted of participants' names and the corresponding number on each questionnaire. In the second assessment, each participant was given the questionnaire with the same assigned number of the first questionnaire, via the list. That process was completed by the assistance of an undergraduate psychology student, as well. The list of assigned numbers and the informed consents were kept by the assistant, and the questionnaires were kept by the main researcher.

2.4 Coding Schemes

Participants who reported that they had remembered a specific learning episode were asked to narrate that specific learning moment. All narratives were coded by the main researcher, and a second-coder who was hypothesis-blind coded 20% of the data in order to assess inter-coder reliability. Twenty percent of the narratives, which was also coded by the second-coder was randomly selected for each course. The coding schemes of *consistence with episodic memory* and *learning context* were adopted from the studies conducted by Sahin and Leichtman (2010) and Leichtman et al. (2011). The *volume of the narratives* (by counting the number of words) and *self-orientation* (by counting number of self-related words) were assessed in tune with the coding scheme of Wang (2001). Because other dimensions of the coding scheme were not conceptually associated with the variables of this study, narratives were only coded for the number of words and self-related words.

2.4.1 Consistence with episodic memory

The narratives were coded by examining whether they were consistent with a specific learning episode, or they were consisted of a more general (semantic) content. For instance, the memories were coded as “consistent with episodic memory”, if the participant reported a particular studying moment, or a specific classroom experience, etc. (e.g., “I remember going through the material in the study hall and seeing the related piece of information in the text book”). This kind of memories was coded as episodic, one-point-in time memories. Narratives were coded as “inconsistent with episodic memory”, if the participant reported more general or routine studying periods rather than a specific point-in-time episode.

2.4.2 Learning context

The narratives for the episodic memories were coded regarding their contexts. There were four categories in total, which were “classroom”, “study alone”, “study in group” and “other”. Narratives were coded as “classroom”, if there was an episodic learning period that had occurred in class. If there was an episodic learning period, which had occurred outside the class while studying alone, it was coded as “study alone”. The narratives which also had occurred outside the class and consisted of episodes from studying in group were coded as “study in group”. Other narratives, which did not fit into those three categories, were coded as “other”.

2.4.3 Accuracy of the answers

The correct answers of the exemplar questions were provided by the course instructors. Since all questions were multiple-choice questions, determining the accuracy of the answers were straight forward and did not require additional coding.

2.4.4 Number of words

Each word included in the narratives were counted and reported as the total number of words. Turkish sentences are predominantly composed of suffixes, however all

words were counted as they had been provided (e.g., one word including verb, tense, and subject, such as “geliyorum”) by the narrator.

2.4.5 Number of self-related words

The words like “I, my, me, mine, myself” were coded as self-related words. However, there are no exact Turkish equivalents of all those self-related words. Instead, suffixes are also used to give self-related meanings to the words. Therefore, single self-related words (“ben, beni, benim, bana, bende, benden, benimki, kendim”) and self-related suffixes (-m) were counted. However, if there were both a self-related word and a suffix describing one word (eg. benim evim), only one of them was counted in order to avoid the inflation of self-related words.

CHAPTER 3

RESULTS

This study concerns how freshmen and senior year psychology students identify knowledge (whether they remember, know, guess or use another technique to recall the piece of information) that they had learned in order to answer the exam questions, and whether their class year and remembering style in answering the questions predict their exam performance (which is named as accuracy in this study). Specifically, the variables of this study are class of the participants (freshmen or senior), their responses to how they answered the exam questions (remember, know, guess, other) at Time 1 (right after the exam) and Time 2 (five weeks later), and the accuracy of the answers. We also asked them to answer other questions, such as the learning context of the narratives (in class, studying alone, studying in a group, other), memory characteristics of the narratives (number of words and self-related words), memory importance, major satisfaction, studying preferences (studying alone or in a group) and frequency of studying.

The analyses were conducted according to the first and second assessments of how participants answered the four-exemplar questions chosen from the final exams. Following analyses were performed according to the first assessment at Time 1, right after the students had taken the exam.

3.1. Preliminary Results

Each question was examined separately at first. For the first questions, 44.2% of the participants ($N = 46$) selected *remember* option, 18.3% of them ($N = 19$) selected *know* option, 33.7% of them ($N = 35$) selected *guess* option and 3.8% of them ($N = 4$) selected *other* option. For the second questions, 53.8% of the participants ($N = 56$) selected *remember* option, 17.3% of them ($N = 18$) selected *know* option, 20.2% of them ($N = 21$) selected *guess* option and 8.7% of them ($N = 9$) selected *other* option.

For the third questions, 50% of the participants ($N = 52$) selected *remember* option, 42.3% of them ($N = 44$) selected *know* option, 6.7% of them ($N = 7$) selected *guess* option and 1% of them ($N = 1$) selected *other* option. For the fourth questions, 59.6% of the participants ($N = 62$) selected *remember* option, 26% of them ($N = 27$) selected *know* option, 9.6% of them ($N = 10$) selected *guess* option and 4.8% of them ($N = 5$) selected *other* option. Since the main hypotheses of the current study was about identifying whether students remember or know the piece of information that helped them to answer the exam questions, further analyses were conducted with *remember* and *know* responses, only. Furthermore, the first two questions were factual questions, and the other two of them were applied questions. These questions were chosen by the help of the instructor while equalizing the difficulty level.

3.2. Main Analyses

It was hypothesized that participants would report more *remember* responses than *know* responses for factual questions, and more *know* responses than *remember* responses for applied questions, regardless of their class. The hypothesis for factual questions was confirmed ($\chi^2(1) = 15.20, p < .001$). However the hypothesis for applied questions was not confirmed, since *remember* option reported more frequently than *know* option for applied questions, as well ($\chi^2(1) = 5.00, p < .05$). In the analysis, we first looked at four questions overall without differentiating them with their type as factual and applied. Therefore, all four questions were analyzed by being collapsed together, in order to create a continuous variable and to avoid inflation in number of statistical analyses. In that sense, participants' *remember* responses and *know* responses were summed separately, and the total number of *remember* and *know* responses were lumped together for each category. For instance, out of 4 questions, if there are 3 *remember* and 1 *know* response, then the participant is assigned 3 for *remember*, and 1 for *know* category. Furthermore, we performed the same analyses for factual and applied questions separately. Thus, total number of *remember* and *know* responses were lumped together for factual and applied questions. For instance, out of 2 factual questions, if there are 2 *remember* responses

and no *know* response, then the participant is assigned 2 for *remember*, and 0 for *know* category.

3.2.1. Analyses for the Data Collected at Time 1 (Right after the Exam)

3.2.1.1. The Effect of Class in Episodic Remembering

In order to test the hypothesis that suggested a difference between freshmen and senior students in total number of remember responses, two Independent Samples T-tests were carried out (for factual and applied questions, respectively). For factual questions, according to Levene's test results, homogeneity of variance assumption was met ($F(102) = 1.661, ns^1$), and there was a significant difference between freshmen and senior students regarding their total number of *remember* responses ($t(102) = -7.24, p < .001$). Senior students ($M = 1.42, SD = 0.67$) reported more remember responses than freshmen students did ($M = .54, SD = .58$), which were in tune with our hypothesis. For applied questions, according to Levene's test results, homogeneity of variance assumption was met ($F(102) = 0.28, ns$), and there was a significant difference between freshmen and senior students regarding their total number of *remember* responses ($t(102) = -3.83, p < .001$). Senior students ($M = 1.37, SD = 0.74$) reported more remember responses than freshmen students did ($M = 0.81, SD = 0.74$), which were also in tune with our hypothesis.

Table 1 Descriptive Statistics for Remember Responses at Time 1

	class	N	Mean	SD	SE
factual_remember_t1	freshmen	52	.54	.58	.08
	senior	52	1.42	.67	.09
applied_remember_t1	freshmen	52	.81	.74	.10
	senior	52	1.37	.74	.10

¹ non-significant

For *remember* responses, participants were asked to write about the moment that they learned about the related information, which helped them to answer that exam question. We coded the learning context of the narratives as “in class”, “studying alone”, “studying in a group” and “other”. In order to assess interrater reliability for codings, 20% of the narratives, which were randomly chosen, were coded by the second coder. For the learning context of all questions, first and second coder showed a complete correspondence ($r = 1.00$).

While considering episodic memories provided by freshmen students, 68 out of 70 narratives were *consistent with episodic memory* (describing a one-point-in-time event for learning or practicing the material), and only 2 of them were coded as *inconsistent with episodic memory*, and those two memories were excluded from the analyses and not coded. For *consistent* memories provided for all four questions, 49% of the narratives ($N = 33$) consisted of memories occurred in class, 50% of the narratives ($N = 34$) consisted of memories occurred while studying alone, and 1% of the narratives ($N = 1$) consisted of memories while studying in a group.

While considering episodic memories provided by senior students, 142 out of 144 narratives were *consistent with episodic memory*, and only 2 out of 144 narratives were coded as *inconsistent with episodic memory*, therefore the context of those memories were excluded from the analyses and not coded. For *consistent* memories provided for all four questions, 34% of the narratives ($N = 48$) consisted of memories occurred in class, 57% of the narratives ($N = 81$) consisted of memories occurred while studying alone, and 9% of the narratives ($N = 13$) consisted of memories while studying in a group.

3.2.1.2. *The Effect of Class and Remembering Style on Exam Performance*

For the accuracy of the answers at Time 1, total number of correct responses was calculated for factual and applied questions, respectively. Hierarchical regression analysis was carried out in order to figure out the role of total number of *remember*

responses, the total number of *know* responses, and class year in predicting the accuracy of the answers. In the first step, total number of *remember* and *know* responses were entered to the model, as hypothesized.

For factual questions, the model was significant ($R^2 = .36$, $F(2, 101) = 28.21$, $p < .001$). The unique effect of *remember* responses was significant ($\beta = .67$, $p < .001$), and it explained 36% of the variance in accuracy of the answers. The unique effect of *know* responses was also significant ($\beta = .29$, $p = .001$), and it explained 7% of the variance in accuracy of the answers. In the second step, class was entered into the model, the model was still significant, and it made a significant contribution to the variance explained by *remember* and *know* responses ($R^2 = .55$, $\Delta R^2 = .19$, $F_{inc}(1, 100) = 42.80$, $p < .001$). In the second step, total number of *remember* responses still significantly predicted total number of correct responses ($\beta = .24$, $p = .017$), whereas total number of *know* responses was no longer a predictor of accuracy of the answers ($\beta = .10$, *ns*).

For applied questions, the model was significant ($R^2 = .06$, $F(2, 99) = 3.34$, $p < .05$). The unique effect of *remember* responses was significant ($\beta = .42$, $p = .011$), and it explained 6% of the variance in accuracy of the answers. The unique effect of *know* responses was marginally significant ($\beta = .32$, $p = .052$), and it explained 4% of the variance in accuracy of the answers. In the second step, class was entered into the model, and the model did not show significant improvement, ($R^2 = .07$, $\Delta R^2 = .01$, $F_{inc}(1, 98) = 1.13$, *ns*). In the second step, total number of *remember* responses still significantly predicted total number of correct responses ($\beta = .42$, $p = .011$), whereas total number of *know* responses was no longer a predictor of accuracy of the answers ($\beta = -.12$, *ns*).

3.2.1.3. Memory Characteristics for Episodic Memories in Classroom Context

In addition to the context of episodic memories, memory characteristics presented in the narratives were also examined. For memory characteristics, total number of

words and self-related words in the narratives were coded for each question. Interrater reliability was also calculated for number of words and self-related words. For words, interrater reliability was changing between .953 and 1.00, and for self-related words, it was changing between .779 and .989 for four questions.

Since participants did not provide equal number of narratives for the exam questions, the number of words and self-related words could not be summed. Thus, we used the arithmetic means of all episodically remembered answer, and each participant had one score for total number of words and one score for total number of self-related words. It was hypothesized that senior students would provide greater number of words and self-related words than freshmen students and Independent Samples T-test was performed in order to test that hypothesis. We found no significant difference between freshmen and senior students regarding total number of words ($t(86.18) = .20, ns$) and total number of self-related words ($t(88) = -.34, ns$) that they used in the episodic memories they provided.

Total number of words and self-related words were also examined in relation to *memory importance* and *major satisfaction*. It was hypothesized that greater *memory importance* would predict greater number of words and self-related words. However, no significant relationship between *memory importance* and number of words ($R^2 = .00, F(1,88) = .005, ns$) and between *memory importance* and self-related words ($R^2 = .03, F(1,88) = 2.97, ns$) were observed. Moreover, relationships between *major satisfaction* and number of words, and between *major satisfaction* and number of self-related words were expected. Regression analyses showed that greater *major satisfaction* predicted greater number of words ($R^2 = .06, F(1,88) = 5.55, p < .001$) and self-related words ($R^2 = .08, F(1,88) = 7.98, p < .05$).

3.2.1.4. *The Effect of Single-Item Memory Habit Questions on Episodic Remembering*

It was hypothesized that greater *memory importance* would predict greater use of episodic memory. Regression analysis was performed, and no significant relationship between memory importance and total number of *remember* responses was observed ($R^2 = .02$, $F(1, 102) = 2.14$, *ns*). The hypothesis suggesting a relationship between frequency of studying and episodic memory use was also not supported ($R^2 = .03$, $F(1, 102) = 2.91$, *ns*).

3.2.2. Analyses for the Data Collected at Time 2 (5 Weeks Later)

After analyzing the variables assessed at Time 1, the variables assessed at Time 2 were analyzed. There was a loss of 19% of the participants in total at Time 2 ($N = 84$).

3.2.2.1. Presence of Remember-to-Know Shift

One of the main hypotheses regarding the time lapse was that there would be a remember-to-know shift from Time 1 to Time 2. Paired Samples T-test was carried out in order to test this hypothesis. Results showed that, regardless of participants' class and type of question, total number of *remember* responses significantly changed from Time 1 to Time 2 ($t(83) = 4.73$, $p < .001$). There were more *remember* responses at Time 1 ($M = 2.18$, $SD = 1.35$) than at Time 2 ($M = 1.58$, $SD = 1.43$). There was also a significant change in *know* responses from Time 1 to Time 2 ($t(83) = 4.73$, $p < .05$). *Know* responses at Time 2 ($M = 1.24$, $SD = 1.22$) were significantly more than the *know* responses at Time 1 ($M = .95$, $SD = .99$). Thus, decrease in *remember* responses while *know* responses were increasing demonstrated remember-to-know shift.

Table 2 Descriptive Statistics for Remember and Know Responses at Time and Time 2

		Mean	N	SD	SE
Pair 1	total_remember_t1	2.18	84	1.35	.15
	total_remember_t2	1.58	84	1.43	.16
Pair 2	total_know_t1	.95	84	.99	.11
	total_know_t2	1.24	84	1.22	.13

In order to investigate class differences, *split file* function was activated, and previous analyses were performed again. For freshmen students, there was a significant change in *remember* responses from Time 1 to Time 2 ($t(38) = 2.12, p < .05$). Yet, there was no significant change in *know* responses ($t(38) = .15, ns$) for this group. For senior students, both *remember* responses ($t(44) = 4.42, p < .001$) and *know* responses ($t(44) = -3.60, p = .001$) significantly changed from Time 1 to Time 2. Hence, the hypothesis suggesting greater remember-to-know shift for senior students compared to freshmen students was also confirmed.

Table 3 Descriptive Statistics for Remember and Know Responses for Freshmen and Senior Students at Time and Time 2

class		Mean	N	SD	SE	
freshmen	Pair 1	total_remember_t1	1.44	39	.07	.17
		total_remember_t2	1.10	39	.10	.18
	Pair 2	total_know_t1	1.31	39	.92	.15
		total_know_t2	1.28	39	1.15	.18
senior	Pair 1	total_remember_t1	2.82	45	1.23	.18
		total_remember_t2	2.00	45	1.57	.23
	Pair 2	total_know_t1	.64	45	.96	.14
		total_know_t2	1.20	45	1.29	.19

When we looked at how remember-to-know shift occurred for different type of questions, the patterns for factual and applied questions were different. For factual questions, regardless of participants' class, while there was a significant decrease in *remember* responses from Time 1 ($M = .98, SD = .76$) to Time 2 ($M = .56, SD = .74$) ($t(103) = 5.78, p < .001$), *know* responses did not significantly change between two time points ($t(103) = -.47, ns$). For applied questions, the situation was similar

regardless of participants' class. Total number of *remember* responses at Time 1 ($M = 1.09$, $SD = .79$) was significantly greater than total number of *remember* responses at Time 2 ($M = .72$, $SD = .83$) ($t(103) = 4.65$, $p < .001$). On the other hand, total number of *know* responses did not significantly change between two time points ($t(103) = .73$, *ns*).

Table 4 Descriptive Statistics for Remember and Know Responses in Factual and Applied Questions at Time and Time 2

		Mean	N	SD	SE
Pair 1	factual_remember_t1	.98	104	.76	.07
	factual_remember_t2	.56	104	.74	.07
Pair 2	applied_remember_t1	1.09	104	.79	.08
	applied_remember_t2	.72	104	.83	.08
Pair 3	factual_know_t1	.36	104	.56	.05
	factual_know_t2	.38	104	.63	.06
Pair 4	applied_know_t1	.68	104	.75	.07
	applied_know_t2	.62	104	.79	.08

Once we focused on class differences and used *split file* function while comparing factual and applied questions. For freshmen students, there was a significant decline in *remember* responses ($t(51) = 2.86$, $p < .01$) from Time 1 ($M = .54$, $SD = .58$) to Time 2 ($M = .31$, $SD = .51$) ($t(51) = 2.86$, $p < .01$) for factual questions. However, there was no significant change in *know* responses ($t(51) = .69$, *ns*) for this group. For applied questions, freshmen students showed significant decreases in both *remember* ($t(51) = 2.77$, $p < .01$) from Time 1 to Time 2, and *know* responses ($t(51) = 2.43$, $p < .05$) from Time 1 to Time 2. For senior students, there was a significant decline in *remember* responses from Time 1 ($M = 1.42$, $SD = .67$) to Time 2 ($M = .81$, $SD = .84$) ($t(51) = 5.26$, $p < .001$) for factual questions. However, there was no significant change in *know* responses ($t(51) = -1.29$, *ns*) for this group. For applied questions, senior students showed significant decrease in *remember* ($t(51) = 3.75$, $p < .001$) from Time 1 ($M = 1.37$, $SD = .74$) to Time 2 ($M = .92$, $SD = .88$), and marginally significant increase in *know* responses ($t(51) = -1.97$, $p = .055$) from Time 1 ($M = .35$, $SD = .59$) to Time 2 ($M = .56$, $SD = .78$). Thus, the hypothesis

suggesting greater remember-to-know shift for senior students compared to freshmen students was confirmed only for applied questions.

Table 5 Descriptive Statistics for Remember and Know Responses for Freshmen and Senior Students in Factual and Applied Questions at Time and Time 2

class			Mean	N	SD	SE
freshmen	Pair 1	factual_remember_t1	.54	52	.58	.08
		factual_remember_t2	.31	52	.51	.07
	Pair 2	factual_know_t1	.35	52	.56	.08
		factual_know_t2	.29	52	.61	.08
	Pair 3	applied_remember_t1	.81	52	.74	.10
		applied_remember_t2	.52	52	.73	.10
	Pair 4	applied_know_t1	1.02	52	.75	.10
		applied_know_t2	.67	52	.81	.11
senior	Pair 1	factual_remember_t1	1.42	52	.67	.09
		factual_remember_t2	.81	52	.84	.12
	Pair 2	factual_know_t1	.37	52	.56	.08
		factual_know_t2	.48	52	.64	.09
	Pair 3	applied_remember_t1	1.37	52	.74	.10
		applied_remember_t2	.92	52	.88	.12
	Pair 4	applied_know_t1	.35	52	.59	.08
		applied_know_t2	.56	52	.78	.1

3.2.2.2. *The Effect of Remember-to-Know Shift on Accuracy of Exam Questions*

Another hypothesis suggested that remember-to-know shift would be associated with greater accuracy in exam question answers. Hierarchical regression analysis was carried out in order to examine this relationship. In the first step, total number of *remember* and *know* responses at Time 2 were entered to the model. The model yielded a significant result ($R^2 = .23$, $F(2,80) = 11.99$, $p < .001$). The unique contribution of total number of *remember* responses at Time 2 was significant ($\beta = .62$, $p < .001$), and it explained 23% variance in total accuracy of the answers. The unique contribution of total number of *know* responses at Time 2 was also significant ($\beta = .44$, $p = .001$), and it explained 12% variance in total accuracy of the answers. In

the second step, class was entered to the model, and it made significant improvement to the model ($R^2 = .43$, $\Delta R^2 = .20$, $F_{inc}(1,79) = 27.44$, $p < .001$). The unique contribution of total number of *remember* responses at Time 2 was still significant ($\beta = .38$, $p < .01$), and it explained 7% variance in total accuracy of the answers. The unique contribution of total number of *know* responses at Time 2 also remained significant ($\beta = .31$, $p < .01$), and it explained 5% variance in total accuracy of the answers. Once again, our results showed that after 5 weeks and shifts in *remember* and *know* answers, all predictors including *remember* responses, *know* responses and class year still significantly predicted accuracy of exam questions.

In order to find out the role of *remember* and *know* responses at Time 2 on the accuracy of the answers for factual and applied questions, we run two separate hierarchical regression analyses. For factual questions, total number of *remember* and *know* responses at Time 2 were entered to the model in the first step. The model yielded a significant result ($R^2 = .28$, $F(2,101) = 19.74$, $p < .001$). The unique contribution of total number of *remember* responses at Time 2 was significant ($\beta = .48$, $p < .001$), and it explained 22% variance in total accuracy of the answers. The unique contribution of total number of *know* responses at Time 2 was also significant ($\beta = .37$, $p = .001$), and it explained 13% variance in total accuracy of the answers. In the second step, class was entered to the model, and it made significant improvement to the model ($R^2 = .59$, $\Delta R^2 = .31$, $F_{inc}(1,100) = 74.84$, $p < .001$). The unique contribution of total number of *remember* responses at Time 2 was still significant ($\beta = .23$, $p < .01$), and it explained 4% variance in total accuracy of the answers. The unique contribution of total number of *know* responses at Time 2 also remained significant ($\beta = .22$, $p < .01$), and it explained 4% variance in total accuracy of the answers. Hence, the results indicated that the shifts in *remember* and *know* answers after 5 weeks, all predictors including *remember* responses, *know* responses and class year still significantly predicted accuracy of exam questions.

For applied questions, total number of *remember* and *know* responses at Time 2 were entered to the model in the first step. The model was not significant ($R^2 = .01$, F

(2,99) = .38, *ns*). In the second step, class was entered to the model, and it did not make significant improvement to the model ($R^2 = .02$, $\Delta R^2 = .01$, $F_{inc}(1,98) = .86$, *ns*). Consequently, none of the variables at Time 2 significantly predicted accuracy of the answers for applied questions.

CHAPTER 4

DISCUSSION

The aim of this study was to explore differences in freshmen and senior students' use of episodic and semantic memory systems, and their role on the accuracy of the different type of exam questions. Data is collected at two points; a) right after the final exam, and b) five weeks after students took the final exam. The findings underscore the difference between a) age (freshmen vs. senior), b) type of question (factual vs. applied), and c) time delay (right after the exam vs. 5 weeks later) on exam performance, or accuracy. In accordance with our hypotheses, we found numerous results in line with our predictions regarding Time 1 and Time 2.

4.1. Frequency of using episodic and semantic memory systems

In the first assessment at Time 1, in which students participated in the study right after their final exam, *remember*, which is associated with the episodic memory system, was the most frequently chosen option overall, for all questions. Considering type of the questions, we expected to find more *remember* responses than *know* responses in the factual questions, and to find more *know* responses than *remember* responses in the applied questions. Examining the difference between factual and applied questions was originally considered by Herbert and Burt (2004). Half of the questions were factual and half the questions were applied in order to eliminate the possible confounding effects created by the nature of the questions; but they did not look whether there is a difference between the two types of questions. In addition to Herbert and Burt's technique, we also compared the questions regarding their relation to *remember* and *know* responses; and specifically compared factual and applied questions in those terms. We found that *remember* responses occurred more frequently than *know* responses in the factual questions. The number of *remember* responses were also found to be significantly greater than the number of *know* responses for the applied questions. As we have noted earlier, remember is a very

frequently used choice in answering the source of knowledge that help students to answer the exam questions, and in line with the recent studies, our study also confirms the prevalence of remember responses in monitoring the source of knowledge. Furthermore, since this is the first time that factual and applied questions were examined separately, our findings also confirmed that remember responses are the most prevalently used ones, regardless of the type of the questions, for assessment right after an exam.

Another line of research examined the courses that have different nature of teaching and studying sessions. In traditional lecture courses, in which the instructor gives relevant information directly, students are more likely to *remember* learning episodes than courses like research methods, in which students make practices and inferences about what they have learned. Hereof, students are more likely to *know* the answer without remembering specific learning episodes in research methods courses due to the role of schematization (Conway et al., 1997). In that sense, it is reasonable to find more *remember* responses than *know* responses for factual questions, in which the necessary information was acquired as it was presented without forgetting the moment of learning it. Nevertheless, in the current study, there were more *remember* responses compared to *know* responses for applied questions. In other words, using episodic memory system by remembering the learning moment seems to be a frequently used strategy while answering all kinds of exam questions. Yet, these findings are specifically generalizable to psychology students.

Students, who chose remember responses for applied questions, mostly wrote narratives about instructor's providing an example about the topic. Therefore, instead of making inferences from the knowledge stored in semantic memory system while answering applied questions, students mostly remembered a specific moment occurred in classroom context; the specific application examples that their instructors provided in class. In other words, finding more *remember* than *know* responses for applied questions might be due to the examples regarding application that students

remember the very moment that their instructors gave examples of application in the classroom.

One of the most important take-home messages regarding this study is about the remember-to-know shift that is presented. As explained in the previous sections, after examining freshmen and senior students' strategies in their final exam at Time 1, their answers to final exam questions were assessed again, 5 weeks later (at Time 2). We aimed to examine whether a transfer from episodic memory to semantic memory system occurs after a five-week delay. In other words, we predicted that at Time 2, more students would shift from *remember* to *know* options (remember-to-know shift) when their answers were assessed after delay. We found that remember-to-know shift has occurred within five weeks. Regardless of students' age (freshmen vs. senior), the frequency of *remember* responses from Time 1 to Time 2 decreased, and the frequency of *know* responses from Time 1 to Time 2 increased, indicating remember-to-know shift, in line with our predictions and with the related literature.

Why would there be a remember-to-know shift in educational settings? A number of researches demonstrated that the information stored in episodic memory can either be transferred into semantic memory, or retained in episodic memory as is (Conway et al., 1997, Herbert & Burt, 2001). In other words, people tend to remember the gist of any technical knowledge they learned, or if it is a worthwhile moment to remember, they remember it like a snapshot, as one-point-in-time memories. Remember-to-know shift indicates the importance of semantic memory in educational settings in the long run. In semantic memory system, the pieces of information are connected to each other, and when one piece of information is activated for retrieval, other related pieces of information are also activated through the connections between them, as explained by the priming paradigm, earlier (Quillian, 1966; Collins and Loftus, 1975). In that sense, semantic memory is composed of accumulated knowledge, rather than several distinct episodes. When there are a lot of pieces of information to be stored in memory and in an integrative fashion, which is the case for educational processes, it becomes more functional to use semantic memory system for the overall

understanding of the material taught. By forming relationships between learned concepts, and having a general knowledge about the related area is a successful way of learning, and transfer of knowledge onto different settings.

4.2 Findings regarding class -age- differences

While considering class (age) differences, which is a new approach in the literature about investigating the use of episodic memory in classroom context, we found that senior students' frequency of using episodic memory was significantly greater than freshmen students' frequency of using episodic memory at Time 1, both for factual and applied questions. Additionally, we looked at the differences in *remember* and *know* responses from Time 1 to Time 2 for freshmen and senior students, separately. Both for freshmen and senior students, there was a significant decrease in *remember* responses after 5 weeks. However, while there was a significant change in *know* responses from Time 1 to Time 2 for senior students, the difference between Time 1 and Time 2 in *know* responses was not significant for freshmen students. Therefore, senior students seem to transfer the information from episodic memory to semantic memory system, whereas the information stored in semantic memory system does not seem to increase for freshmen students. Like episodic memory differences between freshmen and senior students, there was a difference in the occurrence of *remember-to-know* shift. Last but not least, while considering the role of class on the accuracy of the answers, senior students significantly had more accurate answers than freshmen students.

These findings can be mostly explained by the role of experience and knowledge. Cohen (1993) stated that although the actual experience does not change, the meaning inferred from it may develop and change through years. In that sense, since senior students gain more experience in college than freshmen students do have, their interpretations of those experiences are different from their younger counterparts. Thus, older and more experienced individuals become more able to transfer the episodes into the semantic knowledge. In addition, Herbert and Burt (2003) revealed

that reviewing the material regularly by tests results in faster remember-to-know shift and higher number of accurate answers. In the current study, although the level of reviewing the materials was not manipulated, one may conclude that senior students passed through more tests, and they experience remember-to-know shift at a higher level than freshmen students. Thus, observing differences in the accuracy of the answers and in remember-to-know shift between freshmen and senior students might have occurred due to different levels of experience. Besides differences in academic experiences, there are differences between freshmen and senior students in terms of how they regulate their social lives. Beginning of college education is one of the critical life events in life continuum, because most of the students start to live away from their parents, try to manage their money, establish new friendships, try to get used to university system, and they encounter many other struggles. For instance, Pillemer, Rhinehart, and White (1986) collected the narratives of freshmen students and found that they showed several different attributes about their social lives, compared to students from other classes; which they refer as “the longest year of college life”. Wilcox, Winn and Fyvie-Gauld (2005) also examined 22 students who became sophomore year students, and 12 students who dropped out from college within their first year. They found that problems about having good friendships, choosing a place to live, and getting used to independent studying are the most frequently experienced problems by the students who left college. Hence, we speculate that freshmen students have to deal with social problems while they are adjusting to university education, which is different than high school. Pillemer (2001) also suggested that experiencing those differences as a freshman student may influence their memories, which are mostly focusing on interpersonal relationships in college.

In line with adapting to independence and free will in terms of regulating studying and the importance attributed to academic life, freshmen students may suffer from not having fully developed self-regulation skills, since college life requires them to have self control on their own studying habits. Self-regulation skills are composed of three elements; a) cognitive strategies are necessary for learning and understanding

process, b) metacognitive strategies are necessary for individuals to monitor their cognitive strategies, and c) motivation is related to managing the time and energy while concentrating on studying (Bouffard, Boisvert, Vezeau, & Larouche, 1995). Although there might be individual differences regarding self-regulation skills, senior students seem to gain more experience in terms of regulating themselves during college education. For instance, in a longitudinal study comparing students' learning skills, students reported improvement in their quality of learning as their learning strategies changed. More specifically, their use of meaning-directed learning increased through years (Vermetten, Vermunt, & Lodewijks, 1999). Students' higher effort to use meaning-directed learning might result in remember-to-know shift, in which students are expected to create a general understanding about the issue. While considering the role of self-regulation on academic settings, it was found that self-regulation is an important predictor of academic achievement in university (Bouffard, Boisvert, Vezeau, & Larouche, 1995; Heikkilä & Lonka, 2007; Ley & Young, 1998).

The role of university education on differences between freshmen and senior students is also important for identity development. Waterman, Geary and Waterman (1974) examined male college students' identity statuses both when they were freshmen and senior students in college. They demonstrated that, students' identity achiever statuses increased from freshmen to senior years. Moreover, students' learner identities develop through college education, and this development results in taking greater responsibility of their own learning (Harrison, 2001). Consequently, the occurrence of remember-to-know shift among senior students, their greater use of episodic memory and higher levels of achievement might be influenced by the experience and knowledge gained through university education.

Maturation differences in the brain based on age may be another reason for the differences between freshmen and senior students regarding the use of episodic memory. The studies using brain-imaging techniques showed that using episodic memory activates frontal cortex whereas semantic memory is associated with medial

temporal lobe. Those studies indicated that the maturation of frontal cortex continues until late adolescence and young adulthood (Ofen et al., 2007; Cycowicz, 2000). Moreover, developmental psychology studies showed that even if semantic memory system functioning reaches adult maturation level in childhood, the capacity of knowledge stored in it increases by age (Murphy, 2002). Greater transfer from episodic memory to semantic memory might occur due to senior students' greater capacity in semantic memory system.

4.3. Findings Regarding the Type of Questions

In addition to investigating differences between freshmen and senior students for memory differences in overall, investigating how they differ from each other depending on the question type, as factual or applied, is another novel aspect presented in the current study. Regardless of age, there was a significant decrease between Time 1 and Time 2 in *remember* responses, whereas there was no significant change in *know* responses, neither for factual, nor for applied questions. When we examined the age-related differences, we found a converging pattern for factual questions, both for freshmen and senior students. In other words, both freshmen and senior students' *remember* responses decreased after 5 weeks, while their *know* responses did not change significantly from Time 1 to Time 2, for factual questions, which shows the same pattern with results that took all questions into consideration.

On the other hand, in applied questions, the pattern was different across age groups. Freshmen students' both *remember* and *know* responses for applied questions decreased from Time 1 to Time 2, which indicates forgetting the information, since it does not indicate a remember-to-know shift, but not remembering their own answer for the applied questions in the exam, after 5 weeks. When we examined senior students' *remember* responses, our findings showed that they were decreasing, whereas their *know* responses were increasing after a 5-week delay. In other words,

for senior students there was a different picture for applied questions, where we found a remember-to-know shift after 5-weeks delay.

Why is there a difference between the pattern of remember and know responses in factual and applied questions? In the literature three learning approaches have been defined: a) “surface approach” consists of fulfilling the necessary tasks only for passing the course without trying to comprehend the material by only memorizing, b) “deep approach” consists of being intrinsically motivated to learn the material by making inferences and drawing a comprehensive picture, and c) “achieving approach” consists of spending excessive time in studying to be a successful student (Biggs, 1987). The researchers studying these learning approaches mostly focus on *surface* and *deep* approaches, since *achieving approach* is different, and can be joined to other two approaches (Evans, Kirby, & Fabrigar, 2003). In this respect, the type of multiple-choice questions required either *surface* or *deep* studying approaches in order to answer them. Factual questions are associated with *surface* approach whereas applied questions are associated with *deep* approach (Yonker, 2011). Hence, factual questions are more prone to be forgotten while applied questions are more likely to be transferred to the semantic memory system. Moreover, older students were found to use *deep* approach more frequently than *surface* approach compared to younger students (Yonker, 2011). Therefore, the occurrence of remember-to-know shift only for senior students in applied questions can be explained by the role of *deep* learning approach, in which students are required to establish relations between the concepts and understand the general meaning, which is also an important component of semantic memory system.

4.4 Findings regarding the accuracy of the answers

In addition to the examination of the frequencies of *remember* and *know* responses for freshmen and senior students, finding out the role of using different memory systems on the accuracy of the exam questions is one of the main concerns of this study. In that sense, the findings were in compatible with our expectations. Using

episodic memories including specific learning moments as a strategy of answering the questions was a predictor of giving more accurate answers in the exams. However, knowing the information without remembering the specific learning moment -as an indicator of using semantic memory system- was not related to the accuracy of the answers, when the class of the participants was controlled for. Therefore, the role of semantic memory on accuracy was ruled out due to the effect generated by age and experience level, while remembering specific learning episodes was still significantly predicted the accuracy of the answers. In the study conducted by Nuthall and Alton-Lee (1995), most of the accurate answers given by the students going to primary and secondary school, were taken to consist of remembering the moments of learning that information. Moreover, other studies showed that university students, who gave accurate answers for lecture courses -in which students do not have so much opportunity to practice their knowledge-, remembered the moments that they acquired related knowledge while answering the questions in the first assessment (Conway et al., 1997; Herbert & Burt, 2001).

For examining the predictors of accurate answers, we also looked at the “type of question” in separate analyses, and found the same effect for factual questions at Time 1. In other words, for factual questions, *remember* responses and class of the students significantly predicted accurate answers, while *know* responses were not a significant predictor of accuracy. For applied questions, the results were different, and only *remember* responses significantly predicted the accurate answers at Time 1. These findings underscore the importance of episodic memory system on exam performance, which concerns one of the main research questions and important findings of this study. Regardless of the question type and the age group, remembering a specific learning episode still predicted accuracy of the answers, and can be considered as an important way of giving accurate answers in exams.

Furthermore, for applied questions, age group does not predict accuracy of the answers, unlike for factual questions. Yonker (2011) stated that answering applied questions requires *deep* learning approach, and answering factual questions are

associated using a *surface* approach. Hence, once students become able to correctly answer an applied question by using a *deep* approach, they can apply the new knowledge onto different contexts (which is also called “transfer of knowledge), and their experience level in college was no longer associated with their exam performance.

Like investigating the role of *remember* and *know* responses on the accuracy of the answers at Time 1, assessing whether those responses have changed and their use in predicting accuracy at Time 2 -five weeks after the final exam- is another important aspect of this study. Both for factual and applied questions, unlike at Time 1, both *remember* and *know* responses were associated with more accurate answers at Time 2, even when age group was controlled for. This finding shows that accuracy can be predicted and stored either by episodic or semantic memory system, after a delay. In that sense, semantic memory system gains importance in predicting accuracy after the delay, at a time when a new piece of information was not just acquired. In the literature, remember-to-know shift has been studied in relation to the concept of schematization. It was suggested that remember-to-know shift (or schematization of knowledge) occurs due to two reasons: a) being unable to reach the details of the learning episode, and b) developing a more general and abstract understanding of the information. Studies showed that both *remember* and *know* responses are important predictors of accurate answers, when the information not recently acquired, or the course itself fastens the process of remember-to-know shift (Conway et al., 1997; Herbert & Burt, 2001). Regarding this finding, we can conclude that episodic memory system is used more frequently at the time that is closer to the time of initial learning and remains important after a delay, whereas semantic memory becomes a predictor later when students experience remember-to-know shift.

While considering type of the question at Time 2, we found the same effect for factual questions as at Time 1. More specifically, both *remember* and *know* responses at Time 2, and the age group were significant predictors of accuracy of the answers of factual questions. On the other hand, none of the variables were associated with

the accuracy of applied questions, which means that the use of episodic or semantic memory at Time 2 did not predict more accurate answers. This was a finding that we did not expect to find, although we think it is an important finding in terms of emphasizing the importance of question type on memory systems in the case of a time lapse. Wilson and Fowler (2005) stated that finding a relationship between using *deep* approach and better performance in the exams may not be conclusive due to the influence of the type of questions used in the exams. In other words, relating this statement to our findings, we speculate that the role of memory systems on the accuracy of the answers is not valid for all type of questions. The way instructors teach the piece of knowledge that they want to assess by asking a factual question, may not show a wide range of variability across different conditions, such as different instructors or cultures. Of course we do not deny mass body of literature showing that different courses or instructors follow different leads and styles in teaching, but the piece of factual knowledge that they want to assess (e.g., Piaget's sensorimotor stage) show high level of correspondence across different instructors, or even across different educational settings. So, students might be repeatedly exposed to that precise piece of knowledge across different classes. Thus, the need for using episodic or semantic memory might be greater in remembering a factual knowledge. On the other hand, the knowledge assessed by applied questions, only suits to the given situation or example, for the most part. For instance, if a clinical psychologist teaching about depression talks about a case study in class and applies the principles learned in class, mostly those case studies would have a wider range of variability across different instructors, or educational settings. Therefore, when the example –such as the case study about depression- is recently presented, it is important to remember the specific example that the instructor gave in order to answer the question in an accurate way. However, when time passed, neither remembering, nor knowing the applied information example is not associated with giving accurate answers. One may also argue that, since more students experienced remember-to-know shift for applied questions, it does not have an influence on differentiating the students who gave accurate answers or the ones who did not.

In order to understand the different nature of factual and applied questions, different types of knowledge (declarative and procedural) can also be taken into account. Declarative knowledge consists of episodic information, which is organized in a hierarchical way. Although it is stored in long-term memory, working memory is also at work. Yet, procedural knowledge consists of applying declarative knowledge for many times and bringing it to being an automatic process (Clark, Feldon, van Merriënboer, Yates, & Early, 2008). While declarative knowledge deals with “why or that”, procedural knowledge deals with “how and when” (Clark & Estes, 1996). Moreover, a piece of declarative knowledge can be used in different situations whereas procedural knowledge is more resistant to transfer, and it is valid for the related condition (Clark & Voogel, 1985). Taken together, factual questions are related to declarative knowledge, whereas applied questions are related to procedural knowledge. Hence, finding different patterns for factual and applied questions might have occurred, because they assess different types of knowledge.

4.5 Exploratory Findings

Investigating the nature of the narratives provided for *remember* option (learning context and memory characteristics) is the exploratory part of our study. The learning context of the narratives mostly included the moments about studying alone, and the least reported moments belonged to studying in a group. Freshmen students reported similar levels of learning moments occurred in classroom and studying alone. When the instructor or course assistant gave an example about the topic, it was remembered while answering the related question. In addition, they remembered the moment that they were reading the specific information in the book or in PowerPoint slides. For senior students, although remembering the specific example given in classroom occurred frequently, they mostly remembered learning moments belonged to studying alone. These findings showed that the strategy of encoding studying moments and remembering them during the exam developed through university education. Students who use *surface* strategies mostly focus on in-class experiences, whereas *deep* strategy users develop an ability to concentrate on their own learning

periods (Yonker, 2011). Therefore, it may be important to create memorable moments during teaching sessions in class in the early years of university education.

Memory characteristics of the narratives were also examined, and number of words and self-related words were coded, as indicated before. It was found that the level of major satisfaction is an important predictor of number of words and self-related words in the narratives. More specifically, if a student's level of major satisfaction is high, s/he provides longer narratives and emphasizes his/her self more frequently. This finding shows the importance of major satisfaction in university education, beyond academic performance. To clarify, Holland (1997) stated individuals want to be in an environment, which suits their interests best. Thus, being satisfied with the major seems to occur when students find their department suitable for themselves. Moreover, when students are satisfied with their departments, they feel greater self-efficacy, because they feel like they achieved a goal, which is choosing a lifetime career (Jurgens, 2000). These associations with major satisfaction represent the role of self in people's lives. Therefore, it is also plausible to find more words and self-related words in the narratives, when students' level of major satisfaction is high.

In addition to the expected findings, there were also a few findings, which were not in line with our expectations. It was expected that greater memory importance would be related to higher number of *remember* responses. However, no relationship between memory importance and the use of episodic memory system was observed. Likewise, frequency of studying did not predict number of *remember* responses, either. Moreover, we could not find any relationship between memory importance and number of words and self-related words. While considering the distribution of the scores given to memory importance, the majority of the participants reported that memories are important to them, revealing a kind of ceiling effect. In that respect, there was not sufficient variance to find meaningful relationships regarding memory importance. For frequency of studying, participants mostly reported that they start to study a couple of days before the exam. Since the majority of the scores accumulated around average, again the variance was not sufficient. Last of all, there were no

differences in number of words and self-related words between freshmen and senior students. Number of words and self-related words were counted in case the participant remembered the moment that s/he learned the information. Therefore, the analysis was performed with restricted amount of data. Furthermore, participants wrote short narratives on average, thus cannot finding significant results might have occurred due to statistical reasons. If there had been greater number of and longer narratives, the results might have been different and should definitely be examined in the future.

4.6 Limitations

There are some limitations of this study. First of all, the study was conducted with METU students, who are majoring in Psychology department. The sample enabled us to specifically look at the characteristics of social science students, however the participants were chosen from a specific population, which might not reflect all the characteristics of this age group. For instance, the socioeconomic statuses (SES) of the participants belonged to middle and upper-middle class. Therefore, the results might have been different if the participants belonged to lower SES backgrounds. In addition, students can be administered as a student at METU only if they got high scores from the university entrance exam. Thus, the participants were successful individuals in an academic manner. Being a psychology student might be another factor leading to generalization problem. Since this department belongs to Social Sciences, and the nature of teaching sessions and contents of the courses are different from Natural Sciences, the results might not be generalizable to the students from other departments. Having few male participants is also a limitation of this study regarding the problems rise from the nature of the participants. Gender differences in episodic memory have been one of the most studied topics in the episodic memory development literature. Therefore, similar number of females and males would have been a better sample for this study. Second of all, the sample size of the study was not ideal. Third of all, this study was a time-series study, which was conducted at 2 time points. The most frequently experienced problem for time-series studies is drop-

out rates. Eighteen percent of the students did not participate in the second assessment, since participation was on voluntary basis. Furthermore, the drop-out rate was higher for freshmen students than for the senior students. Therefore, there might have been a systematic attrition, which we cannot measure. Last of all, the exemplar questions chosen from final exam questions were not the same. Although we tried to choose the questions from similar difficulty levels by the help of the course assistant -who is the same person for both courses- the contents could not be the same due to the nature of the courses. However, it is impossible to ask the same questions to freshmen and senior students, therefore this problem could not be avoided.

4.7 Contributions

While considering all examined variables, to the best of our knowledge, this study is the first one that examined the effect of different age groups (freshmen vs. senior), memory systems (episodic vs. semantic) on the accuracy of the answers, in addition to looking at remember-to-know shift over time, and the question type on those relationships, simultaneously. It is well known from the literature that remembering specific learning episodes is a frequently used strategy in the exams. However, how this system occurs across different age groups have not been studied before. In that sense, this study has made a unique contribution to the literature by showing more experienced individuals' greater use of episodic memory compared to younger and less experienced ones in classroom context.

In addition to the use of episodic memory, its effect on exam performance is another important aspect of this study. There are only a small number of studies investigating the role of episodic memory on the accuracy of the answers. Our study also replicated the importance of remembering specific learning moments in answering exam questions correctly. The importance of episodic memory on the accuracy of answers was investigated in a couple of studies, in which researchers compared different age groups and different types of questions. In that sense, finding different

patterns for freshmen and senior students in factual and applied questions regarding the exam performance has made an important contribution to the literature. Last of all, this study is the first one to compare different age groups and different types of questions regarding remember-to-know shift, and its relation to exam performance. We found that only senior students experienced remember-to-know shift and only for applied questions. Furthermore, the use of episodic and semantic memory systems at Time 2 predicted greater accuracy only for factual questions. Eventually, comparing different age groups and different type of questions is not present in the literature, and our findings account for several factors in the related research area. This study is also the first one to empirically show these relationships in Turkish academic context.

4.8 Implications

In addition to making contribution to the literature, this study is important to present practical implications. It was shown that episodic memory system is important for students. Remembering learning episodes is important both during exams, and to remember the information after the exams by transferring it to the semantic memory system. In the study investigating the importance of episodic memory in educational settings, it was found that if teaching sessions constituted of “episodic rich” material (i.e. giving many characteristic examples about the topic), students performed better in the exams than the students who received “episodic poor” material (i.e. not giving characteristic examples about the topic). Episodic rich condition was also associated with greater remember-to-know shift, which is an important process for learning due to being an indicator of schematizing the knowledge and linking different pieces of information together. When teaching sessions consisted of episodic rich material, students pay more attention to the explained information, and it becomes easier to remember learning episodes (Herbert & Burt, 2004). In order to make students use episodic memory system in a more efficient way, some suggestions can be made. For instance, teaching sessions can be constituted of more lively sessions, in which vivid examples related to the topic in hand may be presented. Experiencing is one of the

most important requirements for adult learning, because individuals have a need of self-direction, and they can learn new information better if they can actively join the learning sessions (Sims & Sims, 1995). In another study comparing the effectiveness of teaching methods, researchers indicated that providing students to solve a jigsaw was associated with higher scores compared to lecture and lecture/discussion methods (Carpenter, 2006). Therefore, when students have the chance to learn by actively experiencing the topic, they showed the best performance. If it is not possible to provide students to experience the given knowledge, explaining the topic with a real-life example would be an important way of creating memorable moments (Herbert & Burt, 2001). In our study, the majority of the narratives belonging to classroom experiences consisted of a real-life example about the topic. In addition to creating memorable teaching sessions, students can be informed about how they can study to create memorable moments, because most of the learning episodes reported in this study consisted of experiences while studying alone. Class differences also show the importance of less experienced students' greater need of assistance. Consequently, this study has made important contributions both in an empirical and practical way.

4.9 Future Suggestions

In light of limitations and contributions of the study, further studies can be conducted with different samples. First of all, in order to provide generalizability of our findings, students from different universities can be recruited. Second of all, having a more heterogeneous sample regarding SES levels can be another option. In that sense, participants from low and high socio-economic status can be compared in order to find if there are differences between those students. Third of all, making a cross-cultural comparison can also contribute to the existing literature, since there are developmental differences in episodic memory system between collectivist and individualist cultures, in addition to different views on education across cultures. Fourth of all, is gender distribution is counter-balanced, it may shed light onto gender differences in using episodic and semantic memory systems in classroom context.

Also, selecting participants from different departments creates an opportunity for investigating the use of episodic memory in classroom context and remember-to-know shift in different educational contexts. Furthermore, since developmental differences are larger in smaller age groups, comparing students from different grades in primary, secondary, and high school may reveal different pattern of results, therefore these age groups are worthwhile to examine. Finally, in order to figure out the possible reasons behind class differences regarding the use of episodic and semantic memory systems, related variables such as students' studying and memory enhancing strategies can be included in further studies.

Overall, our study was the first attempt to examine the effects of multiple variables, such as using episodic or semantic memory, age groups, and question types on exam performance. These findings have made a valuable addition to the existing literature, however researchers should continue to explore the relationship among these variables in diverse educational contexts.

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APPENDICES

Appendix A: First questionnaire for freshmen students

Okul yılı: _____ Genel Ortalama: _____ Ders saati: _____

1. Soru:

The primary method of collecting data used by structuralists and functionalist was _____

A) introspection

B) correlational analysis

C) empirical research

D) meta-analysis

- Sınavda hangi seçeneği işaretlemiştiniz? _____

- Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

2. Soru:

The one-to-one relationship between the specific nerve stimulated and the resulting type of sensory experience is referred to as _____

- A) the volley principle
B) the opponent-process principle
C) the doctrine of specific nerve energies
D) Weber's Law

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu "an"la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

3. Soru:

Serial killer Ted Bundy was suspected of being responsible for dozens of rapes and murders throughout the United States in the 1970s. During his trial, he was labeled a “psychopath” by prosecutors and mental health professionals. He was convicted and executed for his crimes in 1988. Of the following professionals, _____ psychologists would probably be **MOST** interested in the causes and diagnosis of Ted Bundy’s mental disorders.

A) social B) counseling C) clinical D) developmental

- Sınavda hangi seçeneği işaretlemiştiniz? _____

- Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

4. Soru:

Peter goes from bright sunlight into a dimly lit theater. At first, he can see little or nothing as he looks for a seat. Over a ten-minute period he is gradually able to see things directly in front of him more clearly. His ability to see things off to the side steadily improves for another twenty minutes. This process is called _____

A) light compensation B) dark compensation C) dark adaptation D) light adaptation

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

- Anılar sizin için ne kadar önemlidir?

Hiç önemli değil		Nötr		Çok önemli
1	2	3	4	5

- Bölümünüzden memnun musunuz?

Hiç memnun değilim		Nötr		Çok memnunum
1	2	3	4	5

- Bireysel ders çalışmayı mı yoksa grup halinde ders çalışmayı mı tercih edersiniz?

Sadece bireysel		Hem bireysel hem grup halinde		Sadece grup halinde
1	2	3	4	5

- Sınavlarınıza çalışmaya ne kadar zaman önce başlarsınız?

Sınavdan 1 gün önce		Sınavdan birkaç gün önce		Düzenli olarak her gün
1	2	3	4	5

- Şimdi sizden bu dersle ilgili yeni bir bilgiyi öğrendiğiniz belirli bir anı hatırlamanızı istiyoruz. Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

Appendix B: First questionnaire for senior students

Okul yılı: _____ Genel Ortalama: _____ Ders saati: _____

1. Soru:

Compared to long-term psychodynamic psychotherapy, brief psychodynamic psychotherapy

- A) involves a more narrow focus on specific clinical problems
- B) is better suited for clients with severe (rather than mild) pathology
- C) focuses more on the past than the present
- D) all of the above

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

2. Soru:

In group therapy, the term “social microcosm” refers to the idea that

- A) group members often establish friendships and romantic relationships outside of the therapy setting
- B) group members often have isolated lives and have allowed their social contacts to become infrequent, and these tendencies contribute to their psychological problems
- C) the problems of most group members stem from antisocial tendencies, the exploration of which requires recollections from early childhood
- D) the relationship tendencies that characterize clients’ problematic relationships in their personal lives will also characterize the relationships they form with fellow group members

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

3. Soru:

Nergis, a psychotherapy client, is depressed about a recent breakup with her romantic partner. She believes that the breakup is entirely her fault, and that if she had done things differently, she wouldn't be alone now. This belief best exemplifies the cognitive thought distortion known as

- A) all-or-nothing thinking
- B) catastrophizing
- C) personalization
- D) mental filtering

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

4. Soru:

Identify the defense mechanism illustrated in the following example: Chad always teases and annoys his kid brother Nathan, after he himself is bullied and picked on by his older brother Sam.

- A) projection
- B) reaction formation
- C) displacement
- D) identification

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

- Anılar sizin için ne kadar önemlidir?

Hiç önemli değil		Nötr		Çok önemli
1	2	3	4	5

- Bölümünüzden memnun musunuz?

Hiç memnun değilim		Nötr		Çok memnunuz
1	2	3	4	5

- Bireysel ders çalışmayı mı yoksa grup halinde ders çalışmayı mı tercih edersiniz?

Sadece bireysel		Hem bireysel hem grup halinde		Sadece grup halinde
1	2	3	4	5

- Sınavlarınıza çalışmaya ne kadar zaman önce başlarsınız?

Sınavdan 1 gün önce		Sınavdan birkaç gün önce		Düzenli olarak her gün
1	2	3	4	5

- Şimdi sizden bu dersle ilgili yeni bir bilgiyi öğrendiğiniz belirli bir anı hatırlamanızı istiyoruz. Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

Appendix C: Second questionnaire for freshmen students

Okul yılı: _____ Genel Ortalama: _____ Ders saati: _____

1. Soru:

The primary method of collecting data used by structuralists and functionalist was _____

A) introspection

B) correlational analysis

C) empirical research

D) meta-analysis

- Sınavda hangi seçeneği işaretlemiştiniz? _____

- Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

2. Soru:

The one-to-one relationship between the specific nerve stimulated and the resulting type of sensory experience is referred to as _____

- A) the volley principle
B) the opponent-process principle
C) the doctrine of specific nerve energies
D) Weber's Law

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu "an"la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

3. Soru:

Serial killer Ted Bundy was suspected of being responsible for dozens of rapes and murders throughout the United States in the 1970s. During his trial, he was labeled a “psychopath” by prosecutors and mental health professionals. He was convicted and executed for his crimes in 1988. Of the following professionals, _____ psychologists would probably be **MOST** interested in the causes and diagnosis of Ted Bundy’s mental disorders.

A) social B) counseling C) clinical D) developmental

- Sınavda hangi seçeneği işaretlemiştiniz? _____

- Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

4. Soru:

Peter goes from bright sunlight into a dimly lit theater. At first, he can see little or nothing as he looks for a seat. Over a ten-minute period he is gradually able to see things directly in front of him more clearly. His ability to see things off to the side steadily improves for another twenty minutes. This process is called _____

A) light compensation B) dark compensation C) dark adaptation D) light adaptation

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

Appendix D: Second questionnaire for senior students

Okul yılı: _____ Genel Ortalama: _____ Ders saati: _____

1. Soru:

Compared to long-term psychodynamic psychotherapy, brief psychodynamic psychotherapy

- A) involves a more narrow focus on specific clinical problems
- B) is better suited for clients with severe (rather than mild) pathology
- C) focuses more on the past than the present
- D) all of the above

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

2. Soru:

In group therapy, the term “social microcosm” refers to the idea that

- A) group members often establish friendships and romantic relationships outside of the therapy setting
- B) group members often have isolated lives and have allowed their social contacts to become infrequent, and these tendencies contribute to their psychological problems
- C) the problems of most group members stem from antisocial tendencies, the exploration of which requires recollections from early childhood
- D) the relationship tendencies that characterize clients’ problematic relationships in their personal lives will also characterize the relationships they form with fellow group members

- Sınavda hangi seçeneği işaretlemiştiniz? _____

- Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

3. Soru:

Nergis, a psychotherapy client, is depressed about a recent breakup with her romantic partner. She believes that the breakup is entirely her fault, and that if she had done things differently, she wouldn't be alone now. This belief best exemplifies the cognitive thought distortion known as

- A) all-or-nothing thinking
- B) catastrophizing
- C) personalization
- D) mental filtering

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermeme sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmeme sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

4. Soru:

Identify the defense mechanism illustrated in the following example: Chad always teases and annoys his kid brother Nathan, after he himself is bullied and picked on by his older brother Sam.

- A) projection
- B) reaction formation
- C) displacement
- D) identification

• Sınavda hangi seçeneği işaretlemiştiniz? _____

• Bu seçeneği neden seçtiniz? (Aşağıdakilerden sadece birini işaretleyiniz.)

1. Bu cevabı vermemi sağlayan bilgiyi öğrendiğim belirli anı hatırlıyorum.

Lütfen bize bu “an”la ilgili hatırlayabildiğiniz her şeyi anlatınız.

2. Cevabı biliyorum ama bu cevabı verebilmemi sağlayan bilgiyi öğrendiğim belirli bir an hatırlamıyorum.

3. Cevabı tahmin ettim.

4. Diğer (lütfen açıklayınız).

Appendix E: Turkish Summary

TURKISH SUMMARY

Giriş

Sınıf ortamında epizodik (anısal) bellek kullanımı, bellek ve eğitim alanında çalışan araştırmacılar tarafından geniş ölçüde araştırılan bir konudur (Conway, Gardiner, Perfect, Anderson, ve Cohen, 1997; Herbert ve Burt, 2004; Leichtman, Pillemer, Bemis, Bauer ve Malahy, 2011). Birçok çalışma gösteriyor ki sınıf ortamında öğrenilen bilgileri epizodik olarak hatırlamak daha sonra o bilginin hatırlanmasına yardımcı oluyor. Ayrıca, bazı çalışmalar bilgiyi semantik (anlamsal) olarak hatırlamanın özellikle daha sonraki hatırlama üzerindeki sonuçları üzerinde duruyor (Conway ve ark., 1997; Herbert ve Burt, 2004). Literatürde epizodik ve semantik bellek sistemleri üzerinde duran araştırmalarda katılımcıların bir bilginin kaynağı hakkında düşünürken verdikleri cevaplar değerlendiriliyor. Epizodik bellek “hatırlama” cevaplarıyla ilişkiliyken, semantik bellek “bilme” cevaplarıyla ilişkili bulunuyor. Yani, insanlar bir bilgiyi öğrendikleri belirli bir anı hatırlıyorlarsa epizodik bellek sistemini kullanıyorlar. Öte yandan, insanlar bir bilgiyi öğrendikleri anı hatırlamadan sadece o bilgiyi bildiklerini belirtiyorlarsa semantik bellek sistemini kullanıyorlar (Tulving, 1985). Dolayısıyla *hatırlama/bilme (remember/know)* paradigması literatürde epizodik ve semantik bellek sistemlerinin karşılığı olarak görülüyor.

Literatürde bazı çalışmalar hatırlamadan bilmeye geçişin (*remember-to-know shift*) nasıl oluştuğunu incelemektedir (Herbert ve Burt, 2001; Herbert ve Burt, 2003). Hatırlamadan bilmeye geçiş kavramı bilginin zamanla epizodik bellekten semantik belleğe geçtiğini öne sürmektedir. İnsanlar bir bilgiyi yeni öğrendiklerinde genellikle epizodik bellek sistemini kullanırlar. Zaman içerisinde o bilgi semantik bellek sistemine geçer, yani insanlar bilgiyi öğrendikleri anı hatırlamadan bilgiyi

bildiklerini ifade ederler (Herbert ve Burt, 2001; Herbert ve Burt, 2003; Herbert ve Burt, 2004).

Bu çalışmanın amacı üniversite ortamında sınıf farklılıklarını göz önünde bulundurarak farklı bellek sistemlerinin (epizodik ve semantik) sınav başarısı üzerindeki etkisini incelemektir. Bu amaca ulaşmak için psikoloji bölümü birinci ve dördüncü sınıf öğrencilerinin sınav sorularını yanıtlarken hangi bellek sistemini kullandıkları iki farklı zaman diliminde (sınavdan hemen sonra ve sınavdan 5 hafta sonra) karşılaştırılmıştır. Bu çalışmanın ana kavramları hatırlama/bilme paradigması ve hatırlamadan bilmeye geçiş kavramıdır. Bu kavramları daha iyi anlamak için epizodik ve semantik bellek sistemleri hakkındaki literatür aşağıdaki bölümlerde daha detaylı incelenmiştir.

Epizodik Bellek

Epizodik anılar genellikle bir kere gerçekleşen olaylardan oluşur (Pillemer, 1998) ve epizodik bellek sistemi kişinin belirli bir deneyimi hatırlarken o deneyimin yeri, zamanı ve diğer özelliklerinin farkında olarak hatırlamasıyla tanımlanır (Tulving, 1993). Tulving (2002) epizodik belleğin iki bileşeni olduğunu öne sürmüştür; ilki kişinin hatırlarken olayın belirli detaylarının farkında olması, ikincisi ise kişinin hatırlama esnasında kendisinin farkında olduğu *otonoetik* bilinçtir.

Epizodik bellek gelişimine baktığımızda, birçok çalışma epizodik bellek gelişimini etkileyen faktörleri incelemiştir (Reese ve Fivush, 1993; Leichtman, Pillemer, Wang, Koreishi ve Han, 2000; Wang, Leichtman ve Davies, 2000; Wang, 2006). İki yaşından başlayarak, çocuklar geçmişte gerçekleşen bir olayı hatırlama becerisini gösterir ve bu beceri gelişimsel süreçte tamamlanır (Markowitsch ve Welzer, 2010). Yaşları 2 ve 4 arasında olan 28 çocuk bir çalışmaya katılmıştır ve araştırmacılar epizodik belleğin çocuklarda ortaya çıkışını incelemek istemişlerdir. Katılımcılar evlerinde ziyaret edilmiş ve bir oyun oynamaları istenmiştir. İki gün sonra, araştırmacılar katılımcıların evlerini tekrar ziyaret etmiş ve katılımcılara o olay

hakkındaki anılarını sormuşlardır. Ayrıca, altı ay önce ve bir yıl önce gerçekleşen olaylar hakkındaki anıları da sorulmuştur. Sonuçlar beklenen bir gelişimsel örüntü ortaya koymuştur. Bütün çocuklar iki gün önce gerçekleşen olayı hatırlamışlardır. Altı ay önce ve bir yıl önce gerçekleşen olayların hatırlanma oranı yaş arttıkça artmaktadır. Ayrıca altı ay önce gerçekleşen olay bir yıl önce gerçekleşen olaydan daha fazla hatırlanmaktadır (Markowitsch ve Welzer, 2010). Dolayısıyla, sonuçlar gösteriyor ki 2 yaşındaki çocuklar bile yakın geçmişi hatırlama becerisini gösterirken, yaşları arttıkça daha eski olayları hatırlayabilmekte ve olayları kronolojik olarak sıralama becerileri gelişmektedir.

Yukarıda bahsedildiği gibi, epizodik bellek sistemi yaşla gelişmektedir ve daha büyük yaşlardaki çocuklar daha gelişmiş epizodik bellek sistemi özellikleri gösterirler. Ancak yaş epizodik bellek gelişimindeki farklılıkları açıklamak için yeterli ve tek faktör değildir. Anne ve çocuk arasındaki sosyalleşme örüntüsü epizodik bellek gelişimini etkileyen ana faktörlerden biridir. Çocukların erken yaşlardaki geçmişteki olayları hatırlama becerisi çoğunlukla anne tarafından sağlanan yönlendirici sorulara bağlıdır (Bemis, 2008; Sahin-Acar ve Leichtman, 2014). Epizodik bellek gelişimini inceleyen araştırmalarda katılımcılardan genellikle bir olayı hatırlamaları istenir ve katılımcıların yazdığı anlatılar değerlendirilir. Değerlendirme sonucunda katılımcıların epizodik bellek gelişim düzeyleri hakkında sonuca varılır. Anlatılar bir olayla ilgili eylemlerden oluşan yazılı ve sözlü cümlelerdir ve olayın yapısı bu anlatılardan anlaşılabilir (Fivush, 2011).

Araştırmacılar epizodik bellek gelişimini etkileyen faktörleri hem epizodik bellek sistemini hem de onunla ilişkili diğer gelişimsel süreçleri daha iyi anlamak için incelemektedir. Örneğin dil gelişimi epizodik bellek gelişimiyle paralel giden bir süreçtir (Fivush, 1998). Ek olarak, araştırmacılar epizodik bellek sistemini kişilerin öğrendikleri bilgileri nasıl hatırladıklarını incelemek için de çalışmışlardır. Örneğin, bir çalışmada 4-5 yaşlarındaki çocukların yeni bir bilgiyi öğrendikleri anı hatırlayabildikleri bulunmuştur (Bemis, Leichtman ve Pillemer, 2011). Bununla bağlantılı olarak, epizodik bellek sisteminin sınıf ortamında nasıl kullanıldığı ve

öğrencilerin bilgiyi sınav anındaki hatırlama stilleri arařtırmacılar tarafından alıřılan konulardır (Conway ve ark., 1997; Herbert ve Burt, 2004). Yapılan alıřmalarda lise ve üniversite öđrencileri sınav sorularını cevaplarırken sıklıkla gerekli bilgiyi öđrendikleri anı hatırladıklarını rapor ediyorlar (Conway ve ark., 1997; Leichtman ve ark., 2011).

Epizodik bellek sistemi incelendikten sonra semantik bellek sistemi hakkında detaylı bilgi ařađıdaki bölümde sunulmuřtur.

Semantik Bellek

Semantik bellek, dünya hakkında genel bilgiyi kodlamak ve hatırlamak olarak tanımlanır ve kiřilerin birbiriyle iliřkilendirebileceđi zihinsel temsillerden oluřur (Tulving, 1993). Epizodik bellekten farklı olarak, yařanan olaylar hakkında belirli anları iermez, genel olarak bir bilgiyi veya kavramı bilmekle iliřkilidir (Tulving, 1972). Örneđin bahede bir köpek gören 2 yařındaki bir ocuk daha sonra köpeđi gördüđu anı hatırlamadan köpeđi hatırlayabilir. Dolayısıyla, epizodik bellek sistemi alıřmadan, semantik bellek sistemi sayesinde köpekle ilgili gerekli bilgiyi bilebilir (Wheeler, Stuss ve Tulving, 1997).

Semantik bellek gelişimine baktığımızda, epizodik bellekten daha önce gelişmeye bařladıđı bulunmuřtur (Tulving, 1993). Semantik bellek sisteminin sinyalleri bebeklerin nesnelere olan iliřkilerini inceleyen alıřmalarda gözlemlenebilir. Örneđin, *nesne kalıcılıđı* olarak adlandırılan ocukların görüş alanında olmayan nesnelere hakkında düşünebilme yeteneđi (Berk, 2009) semantik bellek sistemini bir iřareti olarak görülür (Wheeler ve ark., 1997). Literatürde semantik bellek gelişimiyle ilgili savunulan görüşlerden biri bebekte bařladıđı ve depolanan bilginin yařla birlikte artmasına rađmen okul öncesi yılların sonunda yetiřkin semantik bellek sistemi yapısına ulařtıđıdır (Murphy, 2002). Öte yandan, Chi ve Ceci (1987) semantik bellek sistemi yapısının okul yıllarında da geliştiđini öne sürmektedir.

Semantik bellek sistemi, epizodik bellek gibi dil gelişimiyle paralel olarak gözlemlenir. Kelimeler, anlamları ve kelimeler arasındaki ilişkiler semantik bellek sisteminde depolanır ve bu bilgiler kişilerin dili bir iletişim aracı olarak kullanmasında yardımcı olur (Tulving, 1972). Dil gelişimine ek olarak, semantik bellek sistemi eğitim alanında da önemli bir yere sahiptir, çünkü öğrenciler her zaman bilgiyi öğrendikleri belirli bir anı hatırlayamazlar; ancak onun yerine bilgiyi semantik bellek sistemini kullanarak hatırlarlar (Conway ve ark., 1997; Herbert ve Burt, 2004; Leichtman ve ark., 2011). Örneğin, öğrenciler Araştırma Teknikleri gibi uygulamalı derslerde *bilme* seçeneğinin *hatırlama* seçeneğinden daha fazla işaretlemişlerdir (Conway ve ark., 1997).

Farklı Bellek Türlerinin Eğitimdeki Rolü

Epizodik ve semantik bellek sistemlerini kullanma sıklığını incelemek, bu sistemlerin eğitim alanındaki önemini anlamaya yetmez. Bu sebeple, araştırmacılar bellek sistemlerinin kullanımının öğrencilerin sınavlardaki başarısıyla olan ilişkisini incelemişlerdir. Yapılan bir çalışmada, bilgiyi öğrendikleri anı hatırlayan üniversite öğrencileri soruların % 92.1'ini doğru cevaplayarak en yüksek başarıyı göstermişlerdir. Cevabı bilen ama öğrenme anını hatırlamayan öğrenciler soruların % 88.6'sını doğru cevaplamışlardır (Leichtman ve ark., 2011). Başka bir çalışmada araştırmacılar öğrencilere öğretilen materyali “epizodik olarak zengin” ve “epizodik olarak yetersiz” olarak sınıflandırmışlardır. Epizodik olarak zengin materyalde öğrencilere akılda kalıcı belirgin özellikler sunulmuştur. Epizodik olarak yetersiz materyalde ise daha genel bilgiler yer almaktadır. Farklı materyallerin öğretilmesi ve çalışılması sonucunda sınava giren öğrencilerden epizodik olarak zengin materyali çalışan öğrencilerin sınavda daha yüksek bir performans sergilediği bulunmuştur. Ayrıca 5 hafta sonra yapılan ölçümde epizodik olarak zengin materyali çalışan öğrencilerin hatırlamadan bilmeye geçişi daha fazla tecrübe ettikleri bulunmuştur (Herbert ve Burt, 2004). Bu sonuçlar eğitim alanında hem epizodik hem de semantik belleğin önemini ortaya koyuyor. Yani, bilgi yeni öğrenildiğinde öğrenme anını

hatırlamak, uzun vadede ise bu anlardan yola çıkarak çıkarım yapmak ve genel bir bilgi birikimi yaratmak öğrenme ve hatırlama süreçleri üzerinde en etkili yol olarak görülüyor (Conway ve ark., 1997, Nuthall ve Alton-Lee, 1995).

Epizodik ve semantik bellek sistemlerinin eğitim alanındaki önemini inceleyen az sayıda çalışma olduğundan bu konuda kesin bir sonuca varmak mümkün görünmüyor. Ayrıca bu çalışmalara aynı yaş gruplarındaki öğrenciler katılmış ve epizodik ve semantik bellek kullanımının gelişimsel süreçleri incelenmemiştir. Bu sebeple, bu çalışmanın amacı erken yetişkinlikte epizodik ve semantik bellek kullanımını ve bunun sınavlardaki başarıya etkisini farklı yaş gruplarını karşılaştırarak incelemektir.

Yaşın Hatırlamaya Etkisi

Yaşın bellek performansı üzerindeki etkisini araştıran çalışmalarda genellikle beyindeki gelişimsel farklılıklar incelenmiştir. Beyin görüntüleme teknikleriyle yapılan çalışmalarda frontal korteksin epizodik bellek ile medyal temporal lobun ise semantik bellek ile ilişkili olduğu bulunmuştur. Ayrıca bu çalışmaların sonuçları gösteriyor ki frontal korteks geç ergenlik ve erken yetişkinlik dönemine kadar gelişme gösterirken medyal temporal lobun gelişimi 8 yaşına kadar tamamlanıyor (Cycowicz, 2000; Ofen, Kao, Sokol-Hessner, Kim, Whitfield-Gabrieli ve Gabrieli, 2007).

Beyindeki gelişime ek olarak, tecrübe de bellek performansındaki yaş farklılıklarıyla ilişkilidir. Teste tabi tutulma bellek performansının artmasına yol açan tecrübeyle ilişkili faktörlerden biridir. Tek bir teste tabi tutulmanın hiçbir teste tabi tutulmamaya kıyasla anlamlı bir biçimde bellek performansını arttırdığı bulunmuştur (Roediger ve Karpicke, 2006). Ayrıca, teste tabi tutulma bireyleri bir bilgiyi akılda tutmaları konusunda motive eder (Roediger, Agarwal, Kang ve Marsh, 2010). Pratik yapmak da tecrübenin bir parçasıdır. Erken ve geç yetişkinlikteki bireylerin bellek performanslarını arttırmak amacıyla yapılan bir müdahale çalışmasında katılımcılar

materyal üzerinde pratik yapmıştır ve bu eğitimin sonunda bellek performanslarının arttığı gözlemlenmiştir (Noack, Lövdén, Schmiedek ve Lindenberger, 2013). Bu çalışmalar teste tabi tutulma ve pratik yapmanın etkilerini belirli bağlamlarda incelese de sonuçlar yaşın artmasıyla birlikte daha fazla teste tabi tutulma ve pratik yapmanın bellek performansında genel anlamda ilerlemeye yol açacağı şeklinde genellenebilir (Geç yetişkinlikte bellek performansında görülen azalmalar göz önüne alınmamıştır). Ancak yaşın bir göstergesi olarak tecrübe seviyesindeki farklılıklar da bireylerin bellek performanslarındaki farklılıkları tam olarak açıklamaya yetmez, bazı kişisel özellikler de bellek sistemlerinin kullanımında farklılığa yol açmaktadır.

Bellek Sistemlerinin Kullanımıyla İlişkili Diğer Kişisel Özellikler

Bu çalışmada daha önce doğrudan epizodik ve semantik bellek kullanımı ile ilişkisine bakılmamış, ancak akademik performans ve anlatı özellikleriyle ilişkisi bazı çalışmalarda incelenmiş *çalışma sıklığı*, *çalışma tercihleri*, *bölüm memnuniyeti* ve *anılara verilen önem* gibi faktörler de incelenmiştir. Öğrencilerin sınavlara ne sıklıkla çalıştığı, örneğin her gün düzenli çalışmak veya sınavdan bir gün önce çalışmak gibi, öğrenciler arasında büyük farklılıklar göstermektedir (Roediger ve Karpicke, 2006). Öğrenciler aynı zamanda çalışma tercihleri (bireysel ya da grup halinde) bakımından da farklılık göstermektedir. Örneğin bazı öğrenciler bilgiyi birbirlerine anlatmaktan, kendi bilgileri hakkında tartışmaktan faydalanırlar ve karşılığında sınavlarda daha başarılı olurlar (Springer, Stanne ve Donovan, 1999). Bölümden duyulan memnuniyet de öğrencilerini çalışma motivasyonunu ve başarısını etkileyen bir faktördür. Türkiye’de öğrencilerin işsizlik olasılığını düşünerek bölüm seçme eğilimi vardır ve bu yüzden bazı öğrenciler bölümlerinden memnun olmazlar (Doğan, Saraçlı ve Saraçlı, 2005). Bölüm memnuniyeti ile yapılan çalışmalarda bölüm memnuniyeti arttıkça öğrencilerin başarısı düzeylerinin arttığı bulunmuştur (Guan, Shiye, Liu ve Yum, 2006; Kümbül Güler ve Emeç, 2006; Nauta, 2007). Bu yüzden bölüm memnuniyeti de bu çalışmada incelenen bir değişkendir. Son olarak, sınıf ortamında bellek sistemi bu çalışmanın ana konusu olduğu için, bireylerin anılara ne kadar önem verdiği de incelenen diğer bir değişkendir.

Tüm bu deęişkenlerin ötesinde, soru tipinin epizodik ve semantik bellek kullanımıyla olan ilişkisi de bu çalışmada incelenen bir faktördür. Sorular olgusal veya uygulamalı olarak ikiye ayrılır. Olgusal sorularda öğrenciler öğrendikleri bilgiyi doğrudan hatırlarlar. Diğer yandan, uygulamalı sorular öğrencilerin öğrendikleri bilgiyi farklı durumlara uygulayabilme becerisinin ölçer (Sugrue, 1995). Soru tipleri öğrencilerin çalışma stillerini ve başarı düzeylerini etkileyen bir faktördür. Örneğin, olgusal sorular daha yüzeysel çalışma stiliyle ilişkiliyken uygulamalı sorular daha derinlemesine çalışma stilleriyle ilişkili bulunmuştur (Wilson ve Fowler, 2005).

Tüm bu deęişkenler göz önünde alındığında, literatürde epizodik ve semantik bellek ilişkisini sınıf ortamında inceleyen az sayıda çalışma olduğu ve bildiğimiz kadarıyla yaş farklılıkları ve soru tipinin incelendiği hiçbir çalışma olmadığı görülmüştür. Bu sebeple, bu çalışmada yaş ve soru tipi göz önüne alınarak öğrencilerin epizodik ve semantik bellek kullanma sıklığı ve bunun başarıya olan etkisi iki farklı zaman diliminde incelenmiştir. Bu bağlamda, birinci ve dördüncü sınıf psikoloji bölümü öğrencileri final sınavından hemen sonra ve beş hafta sonra çalışmamıza katılmıştır.

Sınavdan hemen sonra gerçekleşen Zaman 1'deki ilk değerlendirmeyle ilgili hipotezlerimiz şu şekildedir:

1. Olgusal sorularda *hatırlama* cevabı *bilme* cevabından daha fazla seçilecektir ve uygulamalı sorularda *bilme* cevabı *hatırlama* cevabından daha fazla seçilecektir.
2. Dördüncü sınıf öğrencileri birinci sınıf öğrencilerinden daha fazla *hatırlama* cevabını seçeceklerdir.
3. Daha fazla epizodik bellek kullanımı daha fazla doğru cevap sayısı ile ilişkili olacaktır (Olgusal ve uygulamalı sorular için ayrı hipotezler kurulmamıştır).

4. Anılara daha fazla önem vermek ve daha yüksek bölüm memnuniyeti anlatılarda daha fazla kelime ve benlikle ilgili kelime sayısı ile ilişkili olacaktır.

5. Dördüncü sınıfların anlatılarında birinci sınıflara kıyasla daha fazla kelime ve benlikle ilgili kelime yer alacaktır.

Sınavdan 5 hafta sonra gerçekleşen Zaman 2'deki ikinci değerlendirmeyle ilgili hipotezlerimiz şu şekildedir:

1. Hem olgusal hem uygulamalı sorularda katılımcıların *hatırlama* cevapları birinci değerlendirmeye kıyasla azalacak ve *bilme* cevapları artacaktır.

2. Hatırlamadan bilmeye geçiş dördüncü sınıf öğrencilerinde birinci sınıf öğrencilerine kıyasla daha fazla gerçekleşecektir.

3. Hem *hatırlama* hem *bilme* cevapları doğru cevap sayısı ile ilişkili olacaktır (Olgusal ve uygulamalı sorular için ayrı hipotezler kurulmamıştır).

Yöntem

Örneklem

Katılımcılar Orta Doğu Teknik Üniversitesi (ODTÜ) Psikoloji bölümü öğrencilerinden oluşmaktadır. Elli iki katılımcı (47 kadın 5 erkek) birinci sınıf öğrencisi ve 52 katılımcı (46 kadın, 6 erkek) dördüncü sınıf öğrencisidir. Birinci sınıfların yaş ortalaması 19.63 iken dördüncü sınıfların yaş ortalaması 22.31'dir. İkinci değerlendirmede birinci sınıflardan 37 öğrenci dördüncü sınıflardan 47 öğrenci çalışmaya katılmıştır. Katılım tamamen gönüllülük esasına dayanmıştır ve katılımcılar sınava girdikleri dersten bonus puan almışlardır.

Veri Toplama Araçları

İlk deęerlendirmede, final sınavından seilen 4 rnek soru ve kişisel zelliklerle ilgili sorulardan oluřan bir anket kullanılmıřtır. rnek sorular ders asistanının yardımıyla birinci ve drdnc sınıf ęrencileri iin benzer zorluk seviyesinden seilmiřtir. Sorulardan iki tanesi olgusal ve iki tanesi uygulamalı sorulardan seilmiřtir. Btn sorular oktan semelidir. Ankette ęrencilere o soruya sınavda hangi cevabı verdikleri ve o cevabı vermek iin kullandıkları bilgiyi nasıl ęrendikleri sorulmuřtur. Seenekler drt tanedir: a) bu bilgiyi ęrendiđim anı hatırlıyorum, b) bu bilgiyi biliyorum ama ęrendiđim anı hatırlamıyorum, c) tahmin ettim, d) “diđer”. ęrenme anını hatırlayan veya “diđer” seeneđini iřaretleyen katılımcılardan bu seeneđi altta verilen bořlukta aıklamaları istenmiřtir. Bu yntem ilk olarak Conway ve arkadaşlarının (1997) alıřmasında kullanılmıřtır. Daha sonra bařka arařtırmacılar da bu yntemi kullanmıřtır (Herbert ve Burt, 2004; Leichtman ve ark., 2011; Sahin ve Leichtman, 2010). rnek 4 sorudan sonra katılımcılara anılara ne kadar nem verdikleri, blmden ne kadar memnun oldukları, bireysel mi grup halinde mi ders alıřmayı tercih ettikleri ve ne sıklıkla ders alıřtıkları beřli Likert leđi ile sorulmuřtur. Son olarak katılımcılardan o derste yeni bir bilgiyi ęrendikleri anı yazmaları istenmiřtir. İkinci deęerlendirmede ise yine aynı 4 rnek soru sorulmuřtur. Bu sefer kişisel zelliklerle ilgili sorular sorulmamıřtır.

İřlem

Veri toplama sreci birinci sınıflarda Psikolojiye Giriř finali sonrası, drdnc sınıflarda ise Klinik Psikoloji finali sonrasında gerekleřmiřtir. Anketleri doldurmak yaklařık 10-15 dakika srmřtr. İlk veri toplama srecinden sonra katılımcılar ikinci veri toplama hakkında bilgilendirilmiřlerdir. Katılımı yksek seviyede tutmak iin ikinci oturuma katılanlar arasından yapılacak kura ile kazanana mini tablet bilgisayar verileceđi duyurulmuřtur.

Kodlama

Örnek sorular için *hatırlama* seçeneğini işaretleyenlerden öğrenme anını mümkün olduğunca detaylı bir şekilde anlatmaları istenmiştir. Daha sonra bu anlatılar ilk araştırmacı tarafından kodlanmıştır. Ayrıca anıların %20'si ikinci bir araştırmacı tarafından kodlanmıştır ve puanlayıcılar arası güvenilirlik hesaplanmıştır. Anıların epizodik anılarla tutarlı olup olmadığı, öğrenme ortamı, kelime sayısı ve benlikle ilgili kelime sayısı kodlanmıştır.

Bulgular

İlk olarak sorulara verilen *hatırlama* ve *bilme* cevap sıklığı değerlendirilmiştir. Katılımcılar olgusal sorularda *hatırlama* cevabını *bilme* cevabından daha fazla seçmişlerdir ($\chi^2(1) = 15.20, p < .001$). Uygulamalı sorularda da *hatırlama* cevabı *bilme* cevabından daha fazla seçilmiştir ($\chi^2(1) = 5.00, p < .05$). Chi karesi analizinden sonra 4 soruya verilen *hatırlama* ve *bilme* cevapları bir araya getirilmiştir. Ayrıca olgusal ve uygulamalı sorulara verilen *hatırlama* ve *bilme* cevapları da bir araya getirilmiş ve analizlere bu şekilde devam edilmiştir.

Yaşın *hatırlama* stili üzerindeki etkisine baktığımızda, Bağımsız T-testi analizi yapılmış ve dördüncü sınıf öğrencilerinin birinci sınıf öğrencilerinden daha fazla *hatırlama* cevabını seçtikleri bulunmuştur. Bu durum hem olgusal ($t(102) = -7.24, p < .001$) hem de uygulamalı sorular için geçerlidir ($t(102) = -3.83, p < .001$).

Yaşın ve *hatırlama* stilinin başarı üzerindeki etkisine baktığımızda Hiyerarşik Regresyon analizi uygulanmış ve ikinci adımda olgusal sorularda hem *hatırlama* cevabının hem de yaşın daha fazla doğru cevapla ilişkili olduğu bulunmuştur ($R^2 = .55, \Delta R^2 = .19, F_{inc}(1, 100) = 42.80, p < .001$). Uygulamalı sorularda ise sadece *hatırlama* cevabı doğru cevap sayısı ile ilişkili bulunmuştur ($R^2 = .07, \Delta R^2 = .01, F_{inc}(1, 98) = 1.13, ns$).

Anlatılardaki anı özelliklerine baktığımızda Bağımsız T-testi analizi yapılmış ve birinci ve dördüncü sınıflar arasında kelime sayısı ve benlikle ilgili kelime sayısı

arasında anlamlı bir fark bulunmamıştır. Kelime sayısı ve benlik ile ilgili kelime sayısının anılara verilen önem ile ilişkisine baktığımızda anlamlı bir sonuç ortaya çıkmamıştır. Öte yandan bölüm memnuniyeti hem daha fazla kelime ($R^2 = .06$, $F(1,88) = 5.55$, $p < .001$) hem de daha fazla benlik ile ilgili kelime sayısını anlamlı bir şekilde yordamıştır ($R^2 = .08$, $F(1,88) = 7.98$, $p < .05$).

Beş hafta sonra gerçekleştirilen ikinci değerlendirmenin sonuçlarına baktığımızda Eşleşmiş T-Testi analizi uygulanmış ve *hatırlama* cevaplarının azaldığı ($t(83) = 4.73$, $p < .001$) ve *bilme* cevaplarının ise arttığı ($t(83) = 4.73$, $p < .05$) bulunmuştur. Yani beklenen hatırlamadan bilmeye geçiş gözlemlenmiştir. Birinci ve dördüncü sınıflara ve olgusal ve uygulamalı sorulara ayrı ayrı baktığımızda hatırlamadan bilmeye geçiş farklı örüntüler göstermiştir. Birinci sınıf öğrencilerinin olgusal sorulara verdiği *hatırlama* cevapları Zaman 1'den Zaman 2'ye kadar azalmıştır ($t(51) = 2.86$, $p < .01$). Öte yandan *bilme* cevaplarında anlamlı bir değişiklik olmamıştır. Birinci sınıfların uygulamalı sorulara verdiği hem *hatırlama* ($t(51) = 2.77$, $p < .01$) hem de *bilme* cevapları ($t(51) = 2.43$, $p < .05$) Zaman 1'den Zaman 2'ye kadar azalmıştır. Dördüncü sınıfların olgusal sorulara verdiği *hatırlama* cevapları Zaman 1'den Zaman 2'ye kadar azalmıştır ($t(51) = 5.26$, $p < .001$). Öte yandan *bilme* cevaplarında anlamlı bir değişiklik olmamıştır. Dördüncü sınıfların olgusal sorulara verdiği *hatırlama* cevapları azalırken ($t(51) = 3.75$, $p < .001$) *bilme* cevaplarında Zaman 1'den Zaman 2'ye kadar artış olmuştur ($t(51) = -1.97$, $p = .055$). Sonuç olarak hatırlamadan bilmeye geçiş sadece dördüncü sınıf öğrencilerinin olgusal sorulara verdiği cevaplarda gözlemlenmiştir.

Yaşın ve Zaman 2'deki hatırlama stilinin başarı üzerindeki etkisine baktığımızda Hiyerarşik Regresyon analizi uygulanmış ve ikinci adımda olgusal sorularda *hatırlama* ve *bilme* cevaplarının ve de yaşın daha fazla doğru cevapla ilişkili olduğu bulunmuştur ($R^2 = .59$, $\Delta R^2 = .31$, $F_{inc}(1,100) = 74.84$, $p < .001$). Uygulamalı sorularda ise hiçbir değişken doğru cevap sayısını yordamamıştır.

Tartışma

Birinci deęerlendirmede epizodik ve semantik bellek kullanım sıklığına baktığımızda, hem olgusal hem de uygulamalı sorularda katılımcıların epizodik bellek sistemini daha sık kullandığı görülmüştür. Olgusal soruları geleneksel derslere benzetirsek, Conway ve arkadaşları (1997) öğrencilerin geleneksel derslerde *hatırlama* cevabını *bilme* cevabından daha fazla seçtiğini bulmuştur. Yani bilginin doğrudan sorulduğu durumlarda bilginin öğrenildiği anı hatırlamak öğrencilerin sıklıkla başvurduğu bir yöntemdir. Öte yandan, uygulamalı soruları Araştırma Teknikleri gibi daha sık pratik yapılan derslere benzetirsek, Conway ve arkadaşları (1997) *bilme* cevabının *hatırlama* cevabından daha fazla seçildiğini bulmuştur. Çünkü zaman içerisinde ve pratikle öğrencilerin bilgiyi şemalaştırdığını ileri sürmüşlerdir. Bu çalışmada ise uygulamalı sorularda epizodik bellek kullanımı semantik bellek kullanımından daha sık gözlemlenmiştir, çünkü öğrenciler genellikle sınıfta verilen benzer bir örneği hatırlamışlardır. Bu sebeple, uygulamalı sorularda bilginin şemalaştırılması ve semantik bellek sistemine daha sık başvurulması bu çalışmada gözlemlenmemiştir.

İkinci deęerlendirmede yaş ve soru tipi ayırıt etmeden baktığımızda hatırlamadan bilmeye geçişin olduğunu görüyoruz. Literatürde bu kavram bilginin şemalaştırılması kavramıyla birlikte inceleniyor ve araştırmacılar tarafından iki adımda oluştuğu öne sürülüyor. İlk olarak bireyler bilgiyi öğrendikleri anı unutmaya başlıyorlar, ikinci olarak da öğrenilen bilgiler hakkında daha genel ve soyut bir anlayış oluşturuyorlar (Conway ve ark., 1997; Herbert ve Burt, 2001). Sonuç olarak, bilginin hatırlanmasında zaman içerisinde epizodik bellek önemini korurken semantik bellek de önem kazanıyor.

Yaşa baęlı farklılıklara baktığımızda dördüncü sınıfların daha başarılı olması, epizodik bellek sistemini daha fazla kullanması ve hatırlamadan bilmeye geçişi daha fazla deneyimlemeleri tecrübe ve bilgi birikiminin etkisiyle açıklanabilir. Örneğin, Cohen (1993) deneyim deęişmese bile ondan çıkarılan anlamın zaman içerisinde deęişip geliştiğini öne sürmüştür. Herbert ve Burt (2003) materyali tekrar etmenin önemini ortaya koyan bir çalışma yapmıştır. Sonuçlar teste tabi tutulma sebebiyle

yapılan düzenli tekrarın hatırlamadan bilmeyen geçişi hızlandırdığını göstermektedir. Dolayısıyla, dördüncü sınıf öğrencilerinin eğitim süresince daha fazla teste tabi tutulduğunu ve öğrendikleri bilgileri daha fazla tekrar ettikleri göz önünde bulundurulursa, bellek sistemlerini daha etkili bir biçimde kullanmaları beklenen bir sonuçtur.

Akademik ilerlemenin yanı sıra birinci ve dördüncü sınıf öğrencileri sosyal hayatlarını düzenleme konusunda da farklılık gösterirler. Birinci ve ikinci sınıf öğrencileriyle yapılan bir çalışmada, ikinci sınıfa geçmeden üniversite eğitimi bırakan öğrencilerin iyi arkadaşlar edinme, yeni bir ortamda yaşama ve bağımsız çalışma düzenine alışma gibi problemlerle karşılaştıklarını belirtmişlerdir (Wilcox, Winn ve Fyvie-Gauld, 2005). Bağımsız çalışma düzenine alışmayla bağlantılı olarak, birinci sınıf öğrencilerinin dördüncü sınıf öğrencilerine kıyasla öz-düzenleme davranışları bakımından da daha dezavantajlı konumda olduğu söylenebilir. Örneğin, boylamsal bir çalışmada öğrencilerin öğrenme stratejileri yıllar içerisinde gelişme göstermiştir (Vermetten, Vermunt ve Lodewijks, 1999). Ayrıca, öz-düzenleme üniversitede akademik başarının önemli bir yordayıcısıdır (Bouffard, Boisvert, Vezeau ve Larouche, 1995; Heikkilä ve Lonka, 2007; Ley ve Young, 1998). Tecrübe ve eğitime ek olarak daha önce bahsedilen beyin gelişimindeki farklılıklar da birinci ve dördüncü sınıflar arasındaki farkların bir sebebi olabilir.

Soru tipini göz önüne aldığımızda olgusal ve uygulamalı sorularda sonuçlar farklı örüntüler göstermiştir. Literatürde farklı soru tipleriyle ilişkili farklı öğrenme yaklaşımlarından bahsedilmiştir. Olgusal sorularla ilişkili olan yüzeysel yaklaşımda öğrencilerin sadece dersi geçmek için bilgiyi ezberledikleri gözlemlenirken, uygulamalı sorularla ilişkili derinlemesine yaklaşımda öğrencinin bilgiyi çıkarımlar yaparak öğrenmek ve genel bir resim çizmek gibi içsel motivasyonları olduğu gözlemlenmiştir (Yonker, 2011). Dolayısıyla olgusal sorularla ölçülen bilgi zaman içerisinde unutulmaya daha yatkınken, uygulamalı sorular bilginin şemalaştırılması yoluyla hatırlamadan bilmeye geçişe yol açmaktadır.

Epizodik ve semantik bellek kullanımının doğru cevap sayısı ile ilişkisine baktığımızda, birinci değerlendirmede beklenildiği gibi epizodik bellek önemli bir yere sahiptir. Bu sonuç hem olgusal hem de uygulamalı sorular için geçerlidir. Epizodik bellek sisteminin sınıf ortamında kullanımını inceleyen çeşitli çalışmalar da soru tipi ayırt etmeksizin bu sonucu göstermektedir (Conway ve ark., 1997; Nuthall ve Alton-Lee, 1995; Herbert ve Burt, 2001). İkinci değerlendirmeye baktığımızda yine beklenildiği gibi olgusal sorularda hem epizodik hem de semantik bellek kullanımını soruları doğru cevaplama da önemli bir yere sahiptir. Hatırlamadan bilmeye geçişin gösterildiği çalışmalar da bu sonucu desteklemektedir (Conway ve ark., 1997; Herbert ve Burt, 2001). Ancak uygulamalı sorulara baktığımızda hiçbir değişkenin doğru cevap sayısı ile ilişkili olmadığı bulunmuştur. Bu noktada olgusal sorularla ölçülen bilginin her durumda aynı olduğu ve değişime çok açık olmadığı için bellek sistemine daha bağlı olduğu önde sürülebilir. Öte yandan uygulamalı sorularla ölçülen bilgi durumdan duruma farklılık gösterebilir ve öğrencilerin başarısı bu yüzden bellek sistemleriyle açıklanamayabilir. Ayrıca olgusal sorularda hatırlamadan bilmeye geçiş gözlemlenemediği için yine bellek sistemlerinin nasıl kullanıldığı doğru cevap sayısını etkileyen bir faktör olabilir. Ancak uygulamalı sorularda hatırlamadan bilmeye geçiş daha fazla gözlemlendiği için doğru cevap veren öğrencilerle vermeyen öğrencileri ayırt etmede bellek sistemlerinin rolü gözlemlenemeyebilir.

Bu çalışmanın bir diğer önemli sonucuysa bölüm memnuniyetinin anlatılarda daha fazla kelime ve benlikle ilgili kelime sayısını yordamasıdır. Holland (1997) bireylerin kendi ilgi alanlarına uyan ortamlarda bulunmak istediğini söylemiştir. Ayrıca Jurgens (2000) de bölümünden memnun olanların kariyer seçme konusunda başarılı olduklarını düşündükleri için daha yüksek öz-yeterlik seviyesine sahip olduklarını bulmuştur. Sonuç olarak, bölüm memnuniyeti akademik başarının yanı sıra kişiyi kendine daha fazla vurgu yapması gibi olumlu sonuçlar da doğurmaktadır.

Bu çalışmanın birkaç kısıtlılığı vardır. İlk olarak örneklem ODTÜ Psikoloji öğrencilerinden oluştuğu için sonuçların genellenebilirliği açısından dikkatli olmak

gerekir. İkinci olarak örneklem sayısı ideal seviyenin altındadır, dolayısıyla bulguları yorumlarken göz önüne alınması gerekir. Üçüncü olarak ikinci değerlendirmede katılımcı sayısında düşüş yaşanmıştır. Son olarak birinci ve dördüncü sınıfların örnek soruları farklıdır ve sonuçlar farklı sorulardan etkilenmiş olabilir.

Bu kısıtlılıklar doğrultusunda gelecek çalışmalarda örneklem daha dikkatli seçilebilir. Boylamsal bir çalışma tasarlayarak daha standardize bir çalışma yapılabilir. Ayrıca gelişimsel farklılıklar daha erken yaşlarda daha fazla gözlemlendiği için benzer bir çalışma daha küçük yaş gruplarıyla tasarlanabilir.

Kısıtlılıklara rağmen bu çalışmanın önemli katkıları vardır. Birçok değişkeni (epizodik ve semantik bellek sistemleri, yaş, soru tipi, sınav performansı ve iki farklı zaman dilimi) aynı anda inceleyen ilk çalışmadır. Bu sebeple literatüre önemli bir katkı sağlamıştır. Özellikle farklı yaş grupları ve farklı soru tipleri bildiğimiz kadarıyla ilk defa bu çalışmada incelenmiştir. Ayrıca bu çalışmanın bulguları eğitim alanında önemli implikasyonlara sahiptir. Epizodik belleğin önemi ve zaman içerisinde semantik belleğin de önem kazanmasıyla birlikte derslerin işleyişi konusunda çeşitli düzenlemelere gidilebilir.

Appendix F: Tez Fotokopisi İzin Formu

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	<input type="checkbox"/>
Sosyal Bilimler Enstitüsü	<input type="checkbox"/>
Uygulamalı Matematik Enstitüsü	<input type="checkbox"/>
Enformatik Enstitüsü	<input type="checkbox"/>
Deniz Bilimleri Enstitüsü	<input type="checkbox"/>

YAZARIN

Soyadı : Elibol
Adı : Nur
Bölümü : Psikoloji

TEZİN ADI (İngilizce) : The Role Of Episodic and Semantic Memory on Exam Performance among Freshmen and Senior Students in Psychology

TEZİN TÜRÜ : Yüksek Lisans Doktora

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir.
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir.
3. Tezimden bir (1) yıl süreyle fotokopi alınmaz.

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: