REDUNDANT ON-SCREEN TEXT, LEARNER CONTROL AND SELF-REGULATION: EFFECTS ON LEARNING PAST TENSE IN ENGLISH

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DECLARATION OF ORIGINALITY

I, Bedi Cananoğlu, certify that

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ABSTRACT

Redundant on-Screen Text, Learner Control and Self-Regulation:

Effects on Learning Past Tense in English

This study aimed to examine the effects of the redundant on-screen text, learner control and self-regulatory skills on students' learning simple past tense in an online tutorial that were variably used. 132 EFL learners with beginner level of English studying at the preparatory school of English and vocational school of Justice participated in this quasi-experimental study. Four treatment conditions were tested: text + control, text + no control, no text + control, no text + no control), with all the groups receiving narrated slides. Each participant was given a prior knowledge test, an academic self-regulation scale, a retention test and a transfer test. Results showed that redundant on-screen text does not have a significant effect on retention or transfer scores. However, learners with control over the learning material performed significantly lower than learners without control. Out of eight tests, only one significant difference was observed between learners with high and low self-regulatory skills in the transfer test when they were given learner control without on-screen text. A significant two-way interaction between the treatment condition and self-regulatory skills on the retention test scores was observed; while the treatment condition and prior knowledge were found to influence students' transfer scores independently.

ÖZET

Gereksiz Ekran Yazısı, Öğrenen Kontrolü ve Öz Düzenleme Becerilerinin İngilizce Geçmiş Zaman Öğrenme Üzerine Etkileri

Bu çalışma öğrencilerin İngilizce geçmiş zaman öğrenmede gereksiz ekran yazısı, öğrenen kontrolü ve öz düzenleme becerileri faktörlerini incelemektedir. Bu araştırma için geliştirilen E-eğitim ortamı İngilizce "Geçmiş Zaman" ünitesi üzerine kurulmuştur. Yarı deneysel olarak tasarlanan bu çalışmaya 132 öğrenci katılmıştır. Uygulama öncesi her bir öğrenciye bir ön bilgi testi ve bir akademik öz düzenleme anketi; uygulama sonrası da bir hatırlama bir de transfer testi verilmiştir. Araştırma sonuçlarına göre gereksiz ekran yazısının öğrenme üzerine olumlu ya da olumsuz bir etkisi olmadığı gözlemlenmiştir. Öğrenen kontrolü faktörü verilmediğinde ise öğrencilerin önemli ölçüde daha başarılı oldukları tespit edilmiştir. Bu çalışma düzeneğinde, öz düzenleme becerileri yüksek ve düşük öğrencilerin, öğrenmeleri karşılaştırıldığında sekiz testin yedisinde önemli bir fark gözlemlenmemiştir. Farkın ortaya çıktığı tek koşul ise öğrencilere ekran yazısının verilmeyip kontrol verildiği E-eğitim ortamıdır. Bu sonuçların ortaya çıkmasında öğrencilerin ön bilgi düzeylerinin düşük olmasının yanı sıra, kullandıkları E-eğitim ortamının ve az da olsa öz-düzenleme becerilerinin etkisi olduğu sonucuna varılmıştır.

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ABBREVIATIONS

CLT:	Cognitive Load Theory
CTML:	Cognitive Theory of Multimedia Learning
EFL:	English as a Foreign Language
ELT:	English Language Teaching
FCSSR:	Five Component Scale of Academic Self-Regulation
HSR:	High Self-Regulation
LSR:	Low Self-Regulation
NTC:	Narrated Slides + No Text + Control Given
NTNC:	Narrated Slides + No Text + No Control Given
TC:	Narrated Slides + Text + Control Given
TNC:	Narrated Slides + Text + No Control Given

CHAPTER 1

INTRODUCTION

There is an old British saying: “Enough is as good as a feast.” What is highlighted in these words makes sense only when we are sure about the balance between what we think is enough and what we are told is enough. However, the question is how are we going to create this balance?

The advancement in technology is so overwhelming that it is inevitable not to see its impacts on our lives. Therefore, it would be a naïve suggestion not to expect any change in the way courses are designed and implemented. This change has received substantial interest in research. Many teachers, researchers and instructional designers try to make use of the advantages of today’s technology to provide better teaching and learning environments. Many researchers have studied the adaptation process to technological advancement and their integration into classes for years. Even though it is a long process when different types of learners, limited interaction ways and the amount of course structure are considered, none of these seem unsolvable as long as there are teachers in the physical classrooms, and moderators or instructors in distant education platforms. Yet, when it comes to online tutorials in which learners try to learn and practice the subject all by themselves, how do we know how much is enough?

To begin with how people are assumed to learn, Mayer (2017) claims that learning occurs when words and images are selected, organized and integrated with the prior domain knowledge of the learner. The presentation of the words and images might vary from one learning material to another. While words can be in a printed or narrated form, pictures can be either static like photographs, or dynamic like

animations and videos. This theory is called Cognitive Theory of Multimedia Learning (CTML). According to CTML, when learning occurs with two modes of representation – verbal or pictorial – being selected, organized and integrated by the learners, the assumption that learners have limited capacity for information processing in visual and auditory channels cannot be ignored.

Limited capacity assumption is based on Sweller's Cognitive Load Theory (CLT) (1988). Cognitive load is observed to occur due to the nature of the instruction material (intrinsic cognitive load) or the design of the material (extraneous cognitive load). To create active processing in the working memory, however, germane cognitive load should be activated to promote learning. Therefore, two modes of representation are stressed since a third mode would cause an overload in the learners' working memory due to the limits of the visual and auditory channels. In order to avoid the redundancy effect caused by the third mode of representation and to increase germane cognitive load, the redundancy principle of CTML should be studied more extensively.

According to CTML, students learn better with narration and animation than narration, animation and on-screen text that duplicates the narration. What happens when the redundant on-screen text is provided in an online tutorial is an increase in the extraneous cognitive load in the working memory, difficulty in concentration, missing the visual content in the animation, all of which serve as a detriment to learning. 13 out of 13 studies documented by Mayer (2017) have been reported to validate this argument. However, most of these studies used science course materials in the experiments. Research shows that this principle may not apply to foreign language courses (She, Wang, Chen, & Chen, 2009; Samur, 2012). In English Language Teaching (ELT), listening and reading inputs foster learners to produce

speaking and writing outputs. However, the reading material which is essential in ELT can be redundant when it duplicates narration in CTML. Therefore, the on-screen text that is added to the learning material given as the treatment conditions in this study will be referred as "redundant" based on the substantial amount of literature.

Unlike the redundant on-screen text, providing students with learner control has been found to decrease cognitive load (Mayer & Chandler, 2001; Hasler, Kresten, & Sweller, 2007). With control given, students would have the opportunity to navigate between slides, move back and forward in an animation, thus reviewing the parts they have missed. Similarly, self-regulatory skills, which help students do their best in their learning, might be required in order to overcome the problems related to the design of the online tutorial or the context of the learning material.

This study aims to examine the effects of the redundant on-screen text, learner control and self-regulatory skills on students' learning in a foreign language teaching online tutorial. In the light of the results, researchers and designers are aimed to get a better understanding of what is better for language learners and how much is enough.

1.1 Statement of the problem

Redundancy principle of CTML has been very controversial for many years in Educational Technology studies. There have been many studies that aim at setting the rules of designing the most effective way of presenting the learning material in terms of this principle.

Earlier studies suggest that the use of redundant text that duplicates the narration hinders learning (Kalyuga, Chandler, & Sweller, 1999; Mayer, Heiser, &

Lonn, 2001; Moreno & Mayer, 2002). The dominant idea in the literature is based on Sweller's (1999) Cognitive Load Theory, which claims that the reason behind this argument is that learners have difficulty in focusing on the words and images or animation, which causes an overload in their visual channel because of the two ways of representation in one channel. However, further studies have shown that this principle is not valid in different research settings and may not be useful depending on the learning domain, the amount of control given to the learners, and the prior knowledge of the students. (Diao & Sweller, 2007; She et al., 2009; Samur, 2012).

One of the areas in which little research has been conducted on the effects of the redundancy principle is language teaching. Since research shows that the earlier findings of the redundancy principle may not be generalized to all kinds of fields, it can be posited that results may vary especially when the objective of the learning material is to teach language skills. Also, little research has brought the learner control and the redundancy principle together and made them their research subject.

By examining the effects of redundancy principle and the learner control on language learners' learning English, the language teachers will choose, design and/or develop better materials for their courses and material developers will have a short guideline in terms of how to design multimedia learning materials for language teaching.

1.2 Purpose of the study

The purpose of the study is to find out the effects of learner control over the learning material, and the redundant on-screen text on students' retention and transfer performances in simple past tense in English by using an online tutorial and examine if self-regulation has an effect on learning.

1.3 Research questions

1. How does on-screen text affect students' retention and transfer scores on the Simple Past Tense unit when they are given learner control?
2. How does on-screen text affect students' retention and transfer scores on the Simple Past Tense unit when they are not given learner control?
3. How does learner control condition affect students' retention and transfer scores on the Simple Past Tense unit when they are given on-screen text?
4. How does learner control condition affect students' retention and transfer scores on the Simple Past Tense unit when they are not given on-screen text?
5. Does self-regulation affect students' retention and transfer scores on the simple past tense unit in English?
    a. Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given on-screen text, but not given learner control?
    b. Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are not given on-screen text or learner control?
    c. Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given on-screen text and learner control?

d. Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given learner control but not given on-screen text?

1.4 Significance of the study

This research primarily aims to fill the research gap in the field of educational technology. Firstly, there is a lack of research on Educational Technology in terms of redundancy principle in a foreign language learning setting, so there are not sufficient and useful guidelines for designing a multimedia learning environment for language teaching. Also, in most of the studies briefly outlined above which found on-screen text non-redundant could only help students remember words or labels. With the online tutorial designed for this study, the author aims to test the transferable skills in language learning, the results of which will add a lot to the literature of CTML. Finally, a lot of studies used redundant on-screen text in non-user-controlled systems in the experiment phase. This study aims to contribute to this literature as well by finding out whether self-regulatory skills promote learning in an online tutorial with redundant on-screen text and learner control students are provided with.

1.5 Organization of the study

In Chapter 2, the literature of the redundancy principle, its relationship with language teaching, learner control, and self-regulation have been reviewed. Chapter 3 presents the methodology used in this study. The background of the participants, the description of the instruments, the treatment and data collection procedure have been explained. In chapter 4, the procedure of the data analysis has been presented. Chapter 5 includes the results of each statistical test applied in this study. Finally, Chapter 6 provides the discussion of the results, limitations of the study, and recommendations for further research.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1 Cognitive theory of multimedia learning

CTML is a theory of learning that is based on the idea that learning occurs when verbal and pictorial information is selected by the sensory memory, organized by the working memory and integrated by the prior knowledge within the long-term memory. In order for learning to occur, there needs to be some links between the verbal and pictorial representations of the learning material (See Figure 1).

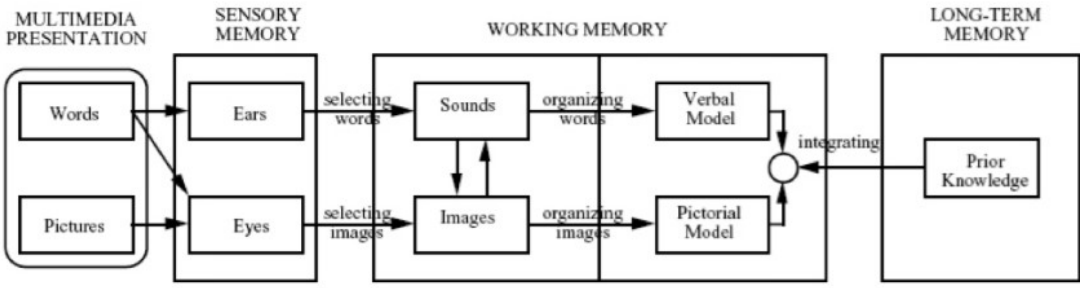

Figure 1. Cognitive theory of multimedia learning

This theory is mostly based on the studies of Mayer (2014) and includes three assumptions:

- Dual channel assumption: Two modes of representations are processed in the working memory. One is verbal and the other is pictorial.
- Limited capacity assumption: A limited amount of information can be processed simultaneously through each channel.
- Active processing assumption: Learning occurs when relevant verbal and pictorial information is selected, organized and integrated with the prior knowledge.

2.2 Cognitive load theory and the redundancy effect

CLT is based on the idea that when new information is presented to the learners, the instruction should be designed in the way that it doesn't create an extraneous cognitive load in the working memory and that it should take the constraints of the working memory of the learner into account (Sweller, Ayres, & Kalyuga, 2011). The design of the learning material, therefore, should aim to decrease the extraneous cognitive load that can occur in the learning process while the learner is focusing on the new material. If the material has a lot of distracting or extra elements on it, learners will have difficulty in focusing on the material, which causes cognitive load that most probably affect learning negatively. There are three components of cognitive load:

- Intrinsic cognitive load: It is caused by the nature of the information or the instruction material.
- Extraneous cognitive load: It is caused by the structure of the instruction material such as instructional strategies, content design, feedback design, etc.
- Germane cognitive load: It is the rest of the working memory that learners use in the learning process.

There are many effects of the CLT, but in this paper the redundancy effect will be the main subject of argumentation. The redundancy effect of CLT occurs when a learning material duplicates information using two different channels of the working memory. This effect suggests that when the material is designed to include an animation/a diagram/an image and narration, adding the transcription of the narration on the screen or the textbook causes cognitive load on the learner's working memory. According to Sweller et al. (2011), the reason for this situation is not only because the visual channel is overloaded due to the animation/diagram and

the text that are presented together, but also because the printed text is exact the same version of the narrated audio.

There is considerable amount of research conducted by different researchers that support the redundancy effect of CLT. In the series of six experiments conducted by Chandler and Sweller (1991), the researchers tested the effectiveness of integrated materials and the amount of potential cognitive load on the learners' working memory during the learning process. With the participation of 20 first-year apprentices in experiment 4, the researchers presented 3 types of instruction material: diagram-only, conventional and modified groups. The modified group had text and diagram integrated. After the instruction and the testing steps, the authors concluded that diagram-only group spent less time on the learning material compared to the other groups, asserting that cognitive load can be decreased if the material is presented to the learners in the visual mode only. However, the modified group had to spend more time on the task, which was an estimated result for the researchers. The question was whether this case would hinder learning or not. According to the test scores, the diagram-only group outperformed the other two groups in two of the three questions due to the integrated text which was found to cause more cognitive load. The authors concluded that when there is no need for integration, the instructional designer should avoid using text with a diagram.

Experiment 5 was conducted to test the consistency of the results obtained in experiment 4. The procedure and the group divisions were the same as experiment 4. The researchers found that the results of this experiment were consistent with those of experiment 4. The diagram-only group performed significantly better than the other two groups in five of the six questions given to the participants. The authors concluded that the text integration in the modified group led to longer time spent on the material which then resulted in cognitive load. The authors suggested that redundant information could impede learning and should be removed from the material, which, in this case, is the text.

Kalyuga et al. (1999) tested three different ways of presenting the learning material and examined their effects on students' performances. 34 students participated in the experiment and they were given a material about soldering. The three materials students were presented were audio-only, visual text-only and visual text and audio. Results show that when students are given an audio-only type of instruction, they perform significantly better in the tests. The duplication of the narration, which is presented as a text, is reported to inhibit learning because of an increase in cognitive load.

Similarly, Pociask and Morrison (2008) tested the effectiveness of instruction types in terms or redundancy and split attention. 41 first-year physical therapy students participated in the experiment and they were divided into two groups: the conventional and the modified. The instruction material was about complex orthopedic physical therapy skills. The conventional group were given the actual units of the content, while the modified group were given the same unit with an important modification: removal of redundant information. At the end of the experiment, the participants were given a written post-test and psychomotor tasks.

The modified group had significantly better results in the post-test and the psychomotor tasks, and they were observed and reported having less cognitive load during the learning process. Results show that the instruction material becomes more effective when redundant information is removed from it.

In sum, according to the Chandler and Sweller (1991), while trying to get the meaning from the material and learn it, students are expected to spare the whole working memory on learning the material. The visual channel of the learner should not be forced to take in two types of representation at a time as it will increase extraneous cognitive load. However, the authors' aim is to increase the germane cognitive load, which is the meaningful time and effort spent directly on the learning material without any unnecessary details or redundant information that can cause distraction or a cognitive load in the working memory.

The experiments mentioned and cited in this section focused on redundant text without a narration. The following section will be more about the effects of spoken and written text combined. Literature on on-screen text when combined with animations or narrated diagrams will be evaluated.

2.3 Redundancy principle and multimedia learning

The redundancy principle of CTML is based on the idea that when written text and narrated audio give the same information and if there is an animation or image, the written text is considered redundant. However, there are not strict guidelines or standards to follow in terms of this principle as it has been found that results might change depending on the learning domain, prior knowledge or learner control. Mayer et al. (2001) have found that there is a decrease in student learning performance when they are given narration and on-screen text at the same time. In

this study students were presented a-140s animation about the formation of lightning. In the first experiment, the first group received animation and narration and the second group received animation, narration and on-screen text summaries. Results show that students who received animation and narration performed significantly better than the students who received animation, narration and on-screen text, both in retention and transfer tests. However, in order to understand the reason behind these results, the researchers conducted a second experiment to test whether these results were obtained either because the text and narration did not match or because the visual channel was overloaded. In the second experiment they added a third group which received animation narration and full on-screen text. Results showed that adding a summary of the narration or the full text version of it hinders learning significantly according to retention and transfer tests.

These results are consistent with what Chandler and Sweller (1991) argued when they examined the redundancy effect of CLT. Students had to read the text and watch the animation at the same time, which causes extraneous cognitive load that in most cases hinder learning. However, it can also be said that the setting of the experiment, the learning material and/or the fact that students had no control over the learning material might have had an influence on the results of this study.

Craig, Gholson and Driscoll (2002) tested the effectiveness of animated pedagogical agents in students' learning the formation of lightning used in Mayer et al. (2001) with a little bit of change. In the first experiment, they found that the presence of the agent did not cause a split attention factor, so they conducted one more experiment to evaluate the effects of redundancy and the animated agents. 71 students who participated in the experiment were separated into 3 groups: spoken-only, printed-only and spoken and printed combined. They found that it is better to present the

instruction material as spoken text only rather than printed-only or printed and spoken texts combined. The spoken-only group with an agent performed better in the retention, matching and transfer tests. These results are consistent with Kalyuga et al. (1999) with an addition of animated pedagogical agents.

In another study that supports the redundancy principle of CTML, Jamet and Bohec (2007) revealed that when on-screen text, whether sequential or static, is added to a multimedia presentation which consists of diagrams and narration, it causes an impairment in retention and transfer tests. The researchers relate the reason for this result to the overload in the visual channel. In this experiment, the students who received only diagrams and narration performed better in retention and transfer tests compared to the students who received diagrams, narration and sequential text and the students who received diagrams, narration and static text. The authors also note in the limitations that the results might differ if the students had the control of the learning process as this could contribute to the reduction of the cognitive overload. Another important point that should be taken into consideration is that the authors found no difference between sequential text group and the full text group. This could be because the full text group was exposed to four long sentences in one slide and the sequential group had the same number of sentences one by one and the last sentence without being erased, which clearly did not help the cognitive load to decrease. One suggestion could be that students can have fewer static sentences in one slide and a control over their learning process in order to reduce the cognitive load.

Leslie, Low, Jin and Sweller (2012) tried to find an answer to the question whether redundant on-screen text would affect the low or no prior knowledgeable students and high prior knowledgeable students the same way. They worked on fifth

and sixth graders. The topic was magnetism and light. They divided the students into two groups, which are audio only, and audio and simultaneous on-screen text. The students were then given a retention and a transfer test. Results show that when students have prior knowledge about the subject, the on-screen text is redundant. However, when the students have little or no knowledge about the subject, then the on-screen text becomes necessary, or at least as the authors suggest the visual presentation does not hinder learning performance. This study is significant as it provides evidence for the fact that redundancy principle might not be applicable when the learners have low knowledge about the subject. The reason behind these findings on the learners with low prior knowledge could be because the learning material did not have any other visual channel item such as an animation, a picture or a diagram. This means that the students did not have to split their attention visually, so they easily focused on the on-screen text while listening to the audio. However, if they had to focus on another visual item, they might not have had the same results from the tests especially when they do not control the learning process. In this case, the fact that the students are bound to the audio and cannot control the learning material might have affected the results of this research.

In a study conducted by Ari, Flores, Inan, Cheon, Crooks, Paniukov, and Kuruçay (2014), the participants were divided into two groups. The first group received diagrams, narration and on-screen text while the second group received diagrams and narration. The focus of the learning material was 12 points of articulation. At the end of the treatment, students were assessed using four instruments; a comprehension test, a matching test, a labelling test and a reconstruction test. According to the results, the group who received the diagrams, narration and the on-screen text performed significantly better in labeling and

reconstruction tests. Looking at these results the researchers came up with an instance of reverse redundancy. Although the students in this study had the control over the learning process and the on-screen text was short, they could only perform better on labelling and reconstruction tests. The authors did not give an explanation why there was no improvement in the comprehension tests. Overall, the authors suggest that the redundant on-screen text does not always decrease the performance of the students, instead it may even help students improve their learning. The learning mentioned here is not comprehensive and transferable learning, but it is based on memorization and retention. It would be good to improve the settings in this study by aiming to improve students' transferable learning in an EFL context.

To sum up, when students receive an instruction material regarding a science-related lesson, where they easily understand the narration in their language, it has been reported in many cases that the on-screen text that duplicates the narration is redundant. The following section examines the redundancy principle in language learning and teaching context.

2.4 Redundancy principle in language teaching

Plass, Chun, Mayer, and Leutner (2003) tested the influence of different types of annotations on learners' reading comprehension and vocabulary acquisition. There were four groups in this experiment. The first group, being the control group, received no annotations. The second group was given verbal annotations only with a dictionary showing the meaning of the word with a narration. The third group were provided with visual annotations only. They received an image or an animation related to the word in the text on the screen together with a narration. The last group were introduced both visual and verbal annotations at the same time. Overall test

results show that visual only group had lower scores in the text comprehension test compared to visual-verbal group. The authors conclude that visual only annotations can hinder learning in reading comprehension, pointing out that the visual annotations cause cognitive load while reading a text. However, the authors do not interpret the findings of visual-verbal group that scored similar to the control group and performed significantly higher on the text comprehension test. This remains unclear in the study. Still, it can be noted that according to the similar scores of the control group and the visual-verbal group, this study demonstrates that a text and a visual when used together as an annotation do not hinder learning.

The study conducted by Diao and Sweller (2007) suggests that the on-screen text is necessary, and it may facilitate learning rather than being redundant when the aim of the presentation is to improve student's EFL (English as a Foreign Language) reading comprehension. While the results of this research provide evidence for CLT, suggesting that text only instruction has been shown to be more efficient in teaching reading comprehension to EFL learners, it contradicts with the modality principle of CTML which claims that words should be presented as narration rather than printed words. For example, even when there are not any pictures, diagrams or animations used in this study, the authors claim that "the common procedure of presenting both written and spoken material simultaneously may not be optimal" (p. 85). This comment makes it clear that when designing a multimedia learning environment, the EFL area may have different requirements from the disciplines of science on which many studies have been done. That's why there are not enough reliable guidelines about the redundancy principle to follow in order to design a multimedia learning environment in EFL. Overall, this research is significant for the EFL literature because there is little research focusing on language learning and how it is affected

by the redundancy principle of CTML, which makes it more difficult for instructional designers to create new learning environments because of the scarcity of reliable guidelines.

Another study that focuses on language teaching and the redundancy principle was conducted by She et al. (2009). 16 fourth-year students of a university took part in this study. The participants were given three different versions of an on-screen material, which aims to teach technical Chinese vocabulary items. The versions are text and narration, animation and narration, and text, animation and narration. After the instruction, participants were given a questionnaire, which aimed at understanding participant's perceptions on the instruction type they were given. They were not tested with a retention or a transfer test. According to the questionnaire results, the on-screen text together with narration and animation was much easier to understand, and the lesson was more interesting when text, animation and narration were given as an instructional tool.

In contrast, Moussa, Ayres, and Sweller (2012) conducted a series of experiments to test the effects of reading and listening materials on students' listening skills in an EFL context. In the first experiment, students were divided into two groups: read-only group and read and listen group. The read-only group received the instruction only in written format in all 4 steps: word learning, word translation, sentence learning and sentence translation, while read and listen group had the same written format plus the narration that duplicates the written text. Results show that the read-only group did better on the listening test compared to the read and listen group. The author conclude that it is better to focus on one single mode - in this case read-only - if the aim is to improve listening skills of the EFL students. The authors tested these results in two more experiments within the same study, the results of

which were consistent with the first one. They found that if the redundant mode that contained similar information is removed from the instructional material, students learn better. They explain the reason for this result with the decrease in the cognitive load in the working memory of the learner during the learning process, in which case the learner does not have to deal with redundant information.

Another research that focuses on the on-screen text and whether it is redundant or not is conducted by Samur (2012) on language teaching. The learning material used in this study aims to teach words in Turkish to non-Turkish participants and as it only focuses on teaching the meanings of the words, not how they are meaningfully used in a sentence, the students in this experiment take only a retention test at the end of the treatment. Results show that when students receive on-screen text together with the animation and narration, they remember more words and get better results in retention tests. The retention results of this study are consistent with the perception study of She et al. (2009) on the instruction types. Additionally, as in Diao and Sweller's (2007) study, this study helps us see that the area of EFL may have different needs in contrast to the areas of science when a multimedia learning environment is going to be designed.

The previous research outlined above demonstrates varying results in reading comprehension, vocabulary acquisition and listening skills depending on the students' needs and prior domain knowledge. Therefore, it can be concluded that instructional designs are not likely to be standardized due to varying students' needs when the context is learning a language unlike science lessons.

2.5 Learner control and multimedia learning

This section of the chapter includes the review of literature about the integration and amount of learner control and its relation with the cognitive load. The learner control principle is based on the idea that learners are allowed to decide upon the pacing, sequencing and selecting the information in the learning material (Scheiter & Gerjets, 2007). According to this principle, learners can have control over the order of the material, the content units and the way material is represented. It is highly suggested that learners be allowed to decide upon the pacing, sequencing and selecting information. According to Scheiter (2014), the reasons for this are learning process being more active, motivation being increased, self-regulatory skills being enhanced, and the learner needs being adapted according to the learner.

Scheiter (2014) divides the learner control into two environments: the linear and non-linear. The linear learning environment allows the learner to use the "back" and "next" buttons, while the non-linear environment allows the learners to make transitions between slides or pages through the use of hyperlinks. In this environment, learners can also decide upon the way of representation and the context of the learning material. Both learning environments have advantages and disadvantages depending on the learners' prior knowledge. If a learner does not have the basic information about the learning material, a linear environment would be a better option in terms of guiding and directing the learner. However, for a learner with high prior knowledge, it is better if they have control over the pacing, sequencing and selecting of the instruction material.

There is a considerable number of studies on learner control and its effectiveness on how it reduces the cognitive load and fosters the learning process. Mayer and Chandler (2001) aimed to test the effectiveness of learner control over the

learning material. The participants were divided into two groups. The first group (PW) could control the material segment by segment. Each segment presents 10s animation. However, the second group (WP) could only see the 140s animation of the lightning formation as a whole without any control. The reason for dividing the animation into segments is because the researchers hypothesized that it would create less cognitive load in the learners' working memory during the learning process and the material would be better understood as the learners move to the next segment after they are sure that they have acquired all the required information from the segment. The type of the control given in this experiment is a linear environment. Learners were only able to use a "next" button in the learning material. Results showed that learners in the PW group had better transfer scores compared to WP group. The authors found that when learners were given control over the material, cognitive load could be reduced during the learning process leading to higher scores in the transfer test.

Similarly, Mayer, Dow, and Mayer (2003) conducted a study to test the effectiveness of interactive agent-based microworlds in which learners, along with controlling the pace and order of the learner material, could interact with the agent by asking questions and receiving answers from it. In the first experiment, the type of feedback students received differed. The first group received a narrated feedback from the agent while the second group had a written feedback. According to the results, students with the narrated feedback did significantly more correct answers on the transfer test, pointing out that when students are in an interaction with the material, it is better to present the feedback orally rather than written. The reason for the low scores of the written feedback group, according to the authors, is the overload in the visual channel of the learners who had to simultaneously focus on the

agent and the text during the instruction. This study shows that whether the students interact with the learning material or not does not have a significant influence on the cognitive load that results from the on-screen text. However, in the second experiment, the effect of interaction was examined. The first group received an interactive version of the material. This feature allowed them to control the pace and order of the learning material. The second group, however, could only use the start button and study the material with continuous animated narration. Results showed that students performed significantly better on problem solving tests when they were provided with an interactive instructional material. The authors, therefore suggested that learners be allowed to control the pace and order of the learning material.

Hasler et al. (2007) tested the effects of learner-controlled environments on the test performances of the learners who were instructed the determinants of day and night. Four groups were compared in this experiment. The narration-group was presented with a narration of the learning material without any control given to them. The system-based group was given a continuous animation. The learners had no control in this material. The segmented group was allowed to view the segments one by one in a sequence. The learners could move between the segments but could not stop the animation. The stop-play group were allowed to use the "pause" and "play" buttons during the instruction. The learners could control the pace of the instruction in this group. The third and the fourth groups had the opportunity to process information between segments. By doing this, the researchers aimed to reduce the cognitive load to enhance learning. Yet, the first and the second groups had to process the learning material without controlling the segments or the pace. The authors hypothesized that this situation would cause cognitive load that would impede learning. Results are consistent with the hypothesis of the researchers, and

the segmented and the stop-play groups outperformed the narration and system-based groups in the tests given after the experiment. Thus, it can be concluded that it is better if students were provided with control over the learning material.

Tabbers and de Koeijer (2009) conducted an experiment to test the interactivity principle. Their hypothesis was to replicate the principle and obtain the same results of the earlier studies. Two groups were tested in this experiment with a total of 52 participants. The materials used were lightning formation animation used by Mayer and Chandler (2001) with a slight difference. Learner controlled group could use the stop-play buttons, enable the narration option and navigate between slides, while the group without learner control could only follow the slides that move automatically without any control on them. The authors also tried to find a relation between the effectiveness of learner control and interest, prior knowledge and cognitive involvement. Results showed that students with the learner control did better on the transfer tests compared to the students without learner control. However, they also found that the learners in the learner control group spent a lot of time on task, and they could not find a relation between interest, prior knowledge and cognitive involvement and the effectiveness of learner control. Still, it can be said that learners perform better when they have control over the learning material.
In this study, the amount of the control given to the learners is limited to linear control because the learning material is a detective story having a linear scenario and the participants are novice learners with low level of prior knowledge about the learning material.

To sum up, it has been observed and examined that learner control principle is an effective way to help reduce the cognitive load during the learning process, to help learners enhance their performances and understanding. The question is whether

the integration of a linear learner control environment reduces the cognitive load of novice learners' cognitive load when learners are presented a redundant on-screen text which duplicates the narration, and which is reported to have increased cognitive load in most cases.

2.6 Self-regulation

For students to stand out from other members in their classes, self-regulatory skills play a crucial role, claims Zimmerman (1998). Those students are the learners who are able to transform their mental abilities into academic skills. In an academic environment when such students face some disadvantages related to their family and social life, lack of resources and limited access to high quality instruction, they can overcome those hardships with their goal-setting, self-monitoring and strategic thinking skills, thus becoming "controllers" of their academic lives rather than being "victims" (Zimmerman, 1986, p.1).

The students who are considered self-regulated are, therefore, their own facilitators in their learning process, not just behaviorally, but motivationally and metacognitively as well (Zimmerman, 1986). The main purpose of the decisions they make is to enhance their academic achievement (Zimmerman, 2001).

There are three phases of academic self-regulation: The forethought (the preparation for learning), performance or volitional control (the process of learning control, concentration and performance) and self-reflection (the process after learning efforts). Table 1 shows each phase and their sub processes.

Table 1. Cyclical Self-Regulatory Phases

Forethought	Performance/Volitional Control	Self-Reflection
Goal-setting	Attention focusing	Self-evaluation
Strategic planning	Self-instruction/imagery	Attributions
Self-efficacy beliefs	Self-monitoring	Self-reactions
Goal orientation		Adaptivity
Intrinsic interest		

To complete a whole process for an academic self-regulatory learning, a cyclical movement between the phases is required. The most important link during this process is between the third step, self-reflection, and the first step, the forethought, as this link ensures the sustainability of the whole process. Only after the learner is triggered to rethink and evaluate the learning process, and prepare himself to initiate a new goal, is the self-regulation process considered to have been completed. The following literature aims to explain the relationships of self-regulation with specific factors and its impact on some learning environments.

According to Lange and Costley (2018), intrinsic cognitive load results from different reasons and the amount of interaction and the complexity of the learning material are some of them. The participants of the study were asked to do surveys on intrinsic load, germane load and self-regulated effort. According to the survey results, a positive relationship between germane cognitive load and self-regulated effort has been observed, and a negative relationship between intrinsic cognitive load and germane cognitive load has been reported. However, the positive relationship between germane cognitive load and self-regulated effort was more significant than the negative relationship between the intrinsic cognitive load and germane cognitive load. The authors conclude that intrinsic load can be compensated through the self-regulated effort. Therefore, the amount of self-regulated effort can be deduced to

decrease the disadvantages caused by the complexity of the content and learning material.

Apart from its positive relationship with germane cognitive load, self-regulation has been reported to have been positively related to the willingness to speak in English as a foreign language (Arkavazi & Nostratinia, 2018). EFL learners usually find it somewhat more challenging to speak in conversations in the target language (Bailey & Savage, 1994). Communication in real life situations, especially in a foreign language, requires active participation of the person who speaks. MacIntyre, Dörnyei, Clement, and Noels (1998) suggested that self-confidence and readiness to speak are two essential factors that influence the willingness to speak, along with the attitude to the target language culture, the context of the conversation and other personality factors. Therefore, those who have more self-regulatory skills can be predicted to be more willing to speak as Arkavazi and Nostratinia suggest in their article. The participants of their experiment were given questionnaires, the results of which show that self-regulation can play an active role in a manner that initiates the urge to communicate in EFL learning process. It can be predicted to make a significant difference in language learning.

Ping, Baranovich, Manueli, and Siraj (2015) claim that self-regulatory strategies ought to be taught to the students for vocabulary studying and learning purposes. With the help of those strategies, Ping et al. believe that strategy use awareness and effective use of vocabulary learning strategies of the students are likely to improve. Learning to use vocabulary is essential because it is considered to be the internal link between all other major language skills, and a determining factor in achieving language acquisition (Jordan, 1997). The survey results of the study show that the insufficient vocabulary knowledge of the students results mainly from

the deficiency in using cognitive strategies, metacognitive control strategies such as goal-setting and planning, and low self-efficacy and motivation. These results highlight the necessity of enhancing students' self-regulation in academic environments.

Similarly, according to Kinzie (1990) for an effective interactive instruction, learner control, self-regulation and continuing motivation should be taken into consideration. While the question whether students will make good choices when they are given learner control remains unclear, the answer depends mainly on the use of global learning strategies that would help learners to overcome problems related to learner control and other various self-management issues (Resnick, as cited by Kinzie, 1972). Besides, learner-controlled instruction can be improved through self-regulatory strategies. At the same time, Kinzie claims that learner control can also help students develop self-regulatory strategies. When students are allowed to shape their learning in line with their personal needs and interests, they will have more opportunities to explore and practice instructional strategies which will then increase the likelihood of improvement in their self-regulation.

With the suggestion that no single cognitive learning strategy has an equal influence on students and the fact that self-regulatory skills play a major role in academic life, it is worth testing those skills in different conditions. In this study, they were tested with redundant on-screen text and learner control variables. The design of the learning material has the potential to arouse and trigger extraneous cognitive load, which will affect overall learning process, while the inner structure of the learning unit might as well increase the intrinsic cognitive load. At this point the question is whether self-regulatory skills help decrease the disadvantages created by redundant on-screen text and learner control given to students.

CHAPTER 3

METHODOLOGY

This chapter provides descriptive information about the method of this research. Details about the research design, sampling and the participants, the instruments, the material and data collection procedure are presented.

3.1 Research design

This study aims to find out the effects of learner control and the redundant on-screen text on EFL learners' learning Past Tense in English. As the participants had already been distributed by the planning offices of the related departments, this research study was designed as quasi-experimental research (Creswell, 2012). The academic self-regulation scale scores, prior knowledge test scores, and one of the four different versions of the online tutorial students were assigned to use were the independent variables of the study. The dependent variables of the study were the students' retention and transfer test scores in the subject of simple past tense in English. The purpose of giving students a prior knowledge test about the subject before the experiment was to get a better understanding of any change in the test scores and to generalize results more appropriately and ensure that the students assigned to different version of the treatment condition were identical in terms of cognitive entry behaviors. A retention test about the context of the past event and a transfer test about the learning unit were given after the experiment. The prior knowledge test and the posttest instruments were not the same so that the threats to the internal validity of the research were minimized.

3.2 Sampling and participants

In this study, the target population was students with a beginner level of English at universities in Turkey who have not studied the Simple Past Tense unit. Convenience sampling method was used due to the accessibility of the students who study in a foundation university in İstanbul. The reason for this selection was the easy access of the researcher to the students. The researcher works there as an instructor of English, so the implementation of the experiment was easily completed with the help of the co-workers at the same department. The participants of this experiment were determined with the decision of the level-1(beginner level of English) coordinator, who assigned the first 10 of the 21 classes to attend the experiment and sent emails to the teachers of those classes, so the participants were randomly assigned. The students who were selected as participants were students who were taking beginner level English courses according to their departmental programs and English Preparatory school. When selecting the participants, the most important criterion was the fact that they had not studied the simple past tense unit yet. Data were collected from 150 students from 10 classes in the preparatory school of the foundation university. Eighteen students were dropped from the sample in analysis stage of the study because they did not take one or more tests; 118 participants came from the English Language Programs, and the rest 32 students came from the Vocational School of Justice department. The age of the participants ranges from 17 to 33. The department head and the school committee were informed about the experiment (see Appendix A). It wasn't compulsory for the students to participate in the experiment, so they were given a consent form as well (see Appendix B). Students who did not participate in the experiment had the opportunity to practice the same learning unit with their course teacher in a face-to-face tutorial.

3.3 Material

All the groups in this experiment were asked to use an online tutorial developed by the researcher on Articulate Storyline II. Each group was given a different version of the material. The tutorial was regularly checked during the design process by one of the teacher trainers in English Language Programs in terms of context and content of the material, and during the development process by the thesis advisor in terms of multimedia principles. These regular checks were made to ensure validity and effectiveness of the learning material. This tutorial aimed to teach Simple Past Tense to the students, who then studied the subject in 15-20 minutes depending on the experimental group they were in.

There were four steps in the learning material based on the context: The introduction of the case, the presentation of the main learning gains, the practices and clues (two steps) and the conclusion. The treatment of the four groups is listed in Table 2:

Table 2. Groups and Treatments

	Multimedia Condition	Abbreviation	Number of Participants
Group 1	Narrated Slides + On-Screen Text + No Learner Control Given	TNC	33
Group 2	Narrated Slides + No Learner Control Given	NTNC	33
Group 3	Narrated Slides + On-Screen Text + Learner Control Given	TC	32
Group 4	Narrated Slides + Learner Control Given	NTC	34

The material used in this study is a self-study tool that contains a specific content and activities which are not available in the coursebook the students use. However, the objectives of the course were in line with the course book used in the English Language Programs. The following are the objectives of the learning unit, which can be listed as:

- Identifying the regular and irregular verbs
- Using correct past form of the verbs in sentences
- Asking and answering simple questions in written format

The material consisted of 4 steps and 30 slides (screen) in total. In each step, there was not only one objective, instead there were more than one objective in every step. Eight of the slides were introductory slides in which students were explained what to do next. Ten of the slides were designed to ask questions to the students about the slides earlier. Eight of the slides were animations or images about the context in which students followed the story. Finally, 4 of the slides were end slides in which students were presented the end of each step. The context and the scenario of the online tutorial were created by the researcher in a way that it could draw the students' attention. Every student in the experiment had access to the game as it was already installed on the PCs in the university's computer labs in the campus. After the completion of the prior knowledge test, students were asked to start the tutorial they were assigned by clicking on the "play" button as shown in Figure 2.

Figure 2. The entrance screen of the tutorial for all groups

Besides, the question slides were the same in all the groups in the study. Below are some examples of question types (see Figures 3, 4, 5, 6 and 7).

Figure 3. An example of a simple "drag and drop" question type

The question in Figure 3 is the introductory question that the students were given. They were expected to drag the option "didn't" and drop it in the blank part of the sentence. In this question, students could not answer incorrectly. They could drag the wrong options (doesn't and isn't) but could not drop them into the blank. The aim of this exercise was to make an awareness in students' minds that "didn't" is used in

different contexts when compared to “doesn’t” or “isn’t”. After the drag and drop process, students got a feedback that explained the reason for using “didn’t” in this context. The second practice question has been designed in the same fashion as well.

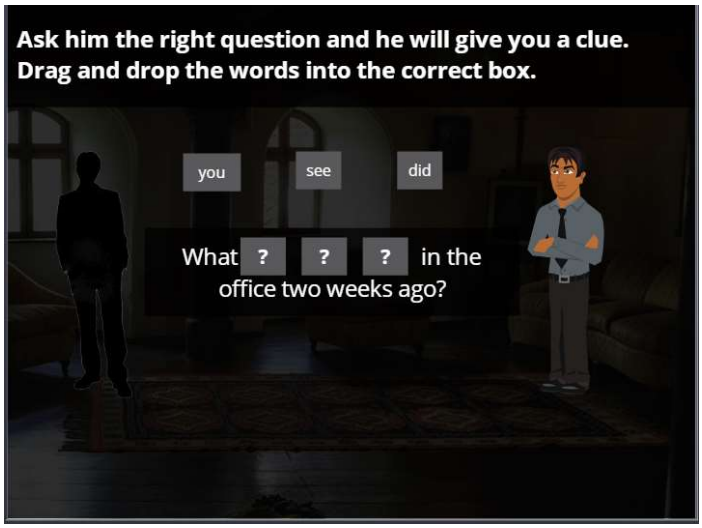

Figure 4. An example of a complex “drag and drop” question type

The question shown in Figure 4 is designed to test if students would be able to make a question in Simple Past Tense. The target words were given in the wrong order, and students were expected to put them in the correct order. Students could give wrong answers this time. In this case, they got a clue in the feedback page, telling them that “did” should come first when making a question. After they did it correctly, they saw the explanation of how questions were made in Simple Past Tense in English.

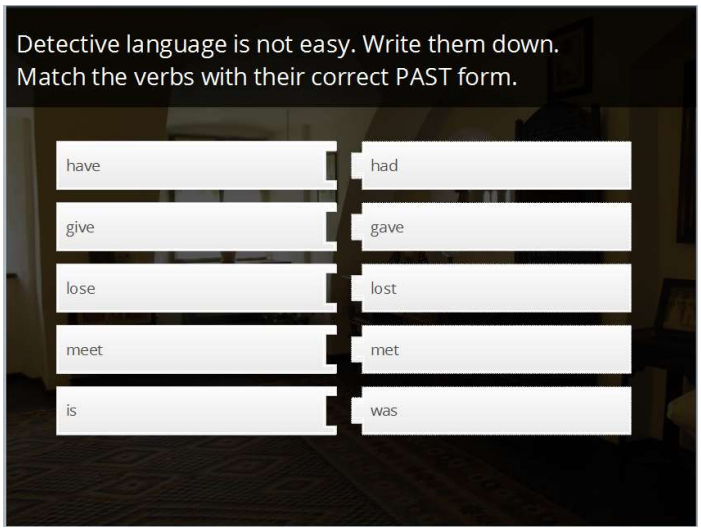

Figure 5. An example of a "matching" question

The purpose of the question in Figure 5 was to make students become more familiar with the past forms (V2) some irregular verbs that are commonly used in English. Students were expected to bring the present (V1) and past (V2) forms together by making associations between the verbs that resemble each other such as give-gave and meet-met.

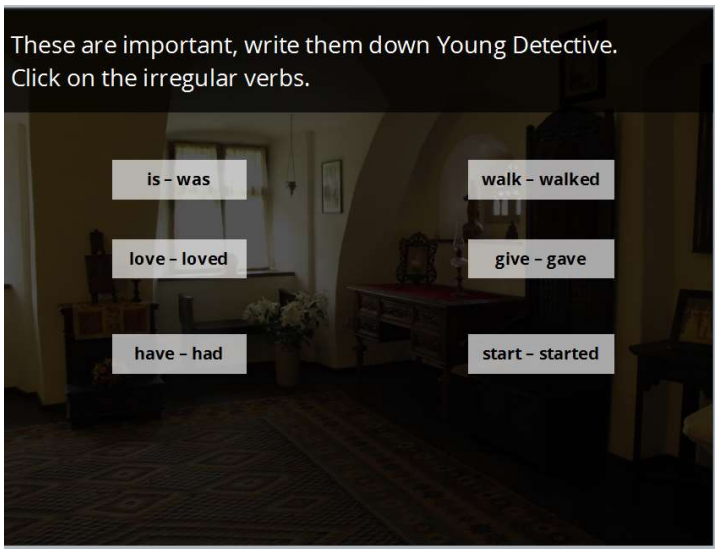

Figure 6. An example of a "pick many" question type

In the question presented in Figure 6, the researcher aimed to create an awareness of regular and irregular verbs in the students who were expected to differentiate the verbs that take "-ed" in the past with the verbs that change their form.

Figure 7. The final question – an example of a "short answer" question type

The question in Figure 6 is the final question of the tutorial in which the case is being solved with the help of the storyline students follow, and the clues they get in the last practice section. If the answer is wrong, the system first asks them to try again, but if they fail twice, they are directed back to the beginning slide of the previous section to do same practices again.

All the questions, slides and practices share the same design in every treatment condition. Also, students get exact the same feedback in every condition whether they answer the questions correctly or wrong. The feedbacks were important as they included explanations, examples or clues, so they weren't designed to be different in either on-screen text or learner control conditions.

About the theme and the context of the material, students were given a criminal case to be solved with the help of the clues given at each stage. Regardless of the condition, the participants were given a small introduction about the case. Then they investigated the witnesses one by one. After investigating the witnesses, they did some practices by trying to question the suspects of the crime. Finally, they were asked to write the name of the person who they think was the criminal.

However, to answer the research questions in the study, some differences were made in each group. The type of representation and the opportunity to navigate between slides differed from one group to another. The following part gives the specific features of each multimedia condition in the learning material.

3.3.1 Narrated slides + on-screen text + no learner control given (TNC condition)

In this condition, apart from the narration, animations and images that were the same in every condition, students were able to read the textual presentation that they already heard in the audio at the same time. The written text duplicated the narration in this condition. However, the students were not given control over the learning material. That is, they could not navigate between slides, and they had to wait for the end of the narration to move to the next slide. Slides moved automatically in this condition. And each slide lasted approximately 7-10 seconds, not allowing the students to listen to or read the material again (see Figures 8 and 9).

Figure 8. TNC condition

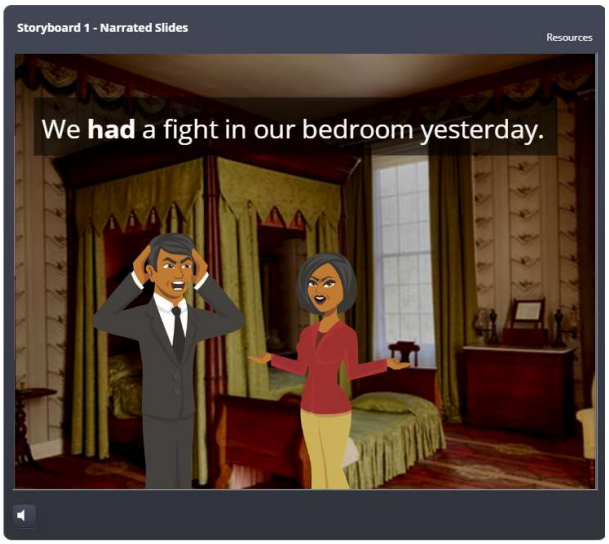

Figure 9. TNC condition

Some examples of animations are the man walking to the door, the door opening and closing, and the woman getting surprised after seeing the man lying on the floor motionless. Some examples of the images are the man and the woman shouting at each other, the man questioning the suspects and the man and the woman in the office.

3.3.2 Narrated slides + no learner control given (NTNC condition)

The difference between the TNC condition and NTNC condition is that students could not read the narration, but they could only listen to it while following the animations and images. Similar to TNC condition, the students in NTNC condition could not control the learning material (see Figures 10 and 11). The duration of the slides, the animations and the images were all the same ones used in the TNC condition.

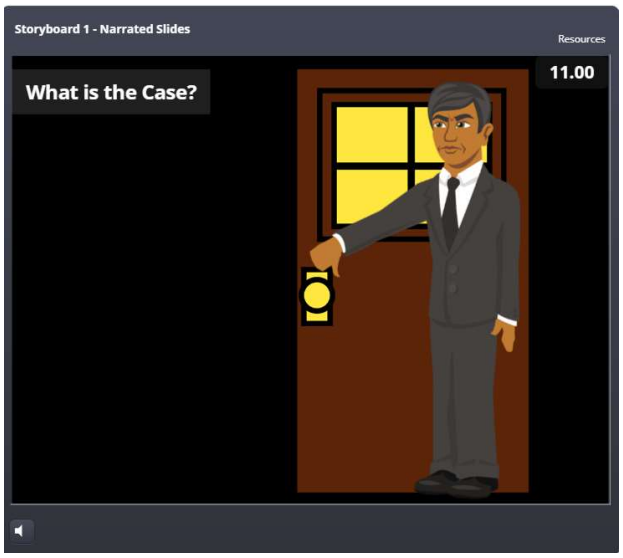

Figure 10. NTNC condition

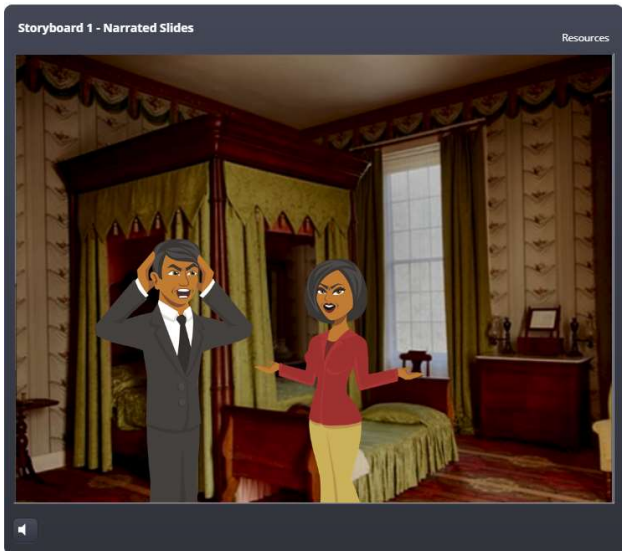

Figure 11. NTNC condition

3.3.3 Narrated slides + on-screen text + learner control given (TC condition)

This condition had both the on-screen text that duplicated the narration and the control over the learning material (see Figures 12 and 13). The slides did not move automatically. It was the students who had to move to the next slide to advance in the tutorial or move to the previous slide to review the material. The animations and the images were all the same ones used in the TNC and the NTNC conditions, but the duration differed because the students had the control over the pace.

Figure 12. TC condition

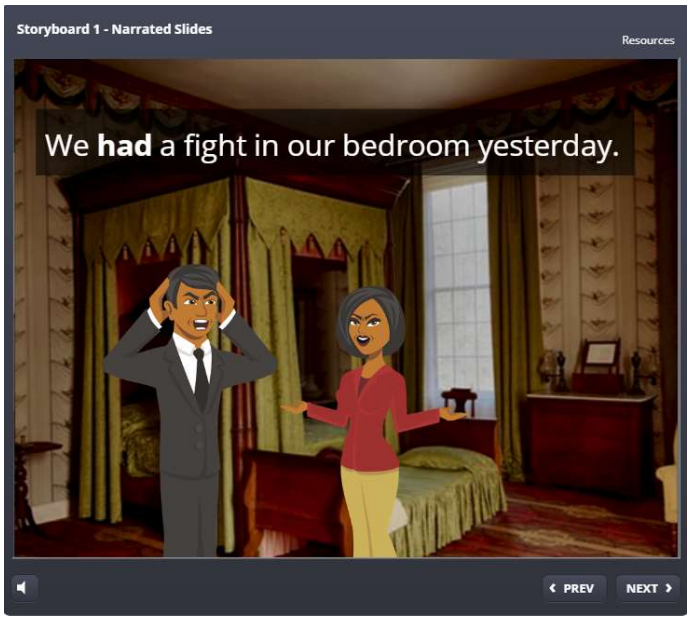

Figure 13. TC condition

3.3.4 Narrated slides + learner control given (NTC condition)

In this condition, students were unable to read the narration. They only listened to it while following the animations or images (see Figures 14 and 15). However, they had the control of the learning materials similar to the TC condition. The animations and the images were all the same ones used in the TNC, NTNC and TC conditions.

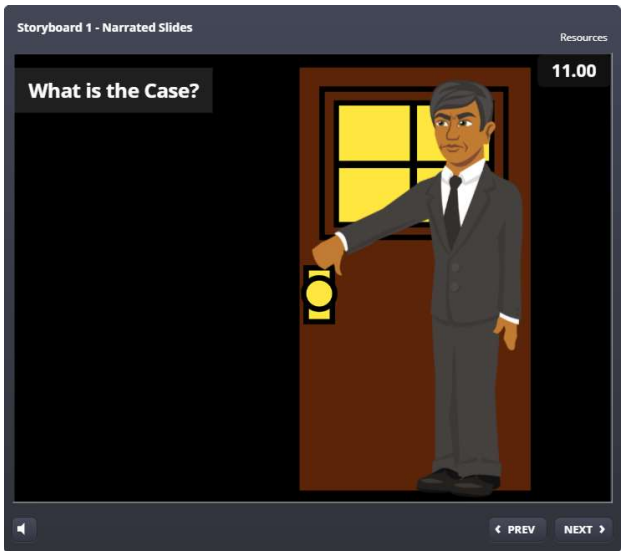

Figure 14. NTC condition

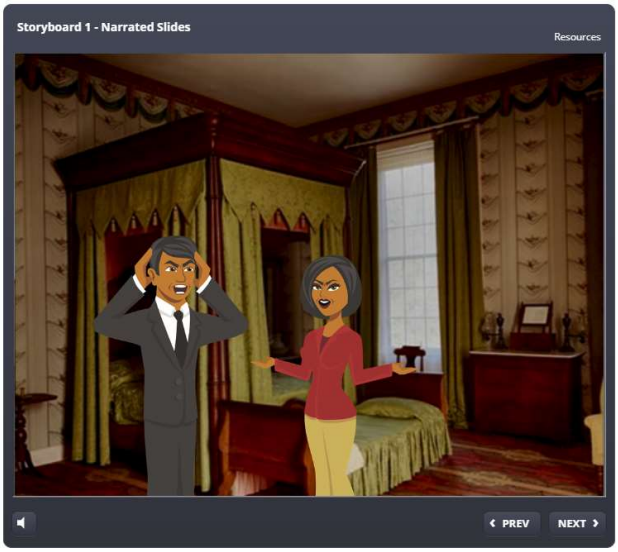

Figure 15. NTC condition

3.4 Instruments

There were 4 data collection instruments used in this study. Before the treatment, students were given an online academic self-regulation scale (see Appendix C) and a prior knowledge test (see Appendix D). After the treatment, students were given a retention test (see Appendix E) and a transfer test (see Appendix F).

The academic self-regulation scale used in this study was "Five-Component Scale of Academic Self-Regulation (FCSSR)" designed by Martinez-Pons (2000). There are five components in this scale, which are motivation, goal setting, strategy use, self-monitoring and strategy adjustment. The scale included 54 7-points Likert scale items where "1" means that the participant completely disagrees with the item, while "7" means that the participant entirely agrees with the item. As the scale is originally designed in English, and because the participants of this study know little English, a translated version was used for this study. Kaplan (2014) had the FCSSR translated into Turkish in her study, finding out that 48 out of 54 items were suitable for her study. In addition to this, the researcher made a factor analysis to the Turkish version of the scale and found that the scale had 4 factors (see Table 3).

Table 3. Cronbach Alpha Coefficient Values for Each Factor in FCSSR

Factors	Number of items	Internal Consistency (Cronbach alpha coefficient)
Goal Setting	15	.928
Strategy Usage	14	.93
Strategy Monitoring	15	.947
Receiving Support	4	.879
TOTAL	48	.969

The prior knowledge test was adapted from Azar's (1996) book of *Basic English Grammar* by the researcher. Then it was revised and finalized by a committee of teachers who work as teacher trainers or testing coordinators at the English Language Program of the university the researcher works in. This test is, therefore, considered content-valid. The first part of the test contains 10 fill-in the blank type of questions. Students were asked to use the verbs in brackets in the past tense form of the verbs in English. The second part has 5 questions students were asked to answer in full sentences. In total, the maximum score a student could get was 20.

The retention test was prepared by the researcher to test the recall of the students about the content of the treatment. Students were asked to match 10 events with 5 characters. This test was not designed to assess what students learned about the simple past tense in English. The purpose of this instrument is to test if the on-screen text or level of learner control causes cognitive load and influenced recall of the learning material. In total, the maximum score a student could get was 10.

The transfer test was also prepared by the researcher, but it was revised and finalized

by the same committee of teachers who revised the pretest because this test is designed to assess if students would be able to transfer what they have studied in the learning material into, in this case simple past tense, a different environment. This test is, therefore, considered content-valid. There was only one question and students were expected to write 10 sentences about a person's past. The sentences were related to each other. In this test, students were asked to use 10 verbs which they had studied in the learning material. In total, the maximum score a student could get was 20.

In sum, the tests are content valid depending on the reason that the questions are about the content of the course and they go parallel with the objectives of the course. They have been developed by a group of experienced instructors; and I, both as the researcher and the instructor of the course, am familiar with the content of the course and the validity of the tests. For these reasons, they were selected to be used in this study.

3.5 Data collection procedure

Before the experiment, required permission was obtained from the Boğaziçi University Research Ethics Review Board by the researcher (see Appendix G). Similarly, the researcher asked the permission of the participants to attend the research (see Appendix B) and the review board at the foundation university to conduct the research there (see Appendix A).

After the consents of all parties, the researcher was directed to the level coordinator of Level 1 groups. She was informed about the purpose, content, treatments and the procedure of the research. The level coordinator emailed the teachers of the assigned classrooms about the research, time and venue of the

experiment. Then the teachers informed the students about the time and venue of the experiment and that it was an experiment with voluntary participation.

On the day of the experiment, the researcher and his co-worker were present on the labs an hour ago to start the computers, open the scale on a browser in each computer and assign conditions to the computers by installing the game on every one of the computers. The reason for this was the internet being very slow in the campus, which caused the internet links that were created for each condition earlier not to work properly in the trials before.

All the data were collected in one day in this research study. Data collection was completed at the participants' school. First, the students were given the consent form. They were given time to read the form and sign it. Second, the students were told to open the "Academic Self-Regulation Scale" online. The link of the scale was already entered on each computer by the researcher and his co-worker. The students completed the scale in ten minutes. Students also typed their names, departments, ages and the multimedia condition they were assigned beforehand. Third, the prior knowledge test was given to all the participants. The researcher asked students to complete the test in ten minutes.

After the treatment, the retention and the transfer tests were given to the students successively. Ten minutes was assigned to the students for completing the retention test. After the researcher collected the retention test papers, he distributed the final test of the experiment: The transfer test, which took fifteen minutes to be completed.

3.6 Data analysis

This chapter gives detailed information about the groups that were matched in the analysis phase of the research. A number of different statistical tests were used to answer the research questions. First, students' prior knowledge test scores, self-regulation scale scores, retention and transfer test scores were matched with each student. Each paper was graded by the researcher, and at the end of the data collection process each grade was then saved in an excel sheet to keep track of the whole data. The sheet included the following information of the 150 participants: name, last name, version of the online tutorial, prior knowledge test scores, self-regulation scale scores, retention test scores and transfer test scores. During the analysis process, 18 students were dropped from the study because they did not attend one or more tests. Table 4 shows the groups that were matched to analyze the data and interpret the research questions.

Table 4. Research Questions and Matched Groups

Question 1	TC vs. NTC
Question 2	TNC vs. NTNC
Question 3	TC vs. TNC
Question 4	NTC vs. NTNC
Question 5.1	HSR + TNC vs. LSR + TNC
Question 5.2	HSR + NTNC vs. LSR + NTNC
Question 5.3	HSR + TC vs. LSR + TC
Question 5.4	HSR + NTC vs. LSR + NTC

3.6.1 Text + learner control vs. no text + learner control (TC vs. NTC)

"Courseware with text and learner control" versus "courseware with no text but with learner control" comparison was made to answer the first question (how does on-screen text affect students' retention and transfer scores on the Simple Past Tense unit when they are all given learner control?). The criteria were that students must have a version of the tutorial with the learner control, but the text condition differed. The groups that were matched were TC (n = 32) and NTC (n = 34).

3.6.2 Text + no learner control vs. no text + no learner control (TNC vs. NTNC)

"Courseware with text but without learner control" versus "courseware with no text and no learner control" comparison was made to answer the second question (how does on-screen text affect students' retention and transfer scores on the Simple Past Tense unit when they are not given learner control?). The criteria were that students must use a version of the tutorial without the learner control, but the text condition differed. The groups that were matched were TNC (n = 33) and NTNC (n = 33).

3.6.3 Text + learner control vs. text + no learner control (TC vs. TNC)

"Courseware with text and learner control" versus "courseware with text but without learner control" comparison was made to answer the third question (how does learner control condition affect students' retention and transfer scores on the Simple Past Tense unit when they are given on-screen text?). The criteria were that students must use a version with the on-screen text that duplicated the audio, but the control condition differed. The groups that were matched were TC (n = 32) and TNC (n = 33).

3.6.4 No text + learner control vs. no text + no learner control (NTC vs. NTNC)

"Courseware with no text but with learner control" versus "courseware with no text and no learner control" comparison was made to answer the fourth question (how does learner control condition affect students' retention and transfer scores on the Simple Past Tense unit when they are not given on-screen text?). The criteria were that students must use a version without the on-screen text that duplicated the audio, but the control condition differed. The groups that were matched were NTC (n = 34) and NTNC (n = 33).

3.6.5 Effect of self-regulation

The fifth question of the research (does self-regulation affect students' retention and transfer scores on the simple past tense unit in English?) has four sub-questions:

3.6.5.1 Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given TNC condition?

The main criterion for sub-question 1 was that students must use the TNC version of the learning material. The comparison was made between high and low self-regulation level students. The retention and transfer scores of low and high self-regulation groups were compared. The groups that were matched were HSR-TNC (n = 25) and LSR-TNC (n = 8).

3.6.5.2 Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given NTNC condition?

The main criterion for sub-question 2 was that students must use the NTNC version of the learning material. The comparison was made between high and low self-regulation level students. The retention and transfer scores of low and high self-regulation groups were compared. The groups that were matched were HSR-NTNC (n = 18) and LSR-NTNC (n = 15).

3.6.5.3 Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given TC condition?

The main criterion for sub-question 3 was that students must use the TC version of the learning material. The comparison was made between high and low self-regulation level students. The retention and transfer scores of low and high self-regulation groups were compared. The groups that were matched were HSR-TC (n = 16) and LSR-TC (n = 16).

3.6.5.4 Is there a significant difference between the retention and transfer scores of students with high self-regulation skills and those of students with low self-regulation skills when they are given NTC condition?

The main criterion for sub-question 4 was that students must use the NTC version of the learning material. The comparison was made between high and low self-regulation level students. The retention and transfer scores of low and high self-regulation groups were compared. The groups that were matched were HSR-NTC (n = 20) and LSR-NTC (n = 14).

3.6.6 Covariate effects

The groups consist of randomly selected students, who took a proficiency test in English and were assigned to take beginner level English courses. Therefore, the students were assumed to have equal prior knowledge about the learning unit. Still, they were given a prior knowledge test during the data collection day. Firstly, the normality of the prior knowledge test scores were evaluated according to the central limit theorem assumption, and the kurtosis-skewness values. Secondly, Levene's test was conducted to test the homogeneity of each group. Finally, a one-way analysis of variance test (ANOVA) was used to compare the prior knowledge test scores of each group. The research questions were tested using independent sample t-test with the assumption that the data had a normal distribution and the homogeneity of variance was provided. However, nonparametric tests were used to test the sub-questions as the number of participants in each group was fewer than 30.

Whether the prior knowledge, the self-regulation and the material version affect together or pairwise the students' learning of the unit was tested with a general linear model 2x2x4 ANOVA test.

CHAPTER 4

RESULTS

This chapter provides detailed information about the data analyzed to answer the research questions. Before deciding whether to use parametric or nonparametric tests, the descriptive statistics of the students' transfer and retention test scores, the distribution of these scores and the homogeneity of the variances were checked. Each comparison group was then analyzed one by one with the statistical test applicable. Table 5 shows the descriptive statistics of prior knowledge test, retention test and transfer test for the treatment groups. Table 6 shows the same statistics for the treatment groups with the self-regulation variable addition.

Table 5. Descriptive Statistics of Prior Knowledge Test, Retention Test and Transfer Test

		Prior Knowledge		Retention		Transfer	
	n	Mean	*St. Dev.*	Mean	*St. Dev.*	Mean	*St. Dev.*
TNC	33	3.121	4.967	4.788	2.190	8.667	6.541
NTNC	33	2.939	4.220	3.848	1.822	7.333	5.823
TC	32	3.188	4.130	4.125	1.979	3.906	5.082
NTC	34	3.235	3.585	3.294	2.250	2.735	4.925
TOTAL	132	3.121	4.202	4.008	2.116	5.652	6.075

Table 6. Descriptive Statistics of Prior Knowledge Test, Retention Test and Transfer Test Based on High and Low Self-Regulation

		Prior Knowledge		Retention		Transfer	
	n	Mean	*St. Dev.*	Mean	*St. Dev.*	Mean	*St. Dev.*
HSR-TNC	25	2.640	4.812	5.000	2.327	8.200	6.409
LSR-TNC	8	4.625	5.475	4.125	1.642	10.125	7.180
HSR-NTNC	18	3.222	4.796	3.889	1.567	6.722	5.808
LSR-NTNC	15	2.600	3.541	3.800	2.144	8.067	5.957
HSR-TC	16	2.688	3.700	3.625	1.784	2.938	3.750
LSR-TC	16	3.688	4.585	4.625	2.093	4.875	6.108
HSR-NTC	20	2.550	3.219	4.150	1.871	3.250	5.514
LSR-NTC	14	4.214	3.964	2.071	2.234	2.000	4.019
TOTAL	132	3.121	4.202	4.008	2.116	5.652	6.075

The first series of tests that were used during the analysis phase were normality tests, the results of which would determine the type of statistical tests in the following phases. First, Shapiro-Wilk and Kolmogorov-Smirnov tests were conducted. According to the results, prior knowledge test scores were not distributed normally between groups while two out of four treatment groups were distributed normally in terms of transfer test and all groups were normally distributed in terms of retention test. However, D'Agostino and Stephens (1986) state that Kolmogorov-Smirnov test is not a useful test for normality and it is better if not used. Therefore, when kurtosis and skewness values are taken into account, scores of the prior knowledge, retention and transfer tests were all normally distributed between groups. George and Mallery (2010) claim that when kurtosis and skewness values are between -1 and +1, that is the ideal state for normality, but when the values are

between -2 and +2, it is still acceptable for normality and therefore groups can be considered to be distributed normally (see Table 7). Third, the central limit theorem posits that data can be regarded as normally distributed when each group has at least 30 participants (Fields, Miles, & Fields, 2012). When this theorem is considered, the data groups in this research have been distributed normally.

Table 7. Skewness and Kurtosis Values of Prior Knowledge, Retention and Transfer Test Scores for each Multimedia Condition

	Prior knowledge		Retention		Transfer	
	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
TNC	1.229	-.135	.041	-.131	.121	-1.347
NTNC	1.333	.634	.041	-.181	.281	-1.127
TC	1.179	-.061	-.371	-.142	.213	.624
NTC	1.335	1.679	.321	-.676	1.865	1.246

The results of the normality tests show that it is acceptable to conduct parametric tests in this study. An independent *t*-test was applied to compare the means of retention and transfer test scores of each matched group. For the analysis of self-regulation variable, the number of participants in each group was fewer than 30, which is not enough to meet the assumptions of parametric tests, so non-parametric version of independent *t*-test, Mann - Whitney U test was used. As for prior knowledge test, a one-way ANOVA parametric statistical test was conducted to compare all the groups in order to make sure that all groups were equally distributed in terms of prior knowledge.

4.1 Prior knowledge test comparison

After the normality tests, homogeneity of variance test (Levene's Test) was conducted. The test scores revealed that homogeneity of variances (p = .121) was provided for each group. There was no statistically significant difference on prior knowledge test scores between the treatment groups according to the one-way ANOVA test F (3, 128) = .031, p = .993. See Table 8. According to these results, it can be concluded that the means of all groups were identical in terms of the prior knowledge test.

Table 8. One-Way ANOVA Test for Students' Prior Knowledge Test Scores in Different Treatment Conditions

	Sum of Squares	*df*	Mean Square	*F*	*Sig*.
Between Groups	1.674	3	.558	.031	.993
Within Groups	2312.387	128	18.066		
Total	2314.061	131			

Similarly, one-way ANOVA tests were made to examine if there were significant differences between groups in terms of retention and transfer test scores. Results showed that there were significant differences between groups for both retention test F (3, 128) = 3.010, p = .033 (see Table 9) and transfer test F (3, 128) = 8.205, p = .000. (see Table 10)

Table 9. One-Way ANOVA Test for Students' Retention Test Scores in Different Treatment Conditions

	Sum of Squares	*df*	Mean Square	*F*	*Sig*.
Between Groups	38676	3	12.892	3.010	.033
Within Groups	548.316	128	4.284		
Total	586.992	131			

Table 10. One-Way ANOVA Test for Students' Transfer Test Scores in Different Treatment Conditions

	Sum of Squares	*df*	Mean Square	*F*	*Sig*.
Between Groups	779.967	3	259.989	8.205	.000
Within Groups	4056.003	128	31.688		
Total	4835.970	131			

The *p* value of the one-way ANOVA tests ($p = .033$ and $p = .000$) indicate that further analysis should be carried out to examine the differences in more details in terms of retention and transfer tests. Therefore, the following independent *t*-tests were conducted to analyze each group in terms of text and control variables.

4.2 Text condition comparisons

4.2.1 Examination of the text and no text conditions with learner control given

An independent *t*-test was conducted to examine whether there is a significant difference between text and no text conditions on students' retention and transfer scores when they are given control over the learning material.

4.2.1.1 Retention in text and no text conditions with learner control given

The retention test scores of TC and NTC groups were matched for this analysis (see Table 11). Homogeneity of variances of the data (p = .372) was observed using Levene's test (see Table 12). The independent t-test showed that there was no statistically significant difference between the mean retention scores of TC condition (M = 4.12, SD = 1.97) and the NTC condition (M = 3.29, SD = 2.25); t (64) = 1.589, p = .117 (see Table 12).

Table 11. Descriptive Statistics for Students' Retention Test Scores in TC and NTC Conditions

Groups	Mean	*St. Dev.*	n
TC	4.12	1.97	32
NTC	3.29	2.25	34

Table 12. Independent Sample t-Test for Students' Retention Test Scores in TC and NTC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
.809	.372	1.589	64	.117	.830	.523

4.2.1.2 Transfer in text and no text conditions with learner control given

The transfer test scores of TC and NTC groups were matched for this analysis (see Table 13). Homogeneity of variances of the data (p = .485) was observed using Levene's test (see Table 14). The independent t-test showed that there was no statistically significant difference between the transfer scores of TC condition (M = 3.90, SD = 5.08) and the NTC condition (M = 2.73, SD = 4.92); t (64) = .95, p = .345 (see Table 14).

Table 13. Descriptive Statistics for Students' Transfer Test Scores in TC and NTC Conditions

Groups	Mean	*St. Dev.*	n
TC	3.90	5.08	32
NTC	2.73	4.92	34

Table 14. Independent Sample t-Test for Students' Transfer Test Scores in TC and NTC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
.494	.485	.950	64	.345	1.171	1.232

4.2.2 Examination of the text and no text conditions with no learner control given

An independent t-test was conducted to examine whether there is a significant difference between text and no text conditions on students' retention and transfer scores when they are not given control over the learning material.

4.2.2.1 Retention in text and no text conditions with no learner control given

The retention test scores of TNC and NTNC groups were matched for this analysis (see Table 15). Homogeneity of variances of the data (p = .367) was observed using Levene's test (see Table 16). The independent t-test showed that there was no statistically significant difference between the mean retention scores of TNC condition (M = 4.78, SD = 2.19) and the NTNC condition (M = 3.84, SD = 1.82); t (64) = 1.89, p = .063 (see Table 16).

Table 15. Descriptive Statistics for Students' Retention Test Scores in TNC and NTNC Conditions

Groups	Mean	*St. Dev.*	n
TNC	4.78	2.19	33
NTNC	3.84	1.82	33

Table 16. Independent Sample t-Test for Students' Retention Test Scores in TNC and NTNC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
.827	.367	1.894	64	.063	.939	.496

4.2.2.2 Transfer in text and no text conditions with no learner control given

The trasfer test scores of TNC and NTNC groups were matched for this analysis (see Table 17). Homogeneity of variances of the data (p = .273) was observed using Levene's test (see Table 18). The independent t-test showed that there was no statistically significant difference between the mean transfer scores of TNC condition (M = 8.66, SD = 6.54) and the NTNC condition (M = 7.33, SD = 5.82); t (64) = .87, p = .385 (see Table 18).

Table 17. Descriptive Statistics for Students' Transfer Test Scores in TNC and NTNC Conditions

Groups	Mean	*St. Dev.*	n
TNC	8.66	6.54	33
NTNC	7.33	5.82	33

Table 18. Independent Sample *t*-Test for Students' Transfer Test Scores in TNC and NTNC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
1.222	.273	.875	64	.385	1.333	1.524

4.3 Control condition comparisons

4.3.1 Examination of the control and no control conditions with text given

An independent *t*-test was conducted to examine whether there is a significant difference between control and no control conditions on students' retention and transfer scores when they are given text on the learning material.

4.3.1.1 Retention in control and no control conditions with text given

The retention test scores of TC and TNC groups were matched for this analysis (see Table 19). Homogeneity of variances of the data (p = .601) was observed using Levene's test (see Table 20). The independent *t*-test showed that there was no statistically significant difference between the mean retention scores of TC condition (M = 4.12, SD = 1.97) and the TNC condition (M = 4.78, SD = 2.19); t (63) = -1.27, p = .206 (see Table 20).

Table 19. Descriptive Statistics for Students' Retention Test Scores in TC and TNC Conditions

Groups	Mean	*St. Dev.*	n
TC	4.12	1.97	32
TNC	4.78	2.19	33

Table 20. Independent Sample *t*-Test for Students' Retention Test Scores in TC and TNC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
.276	.601	-1.279	63	.206	-.662	.518

4.3.1.2 Transfer in control and no control conditions with text given

The transfer test scores of TC and TNC groups were matched for this analysis (see Table 21). Homogeneity of variances of the data (p = .042) was not observed using Levene's test (see Table 22). The independent *t*-test showed that there was statistically significant difference between the mean transfer scores of TC condition (M = 3.90, SD =5.08) and the TNC condition (M = 8.66, SD = 6.54); t (63) = -3.26, p = .002 (see Table 22). Students with the control over the learning material given outperformed students without any control given when both groups had on-screen text that duplicated the narration.

Table 21. Descriptive Statistics for Students' Transfer Test Scores in TC and TNC Conditions

Groups	Mean	*St. Dev.*	n
TC	3.90	5.08	32
TNC	8.66	6.54	33

Table 22. Independent Sample *t*-Test for Students' Transfer Test Scores in TC and TNC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
4.315	.042	-3.269	63	.002	-4.760	1.456

4.3.2 Examination of the control and no control conditions with no text given

An independent *t*-test was conducted to examine whether there is a significant difference between control and no control conditions on students' retention and transfer scores when they are not given text on the learning material.

4.3.2.1 Retention in control and no control conditions with no text given

The retention test scores of NTC and NTNC groups were matched for this analysis (see Table 23). Homogeneity of variances of the data (p = .194) was observed using Levene's test (see Table 24). The independent *t*-test showed that there was no statistically significant difference between the mean retention scores of NTC condition (M = 3.29, SD = 2.25) and the NTNC condition (M = 3.84, SD = 1.82); t (65) = -1.10, p = .273 (see Table 24).

Table 23. Descriptive Statistics for Students' Retention Test Scores in NTC and NTNC Conditions

Groups	Mean	*St. Dev.*	n
NTC	3.29	2.25	34
NTNC	3.84	1.82	33

Table 24. Independent Sample *t*-Test for Students' Retention Test Scores in NTC and NTNC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
1.726	.194	-1.106	65	.273	-.554	.501

4.3.2.2 Transfer in control and no control conditions with no text given

The transfer test scores of NTC and NTNC groups were matched for this analysis (see Table 25). Homogeneity of variances of the data (p = .126) was observed using Levene's test (see Table 26). The independent *t*-test showed that there was statistically significant difference between the mean transfer scores of NTC condition (M = 2.73, SD = 4.92) and the NTNC condition (M = 7.33, SD = 4.92); t (65) = -3.49, p = .001 (see Table 26). Students with the control over the learning material given outperformed students without any control given when neither group had on-screen text that duplicated the narration.

Table 25. Descriptive Statistics for Students' Transfer Test Scores in NTC and NTNC Conditions

Groups	Mean	*St. Dev.*	n
NTC	2.73	4.92	34
NTNC	7.33	5.82	33

Table 26. Independent Sample *t*-Test for Students' Transfer Test Scores in NTC and NTNC Conditions

Levene Statistic				*Sig.*	Mean	Std. Error
F	*Sign.*	*t*	*df*	(2-tailed)	Difference	Difference
2.396	.126	-3.493	65	.001	-4.598	1.316

4.4 Self-regulation effect

In order to examine the effect of self-regulation on the learning, first descriptive statistics were conducted. The means and standard deviations are presented in Table 27. Second, A one-way ANOVA was conducted to examine if self-regulatory skills of the participants had an influence on the retention or transfer scores. The homogeneity of variances (p = .603) was provided for each group according to the Levene's Test (see Table 28). There was no statistically significant difference on self-regulation scale scores between the treatment groups according to the one-way ANOVA test F (3, 128) = .375, p = .771 (see Table 29).

Table 27. Descriptive Statistics for Students' Self-Regulation Scale Scores in all Treatment Groups

Groups	n	Mean	*St. Dev.*
TNC	33	5.152	1.101
NTNC	33	4.917	1.232
TC	32	4.941	.910
NTC	34	4.921	.973
Total	132	4.982	1.054

Table 28. Levene's Test Results of Self-Regulation Scale Scores for all Treatment Groups

Levene Statistic	*df1*	*df2*	*Sig.*
.620	3	128	.603

Table 29. One-Way ANOVA Test for Students' Self-Regulation Scale Scores in Different Treatment Conditions

	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Between Groups	1.270	3	.423	.375	.771
Within Groups	144.400	128	1.128		
Total	145.670	131			

The participants self-regulation survey scores were divided into two groups: low (LSR) and high (HSR). Participants are defined to have low or high self-regulatory skills depending on the mean score of total participants in table 20, which is 4.98.

4.4.1 Comparison of LSR and HSR in TNC condition

Mann-Whitney U nonparametric test was conducted to examine whether there is a significant difference between low and high self-regulatory skilled students on their retention and transfer test scores when they are given text but not given control over the learning material.

4.4.1.1 Retention in LSR and HSR groups in text without control condition

The retention test scores of LSR and HSR groups in TNC condition were matched for this analysis (see Table 30). Mann-Whitney U test indicates that the distribution of the retention test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (31) = 75000, z = -1.066, p = .287 (see Table 31).

Table 30. Descriptive Statistics for Retention Test Scores of LSR and HSR Groups in TNC Condition

	Group	N	Mean Rank	Sum of Ranks
Retention	HSR + TNC	25	18.00	450.00
	LSR + TNC	8	13.88	111.00
	Total	33		

Table 31. Mann-Whitney U Test for Retention Test Scores of LSR and HSR Groups in TNC Condition

	Retention
Mann-Whitney U	75.000
Wilcoxon W	111.000
Z	-1.066
Asymp. *Sig*. (2-tailed)	.287
Exact Sig. [2*(1-tailed Sig.)]	.310[b]

4.4.1.2 Transfer in LSR and HSR groups in text without control condition

The transfer test scores of LSR and HSR groups in TNC condition were matched for this analysis (see Table 32). Mann-Whitney U test indicates that the distribution of the transfer test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (31) = 84500, z = -.653 p = .514 (see Table 33).

Table 32. Descriptive Statistics for Transfer Test Scores of LSR and HSR Groups in TNC Condition

	Group	N	Mean Rank	Sum of Ranks
Transfer	HSR + TNC	25	16.38	409.50
	LSR + TNC	8	18.94	151.50
	Total	33		

Table 33. Mann-Whitney U Test for Transfer Test Scores of LSR and HSR Groups in TNC Condition

	Transfer
Mann-Whitney U	84.500
Wilcoxon W	409.500
Z	-.653
Asymp. Sig. (2-tailed)	.514
Exact Sig. [2*(1-tailed Sig.)]	.522[b]

4.4.2 Comparison of LSR and HSR in NTNC condition

Mann-Whitney U nonparametric test was conducted to examine whether there is a significant difference between low and high self-regulatory skilled students on their retention and transfer test scores when they are not given text or control over the learning material.

4.4.2.1 Retention in LSR and HSR groups in no text and no control condition

The retention test scores of LSR and HSR groups in NTNC condition were matched for this analysis (see Table 34). Mann-Whitney U test indicates that the distribution of the retention test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (31) = 133500, z = -.055, p = .956 (see Table 35).

Table 34. Descriptive Statistics for Retention Test Scores of LSR and HSR Groups in NTNC Condition

	Group	N	Mean Rank	Sum of Ranks
Retention	HSR + NTNC	18	17.08	307.50
	LSR + NTNC	15	16.90	253.50
	Total	33		

Table 35. Mann-Whitney U Test for Retention Test Scores of LSR and HSR Groups in NTNC Condition

	Retention
Mann-Whitney U	133.500
Wilcoxon W	253.500
Z	-.055
Asymp. Sig. (2-tailed)	.956
Exact Sig. [2*(1-tailed Sig.)]	.957[b]

4.4.2.2 Transfer in LSR and HSR groups in no text and no control condition

The transfer test scores of LSR and HSR groups in NTNC condition were matched for this analysis (see Table 36). Mann-Whitney U test indicates that the distribution of the transfer test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (31) = 114500, z = -.747 p = .455 (see Table 37).

Table 36. Descriptive Statistics for Transfer Test Scores of LSR and HSR Groups in NTNC Condition

	Group	N	Mean Rank	Sum of Ranks
Transfer	HSR + NTNC	18	15.86	285.50
	LSR + NTNC	15	18.37	275.50
	Total	33		

Table 37. Mann-Whitney U Test for Transfer Test Scores of LSR and HSR Groups in NTNC Condition

	Transfer
Mann-Whitney U	114.500
Wilcoxon W	285.500
Z	-.747
Asymp. Sig. (2-tailed)	.455
Exact Sig. [2*(1-tailed Sig.)]	.464[b]

4.4.3 Comparison of LSR and HSR in TC condition

Mann-Whitney U nonparametric test was conducted to examine whether there is a significant difference between low and high self-regulatory skilled students on their retention and transfer test scores when they are given text and control over the learning material.

4.4.3.1 Retention in LSR and HSR groups in text and control condition

The retention test scores of LSR and HSR groups in TC condition were matched for this analysis (see Table 38). Mann-Whitney U test indicates that the distribution of the retention test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (30) = 94500, z = -1.281, p = .200 (see Table 39).

Table 38. Descriptive Statistics for Retention Test Scores of LSR and HSR Groups in TC Condition

	Group	N	Mean Rank	Sum of Ranks
Retention	HSR + TC	16	14.41	230.50
	LSR + TC	16	18.59	297.50
	Total	32		

Table 39. Mann-Whitney U Test for Retention Test Scores of LSR and HSR Groups in TC Condition

	Retention
Mann-Whitney U	94.500
Wilcoxon W	230.500
Z	-1.281
Asymp. Sig. (2-tailed)	.200
Exact Sig. [2*(1-tailed Sig.)]	.210[b]

4.4.3.2 Transfer in LSR and HSR groups in text and control condition

The transfer test scores of LSR and HSR groups in TC condition were matched for this analysis (see Table 40). Mann-Whitney U test indicates that the distribution of the transfer test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (30) = 114000, z = -.565 p = .572 (see Table 41).

Table 40. Descriptive Statistics for Transfer Test Scores of LSR and HSR Groups in TC Condition

	Group	N	Mean Rank	Sum of Ranks
Transfer	HSR + TC	16	15.63	250.00
	LSR + TC	16	17.38	278.00
	Total	32		

Table 41. Mann-Whitney U Test for Transfer Test Scores of LSR and HSR Groups in TC Condition

	Transfer
Mann-Whitney U	114.000
Wilcoxon W	250.000
Z	-.565
Asymp. Sig. (2-tailed)	.572
Exact Sig. [2*(1-tailed Sig.)]	.616[b]

4.4.4 Comparison of LSR and HSR in NTC condition

Mann-Whitney U nonparametric test was conducted to examine whether there is a significant difference between low and high self-regulatory skilled students on their retention and transfer test scores when they are given control but not given text on the learning material.

4.4.4.1 Retention in LSR and HSR groups in no text but with control condition

The retention test scores of LSR and HSR groups in NTC condition were matched for this analysis (see Table 42). Mann-Whitney U test indicates that the distribution of the retention test scores between high and low self-regulation groups were not similar. There was statistically significant difference between groups, U (32) = 58000, z = -2.904, p= .004 (see Table 43). Students with high self-regulatory skills outperformed the students with low self-regulatory skills in the retention test.

Table 42. Descriptive Statistics for Retention Test Scores of LSR and HSR Groups in NTC Condition

	Group	N	Mean Rank	Sum of Ranks
Retention	HSR + NTC	20	21.60	432.00
	LSR + NTC	14	11.64	163.00
	Total	34		

Table 43. Mann-Whitney U Test for Retention Test Scores of LSR and HSR Groups in NTC Condition

	Retention
Mann-Whitney U	58.000
Wilcoxon W	163.000
Z	-2.904
Asymp. Sig. (2-tailed)	.004
Exact Sig. [2*(1-tailed Sig.)]	.003[b]

4.4.4.2 Transfer in LSR and HSR groups in no text but with control condition

The transfer test scores of LSR and HSR groups in NTC condition were matched for this analysis (see Table 44). Mann-Whitney U test indicates that the distribution of the transfer test scores between high and low self-regulation groups were similar. There was not statistically significant difference between groups, U (32) = 128500, z = -.460 p = .645 (see Table 45).

Table 44. Descriptive Statistics for Transfer Test Scores of LSR and HSR Groups in NTC Condition

	Group	N	Mean Rank	Sum of Ranks
Transfer	HSR + NTC	20	18.08	361.50
	LSR + NTC	14	16.68	233.50
	Total	34		

Table 45. Mann-Whitney U Test for Transfer Test Scores of LSR and HSR Groups in NTC Condition

	Transfer
Mann-Whitney U	128.500
Wilcoxon W	233.500
Z	-.460
Asymp. *Sig*. (2-tailed)	.645
Exact Sig. [2*(1-tailed Sig.)]	.691[b]

4.5 Prior knowledge as a covariate

4.5.1 Covariate effects on the retention test scores

In order to test whether prior knowledge, material type (version) or self-regulatory skills together or pairwise have an effect on students' retention test score, a general linear modal 2x2x4 ANOVA test was conducted (see Table 46).

(1) There was not a statistically significant three-way interaction between prior knowledge, material type and self-regulatory skills on students' retention scores, F (3, 132) = 1.441, p = .235.

(2) There was not a statistically significant two-way interaction between prior knowledge and self-regulatory skills on students' retention scores, F (1, 132) = 2.077, p = .152.

(3) There was not a statistically significant three-way interaction between prior knowledge and material type on students' retention scores, F (3, 132) = .544, p = .653.

(4) There is a significant two-way interaction between material type and self-regulatory skills on the retention test scores of the students, F (3, 132) = 3.227, p =.025.

(5) However, none of the three variables influence the retention scores of the students independently: material type F (3, 132) = 1.959, p=.124, prior knowledge (F (1, 132) = .011, p = .918) and self-regulation skills F (1, 132) = 3.393, p =.068.

Table 46. Three-Way ANOVA Test for Students' Retention Test Scores in Multimedia Conditions

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Corrected Model	122.526[a]	15	8.168	2.040	.018
Intercept	1586.881	1	1586.881	396.322	.000
Version (material type)	23.527	3	7.842	1.959	.124
Prior Knowledge	.043	1	.043	.011	.918
Self-Regulation	13.584	1	13.584	3.393	.068
Version * Prior Knowledge	6.538	3	2.179	.544	.653
Version * Self-Regulation	38.765	3	12.922	3.227	.025
Prior Knowledge * Self-Regulation	8.317	1	8.317	2.077	.152
Version * Prior Knowledge * Self-Regulation	17.307	3	5.769	1.441	.235
Error	464.467	116	4.004		
Total	2707.000	132			
Corrected Total	586.992	131			

4.5.2 Covariate effects on the transfer test scores

In order to test whether prior knowledge, material type (version) or self-regulatory skills together or pairwise have an effect on students' transfer test score, a general linear modal 2x2x4 ANOVA test was conducted (see Table 47).

(1) There was not a statistically significant three-way interaction between prior knowledge, material type and self-regulatory skills on students' transfer scores, F (3, 132) = 1.400, p = .246.

(2) There was not a statistically significant two-way interaction between prior knowledge and self-regulatory skills on students' transfer scores, F (1, 132) = .012, p = .914.

(3) There was not a statistically significant three-way interaction between prior knowledge and material type on students' transfer scores, F (3, 132) = 2.102, p = .104.

(4) There was not a significant two-way interaction between material type and self-regulatory skills on the transfer test scores of the students, F (3, 132) = 1.328, p =.269.

(5) However, material type (F (3, 132) = 13.064, p =.0001) and prior knowledge (F (1, 132) = 31.393, p =.0001) independently influence students' transfer test scores, while self-regulation skills (F (1, 132) = .269, p =.605) does not have an independent influence.

Table 47. Three-Way ANOVA Test for Students' Transfer Test Scores in Multimedia Conditions

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Corrected Model	1988.728[a]	15	132.582	5.402	.000
Intercept	4623.395	1	4623.395	188.363	.000
Version (material type)	961.967	3	320.656	13.064	.000
Prior Knowledge	770.553	1	770.553	31.393	.000
Self-Regulation	6.610	1	6.610	.269	.605
Version * Prior Knowledge	154.778	3	51.593	2.102	.104
Version * Self-Regulation	97.812	3	32.604	1.328	.269
Prior Knowledge * Self-Regulation	.290	1	.290	.012	.914
Version * Prior Knowledge * Self-Regulation	103.080	3	34.360	1.400	.246
Error	2847.242	116	24.545		
Total	9052.000	132			
Corrected Total	4835.970	131			

CHAPTER 5

DISCUSSION AND CONCLUSION

This study was conducted to test whether the redundant on-screen text and the learner control had an influence on foreign language learners' retention and transfer performances in the unit of simple past tense in English. In addition to this, self-regulatory skills were examined if they had any impact on the students' test scores. Although it has been suggested that the redundant on-screen text that duplicates narration hinders learning especially when the learning unit is a science course unit (Kalyuga et al., 1999; Mayer et al., 2001; Moreno & Mayer, 2002), more recent studies have shown that the redundancy principle of CTML may not be generalized when language courses are taken into consideration (Diao & Sweller, 2007; She et al., 2009; Samur, 2012). The main reason for not integrating a redundant text into an e-learning course material results from the reason that it causes the extraneous cognitive load in the learning process (Chandler & Sweller, 1991) and makes it harder to perform better during studying the learning material. Many studies regarding the redundancy principle focused more on the science courses rather than language courses, so this study was set up in language learning context. The hypothesis was that the redundant on-screen text might not be a hinder in EFL when it is considered that language learning has four skills (reading, writing, speaking and listening) being interconnected to each other. On the other hand, text plays a crucial role in language teaching and learning as it has been claimed that reading facilitates writing while learning a language (Smith, 1994; Grabe & Kaplan, 1996). In this study it was predicted that it would be better if text duplicated narration. While listening the narration aimed to help students better understand the story with the

stress and intonation of the narrator, reading the text aimed to create a visual support for spelling the words and for writing better.

In order to discard the disadvantage of the redundant text causing cognitive load and to feature the advantage that it helps students write better, a second condition was added to the study: learner control. Research shows that learner control contributes to the decrease in cognitive load (Mayer & Chandler, 2001; Hasler et al., 2007). In this study it was hypothesized that providing learner control over the learning material would help learners get better results in retention and transfer tests. When given learner control, students were expected to be able to navigate between slides, and read or listen the dialogues or instructions one more time because they were not passive receivers of information or instruction any more. The main objective of this condition was to give them an opportunity to better understand the topic.

In addition to redundant text and learner control, which are two conditions that depend on the designer of the material, an inner skill of students, which is self-regulation, was also examined to test if it was a determining factor in the learning process when students were or were not given redundant text and learner control conditions. Zimmerman (1998) defines self-regulation as the factor that transforms students from victims into controllers of their academic lives. Also, self-regulation was reported to decrease the intrinsic cognitive load (Lange & Costley, 2018), encourage students to communicate in EFL (Arkavazi & Nostratinia, 2018) and help discard problems related to learner control (Resnick, cited by Kinzie, 1972). Thus, investigating the influence of the self-regulation was one of the purposes of this study.

This quasi-experimental study relied mainly on one prior knowledge test, one academic self-regulation scale, one retention test and one transfer test. The researcher and one of his colleagues completed the experiment in 4 sessions, each lasting 45-50 minutes. 150 English preparatory school students participated in the study. Eighteen of them were dropped because they missed one or more tests.

First, one-way ANOVA test was conducted to examine how different prior knowledge test scores the four treatment groups had and whether that difference was statistically significant or not. Results indicated that the groups were equally distributed in terms of prior knowledge and there was not a significant difference between groups means scores of the pre-test (p = .993).

In the second step of the analysis, the first two research questions were examined for the analysis. A one-way ANOVA test was carried out in order to learn if the groups had differences in terms of retention and transfer results. Results showed that there were significant differences between treatment groups' mean scores both in retention (p = .033) and in transfer test (p = .000), leading to further analysis.

In this chapter, the discussion of the results will be provided following the summary of SPSS statistics results. Implications will be presented together with the limitations and recommendations for further research.

5.1 The redundancy effect

The first and the second research questions of the study focused on the redundancy effect of the online tutorial on students' retention and transfer test scores. Four independent sample *t*-tests were conducted to test the redundant on-screen text condition. In the first question, both groups (TC and NTC) were given control and in

the second question, groups (TNC and NTNC) were not given control. It was found that although the groups with redundant on-screen text – TC (M = 4.12, SD = 1.97) and TNC (M = 4.78, SD = 2.19) – got better retention test scores than the groups with no text – NTC (M = 3.29, SD = 2.25) and NTNC (M = 3.84, SD = 1.82), the difference was not statistically significant. Similarly, when the transfer scores were compared, it was found that the redundant on-screen text groups – TC (M = 3.90, SD = 5.08) and TNC (M = 8.66, SD = 6.54) – outperformed the groups with no text – NTC (M = 2.73, SD = 4.92) and NTNC (M = 7.33, SD = 5.82). However, this difference was not reported to be statistically significant according to these results.

In the light of the results summarized above it can be concluded that the redundant on-screen text does not hinder the retention of the content presented in the material or the transfer of the new vocabulary items. According to CTML, when on-screen text duplicates the audio, the text is redundant since it causes extra visual load in the learner's mind. First of all, most studies that contradict with these results are generally those which used science course materials in their experiments (Mayer et al., 2001; Kalyuga et al., 1999; Craig et al., 2002; Mayer, 2001). It can be understood that it is redundant to add a text that copies the narration when a student is studying to learn the lightning formation or how brakes work in their mother language. Mayer et al. (2001) has found that the text is redundant as it makes it difficult for the learner to focus on the animation which presents the formation of a lightning. The narration already completes the animation and contributes to the creation of meaning images in students' minds with the integration of the visual and audial inputs. However, when it comes to learning a foreign language, students' needs and the efforts they make might differ, as the results in this study suggested.

Although the difference was not significant, it was reported that the mean scores of the redundant text groups were higher than the other two groups. These results present consistency with Garza (1991) that concludes subtitled videos help students integrate reading and listening inputs while learning a foreign language, Borras and Lafayette (1994) that demonstrates on-screen text provides students with valuable linguistic input, resulting in communicative output in a foreign language, Markham (1999) that shows captioned videotapes significantly enhance EFL learners' word recognition, the results of She et al. (2009) when presented together, on-screen text and narration are better for foreign language learners, and Samur (2012) that displays redundant on-screen text facilitates students in learning foreign language vocabulary.

Unlike science courses, language courses rely chiefly on written and spoken inputs with neither superior to the other. In order to speak a foreign language, one needs to hear the correct pronunciation, and to write, one needs to know how words are spelled. Since the two skills speaking and writing cannot be separated while learning a language, the role of a text cannot be ignored as seen in the results. The transfer test in this study is designed in the way that asks students to write grammatically correct past tense sentences with the words practiced in the online tutorial, so not including text, even if there is narration, would cause students to spell words incorrectly and write fewer correct sentences. Overall results suggest that designing a language learning tutorial is different from designing a science course tutorial, regardless of the insignificance of the difference.

In addition to the different course types, students' being novices has had an impact in these results. The prior knowledge of the students who took part in the experiment were so low that they were considered to be novice learners. In a study

conducted by Moreno and Mayer (2002) in which low-experience learners were included, with the assertion that some instructional factors might influence learners differently. Results indicated that students remembered and transferred the relevant learning inputs significantly more when they were given redundant on-screen text plus animation and narration. Therefore, this study is in consistency with Moreno and Mayer (2002). Similarly, Leslie et al. (2012) concluded that adding visual information to an audio presentation would be useful and beneficial for novice learners. It could be argued that students with less knowledge about the foreign language material made use of any kind of inputs to understand the subject better. In this case, contrary to the expectation that the redundant text would cause cognitive load, it can be asserted that the text, the audio and the images worked together in the organization of meaning creation and in its integration of it in the students' mind. This conclusion is consistent with Persky and Robinson's (2017) suggestion that learner expertise is one important factor that should be taken into consideration when determining an effective instructional strategy and that integrated text with diagrams and visuals with auditory narration are two of those recommended.

Overall, considering the results in the study and the overview of the related literature, it can be reported that redundant on-screen text, although it was not significantly confirmed to enhance learning, is not a hinder in language learning context. Even it may be necessary considering the needs of the novice learners studying a foreign language.

5.2 Learner control

In this study, four independent sample *t*-tests were conducted to test the learner control condition's effect on students' retention and transfer test scores. The third

and fourth research questions of the study examined this effect in two different conditions: text and no text. Results indicated that the groups without control – TNC (M = 4.78, SD = 2.19) and NTNC (M = 3.84, SD = 1.82) – gained better scores on the retention test than the groups with learner control – TC (M = 4.12, SD = 1.97) and NTC (M = 3.29, SD = 2.25). Although there was a difference favoring the non-learner-controlled groups, it was not statistically significant. However, when the transfer scores were compared, findings suggest that the non-learner-controlled groups – TNC (M = 8.66, SD = 6.54) and NTNC (M = 7.33, SD = 5.82) – performed significantly better than the groups with control given – TC (M = 3.90, SD = 5.08) and NTC (M = 2.73, SD = 4.92).

Based on the results listed above, it can be suggested that learners benefitted from the absence of a learner-controlled material. When students were given control when using the online tutorial, they did not make use of the "back" and "next" options that allowed them to read and listen to the slide one more time. In contrast, the students who were not given an opportunity to move back and forth took the advantage of being guided by the system itself. One of the reasons why these results do not accord with CTML is the total duration of the online tutorial. As an example to this claim, these results contradict with Mayer and Candler's (2001) results which suggest that providing learners with control would enhance learning with a significant difference. However, the total amount of time allocated to the animation was only 140s. Students who could not navigate between slides spent less than 3 minutes to learn about the formation of lightning. The amount of time being controversial itself must have been insufficient to the learners who were expected to understand the formation of lightning in less than three minutes. Similar to Mayer and Candler's (2001) study, the results of Hasler et al.'s (2007) study do not accord

with the results found in this study. The system-based group were outperformed by the segmented and stop-play groups. The animation used in that experiment lasted 3 minutes and 45 seconds for the system-based group. Although the researchers tried to minimize the disadvantages of this unfair situation by allowing the system-based group to restudy the animation and ensuring that all groups studied the material in 10 minutes, results showed that providing learner control affected the results significantly favoring learner-controlled groups. In contrast, students who took part in this study spent nearly 15-20 minutes to study the online tutorial. This length of time might have enabled students who were not provided with learner control to better understand the context and the learning unit. In addition to this, students might have benefitted from the content of the material, which included exercises and a lot of review slides. However, this only explains why the groups without learner control did not get lower scores than the groups with learner control. The possible reasons why they got significantly higher scores in the transfer test than learner-controlled groups are discussed below.

First, the prior knowledge of the students was low. Research shows that students whose prior knowledge is low find it hard to navigate between slides in learner-controlled systems (Kelly, 1993; Last, O'Donnell, & Kelly, 2001). Besides that, a learner-controlled system is reported to hinder learning and cause insufficient learning outcomes (Potelle & Rouet, 2003; Lawless & Brown, 1997). In a similar manner, Shin, Schallert and Savenye (1994) and Chen, Fan and Macredie (2006) have found that students with low prior knowledge need more instructional support in terms of learner control and that it would be better if they are provided with a more structured design. Chen et al. (2006) concluded that the structured e-learning material would ensure a better opportunity for the learners to organize and integrate

the input. Considering this overview of the literature, it can be argued that the low prior knowledge of the students has been a determining factor in the results favoring the groups without learner control as they followed a structured path during the learning process.

Secondly, being novice learners, students had difficulty handling the online tutorial. It can be suggested that students were overloaded with the difficulty of a new content due to the fact that they were beginner level students of EFL, and it has been only 2 months since they started taking English courses at the university. Research suggests that novice learners have difficulty in making decisions when it comes to managing their own learning (Koriat & Bjork, 2005). In this study, there was no time limit for the groups with the learner control, so they had the chance to review the slides and benefit from the learner-controlled environment. However, it is obvious that students failed to manage their time as well. This conclusion is consistent with Brown's (2001) study results which argue that novice learners do not necessarily use the time given to them efficiently. Besides, Granger and Levine (2010) discuss in their article that novice learners are not qualified enough to benefit from the advantages provided by learner-controlled environments. Persky and Robinson (2017) affirm the arguments above by adding the suggestion that novice learners are not fully aware of the idea that they have mastered or understood the input provided in the online tutorial.

To conclude, in the light of the results discussed above, it can be suggested that providing novice learners with a learner-controlled system would result in a deterioration in learning. Rather, it is more useful if the learners are guided through a pre-structured and controlled system, which would alleviate the cognitive burden in the novice learners who have low experience and prior knowledge in the course

material. In the same way, it can be concluded that students who were not given learner control had a better opportunity to focus on the course material thanks to the structure of the online tutorial.

5.3 Self-regulation

The first analysis was conducted to learn if self-regulation scores were distributed evenly among groups. One-way ANOVA test results indicated that the difference between four groups (TNC, NTNC, TC and NTC) was not statistically significant. However, the purpose of the rest of the analysis was to determine whether there was a difference between LSR and HSR students' retention and transfer scores and whether self-regulation had an impact on getting better results. Therefore, eight Mann-Whitney U tests were conducted for these comparisons.

Although the results were statistically not significant, there were some variations in students' performances. First, LSR and HSR students' performance were compared in TNC condition. Results showed that LSR students performed better in the transfer test than HSR students, while HSR students outperformed LSR students in the retention test. However, neither of these results were statistically significant.

Secondly, LSR and HSR students' performance were compared in NTNC condition. Results showed that LSR students had higher scores in the transfer test than HSR students, while HSR students performed better in the retention test. However, these results were not statistically significant.

Thirdly, the comparison analysis was made between the performances of HSR and LSR students' retention and transfer scores in TC condition. According to the results, both the transfer scores and the retention scores of LSR students were

higher than those of HSR students. However, these results were not statistically significant.

Finally, the LSR and HSR students' performances were compared in NTC condition. Results showed that HSR students had better retention scores than LSR students, but the difference was not significant. As for the transfer test, HSR students (Mean Rank = 21.60) performed significantly better than LSR students (Mean Rank = 11,64).

When analyzed more carefully, the results summarized above are not congruent with each other. In some conditions students with low self-regulation outperformed students with high self-regulation in retention or transfer tests, and in some others vice versa. The number of the participants might have had an impact on those inconsistent results. Also, the fact that students have very little prior domain knowledge about the course material has prevented the self-regulatory skills to become activated. This assumption accords with Moss and Azevedo's (2007) argument that self-regulated effort and prior domain knowledge are significantly related to each other. Students might have used some of their self-regulatory skills, but they may be overwhelmed by the amount of the input unfamiliar to them.

On the other hand, beside the results above there is one statistically significant result obtained from the study in self-regulation comparisons. When students were given learner control over the material without redundant on-screen text, those with high self-regulation performed significantly better than those with low self-regulation. As discussed in earlier sections of this chapter, the presence or absence of redundant on screen-text did not make a significant difference in retention or transfer tests. However, it was also reported that students performed significantly lower in the transfer test when they were given learner control. Therefore, it can be

asserted that, in this NTC condition, the students with high self-regulation outperformed the students with low self-regulation because they handled the controls more efficiently, being aware of the advantages offered by the control provided to them. This conclusion is consistent with Zimmerman's (1998) suggestion that learners with low self-regulation tend to depend on other factors in order to master the provided course material.

Overall, considering all the results discussed in this chapter, it was not surprising that the only significant difference concerning self-regulation group comparisons was observed in one learner-controlled group. When students have more self-regulatory skills, they have more chance to be more successful in a learner-controlled environment. It can also be concluded that students with high self-regulatory skills can be considered to overcome the learner control condition despite being novice learners.

5.4 Covariate effects

In order to examine the overall or pairwise effects of prior knowledge, material type and self-regulation on students' retention and transfer scores, 2 general linear modal 2x2x4 ANOVA tests were conducted. According to the results, no three-way interaction between the variables was observed either in retention or in transfer tests. There were also no two-way interactions in transfer test. However, the material type and the self-regulatory skills of the students had an effect on students' retention test scores. For the transfer test, it was found that prior knowledge of the students and the material type influenced students' transfer scores independently.

5.5 Implications

The current study has examined redundant on-screen text, learner control and self-regulation in a quasi-experimental design, providing the participants with an online tutorial and giving them a prior knowledge test, an academic self-regulation scale before the treatment, and retention and transfer tests after the treatment. This study is the first to investigate the effects of redundant on-screen text, learner control and self-regulation variables on transferrable skills of EFL learners. The practical and theoretical implications of this current study which instructional designers, course planners or teachers might benefit from in future are listed and briefly discussed below.

First, it was found that adding on-screen text that duplicates narration in an EFL unit does not have a negative or positive effect on learning, and it does not hinder learning. In fact, students got higher scores both in retention test and transfer test, which was not statistically significant. These results are consistent with Moreno and Mayer (2002) and Leslie et al. (2012) when novice learners are considered. Redundancy principle claims that people learn better with graphics and narration than graphics, narration and on-screen text. However, it was found that this principle does not necessarily apply to every condition, especially in a foreign language course as it is in this study.

Secondly, the results showed that providing control to the novice learners resulted in deterioration in learning, especially in the transfer test. It was indicated that novice learners with low prior knowledge could not handle the advantage of a learner-controlled system. Rather, they would benefit from a pre-structured and guided system. These results are not in alignment with Mayer and Candler (2001) and Hasler et al. (2007) as the treatment materials in those studies were too short

compared to the one used in this study. Based on the consistency with the relevant literature (Potelle & Rouet, 2003; Koriat & Bjork, 2005; Persky & Robinson, 2017) it can be proposed that novice learners benefited from a guided online tutorial rather than a learner-controlled system.

Finally, it was reported that self-regulation created a significant difference only in one out of eight comparisons: in a learner-controlled environment. With no text on the screen, and additional learner control, the difficulty of understanding the content and navigating the learning material, it was found that students with high self-regulation performed significantly better in the transfer test. Even if they were all novice learners with low prior knowledge, students with high self-regulation outperformed the students with low self-regulation. This result is consistent with Resnick (cited by Kinzie, 1972). Since the significant difference and activation of self-regulatory skills were only observed only in one comparison concerning self-regulation, it can be suggested that a system-controlled online tutorial is best for novice learners.

After all the results were analyzed and the discussion was outlined, it can be suggested that (1) on-screen text might be helpful for novice EFL learners, (2) a pre-structured, system-controlled online tutorial that minimizes cognitive load should be preferred by the instructional designers, (3) exercises or small tasks that activate self-regulatory skills can be integrated in the course material instead of giving students all the control over the learning material.

5.6 Limitations

The first limitation of the study was that it was not conducted in a true experiment design as the participants were not randomly selected. The participants of this study were preparatory school students at a foundation university, with the ages between 18-33. Therefore, the results are limited to samples and populations with similar characteristics. The results of this study can be misleading in different learning and teaching contexts, so they should not be generalized without any caution.

Second, students were tested only immediately after the treatment. Retention and transfer tests were given to the students right after they completed the online tutorial training. Repeated or delayed tests would give more information about how much students remember and what they could transfer.

Thirdly, the instruments given to the students might have had more variation. An additional survey concerning cognitive load measurement after the treatment or concerning self-study skills would give critical information for the research. Therefore, the results are limited to the instruments used in the study.

Finally, it is suggested that the results not be generalized for all English lessons as the participants in this study were especially selected from those who have not studied Simple Past Tense before. While studying or practicing a language through online tutorials, students' needs might differ from one language skill to another. More research should be carried out in the field of CTML and ELT before the results in this study are generalized.

5.7 Recommendations

More research is required to produce a guideline in the field of ELT, and specific to ELT, similar to CTML. For future research, whether giving control to the learners on the feedback slides of the online tutorial affects learning can be a subject of research. Also, the redundancy of the text can be examined in different contexts such as speaking, listening or reading lessons in EFL. Most importantly, more research is required in the activation of self-regulatory skills with different e-learning tools in order to design better course materials both for enhancing learning and improving self-regulation.

APPENDIX A

CONSENT FORM FOR THE PARTICIPANTS

(EK1) KATILIMCI BİLGİ ve ONAM FORMU

Araştırmayı destekleyen kurum:
Araştırmanın adı: Öğrenen Kontrolü ve Ekran Yazısının Öğrencilerin Yazma Performansına Etkileri
Proje Yürütücüsü: Yavuz AKPINAR
E-mail adresi: akpinar@boun.edu.tr
Telefonu: 0212 359 44 97
Araştırmacının adı: Bedi CANANOĞLU
E-mail adresi: bedi.cananoglu@bilgi.edu.tr
Telefonu: 05433402950

Sayın katılımcı,

Boğaziçi Üniversitesi Eğitim Teknolojileri Bölümü öğrencisi olarak "Öğrenen Kontrolü ve Ekran Yazısının Öğrencilerin Yazma Performansına Etkileri" adı altında bilimsel bir araştırma projesi yürütmekteyim. Bu çalışmanın amacı e-eğitim geliştirirken öğrenen kontrolü ile ekran yazısının öğrencilerin yazma performansına etkilerini incelemektir. Bu araştırmada bana yardımcı olmanız için siz Hazırlık veya 1. Sınıf öğrencilerini de projeme davet ediyorum. Kararınızdan önce araştırma hakkında sizi bilgilendirmek istiyorum. Bu bilgileri okuduktan sonra araştırmaya katılmak isterseniz lütfen bu formu imzalayıp bana teslim ediniz.

Bu araştırmaya katılmayı kabul ettiğiniz takdirde size öncelikle 2 bölümden oluşan bir önbilgi testi yapmanızı rica edeceğim. Bu test sizin ders konusu ile ilgili mevcut bilginiz hakkında bize fikir verecektir. Bu testi tamamlamak en çok 10 dakikanızı alacaktır. İkinci olarak, size 48 sorudan oluşan Akademik Öz-düzenleme Ölçeği verilecektir. Bunun amacı deney sonrası elde edeceğimiz skorlar ile bu anketin skorları arasındaki ilişkiyi incelemektir. Bu bölüm en çok 10 dakikanızı alacaktır. Üçüncü olarak, öğrenme aracı olan e-eğitim ile yaklaşık 15 dakika sürecek olan kısım başlayacaktır. Bu kısım bilgisayarlı laboratuvarda gerçekleştirilecektir. Son olarak da deney sonrası bir anımsama testi bir de bilgi transfer testi verilecektir. Bu bölüm de en fazla 30 dakikanızı alacaktır. Çalışmaya katılmanız tamamen isteğe bağlıdır. Sizden ücret talep etmiyorum ve size herhangi bir ödeme yapmayacağım.

Bu araştırma bilimsel bir amaçla yapılmaktadır ve katılımcı bilgilerinin gizliliği esas tutulmaktadır. Anket ve test kağıtlarında sizin isminiz yerine bir numara kullanılacaktır. Bütün dokümanlar araştırma projemiz süresince kilitli bir dolapta muhafaza edilip araştırma sona erdiğinde imha edilecektir.

Bu araştırmaya katılmak tamamen isteğe bağlıdır. Katıldığınız takdirde çalışmanın herhangi bir aşamasında herhangi bir sebep göstermeden onayınızı çekmek hakkına da sahipsiniz. Bu araştırmada farklı sınıf gruplarını veya farklı bölümleri karşılaştırmadığımızı vurgulamak istiyoruz. Araştırma projesi hakkında ek bilgi almak istediğiniz takdirde lütfen Boğaziçi Üniversitesi Eğitim Teknolojileri Bölümü Öğretim Üyesi Yavuz Akpınar ile temasa geçiniz.

Ben, ..., yukarıdaki metni okudum ve katılmam istenen çalışmanın kapsamını ve amacını, gönüllü olarak üzerime düşen sorumlulukları tamamen anladım. Çalışma hakkında soru sorma imkanı buldum. Bu çalışmayı istediğim zaman ve herhangi bir neden belirtmek zorunda kalmadan bırakabileceğimi ve bıraktığım takdirde herhangi bir olumsuzluk ile karşılaşmayacağımı anladım.

Bu koşullarda söz konusu araştırmaya kendi isteğimle, hiçbir baskı ve zorlama olmaksızın katılmayı kabul ediyorum.

Formun bir örneğini aldım / almak istemiyorum.

Katılımcının Adı-Soyadı:

Yaşı:

Bölümü: Tarih ve İmza:

Araştırmacının Adı-Soyadı:

Tarih ve İmza:

APPENDIX B

CONSENT FORM TAKEN FROM BILGI UNIVERSITY

ETİK KURUL DEĞERLENDİRME SONUCU/RESULT OF EVALUATION BY THE ETHICS COMMITTEE

(Bu bölüm İstanbul Bilgi Üniversitesi İnsan Araştırmaları Etik Kurul tarafından doldurulacaktır /This section to be completed by the Committee on Ethics in research on Humans)

Başvuru Sahibi / Applicant: Bedi Cananoğlu

Proje Başlığı / Project Title: The effects of learner control and the redundant on screen text on learners' writing performance

Proje No. / Project Number: 2018-40888-105

1.	Herhangi bir değişikliğe gerek yoktur / There is no need for revision	XX
2.	Ret/ Application Rejected Reddin gerekçesi / Reason for Rejection	

Değerlendirme Tarihi / Date of Evaluation: 22 Ekim 2018

Kurul Başkanı / Committee Chair
Doç. Dr. Itır Erhart

Üye / Committee Member
Prof. Dr. Aslı Tunç

Üye / Committee Member
Prof. Dr. Hale Bolak

Üye / Committee Member
Prof. Dr. Turgut Tarhanlı

Üye / Committee Member
Prof. Dr. Koray Akay

Üye / Committee Member
Prof. Dr. Ali Demirci

Üye / Committee Member
Prof. Dr. Ayhan Özgür Toy

APPENDIX C

ACADEMIC SELF-REGULATION SCALE

Adınız ve Soyadınız: Tarih:

Bölümünüz: Saat:

İmza: Versiyon No:

(EK2) Akademik Öz-düzenleme Ölçeği

1. Akademik çalışmamı yaparken daima kendime rehber olacak hedefler koyarım.

1	2	3	4	5	6	7

2. Akademik çalışmamda hedef koyduğum zaman, hedeflerimin başaramadığım hedefler içerdiğinden emin olurum.

1	2	3	4	5	6	7

3. Akademik çalışmamda; hedeflerimin gerçekçi olduğundan emin olmak için başkaları ile (anne, baba, öğretmenler) kontrol ederim.

1	2	3	4	5	6	7

4. Akademik çalışmamda; başkalarına kolayca anlatabileceğim hedefler koyarım.

1	2	3	4	5	6	7

5. Akademik çalışmamda; öğrenmiş olduklarımın ötesine geçebilecek hedefler koyarım.

1	2	3	4	5	6	7

6. Akademik çalışmamda; beni zorlayacak hedefler koyarım.

1	2	3	4	5	6	7

7. Akademik çalışmamda; hedeflerimin net olduğu konusunu başkaları ile(anne, baba, öğretmenler) kontrol ederim.

1	2	3	4	5	6	7

8. Akademik çalışmamda; koyduğum hedeflere ulaşmak için kendime fazlasıyla zaman ayırırım.

1	2	3	4	5	6	7

9. Akademik çalışmamda; başarma şansımın yüksek olduğu hedefler koyarım.

1	2	3	4	5	6	7

10. Akademik çalışmamda; belirlediğim hedeflere ulaşmada kendime yeterli zaman ayırdığımdan emin olmak için başkaları ile (anne, baba, öğretmenler) kontrol ederim.

1	2	3	4	5	6	7

11. Akademik çalışmamda; akademik hedeflerimi birbirlerinden net olarak ayırabilirim.

1	2	3	4	5	6	7

12. Akademik çalışmamda; hedeflerimin henüz erişmediğim amaçları kapsadığından emin olmak için başkaları ile (aile, öğretmenler) kontrol ederim.

1	2	3	4	5	6	7

13. Akademik çalışmamda; kendim için koyduğum hedeflerin ulaşılabilirliğinden emin olurum.

1	2	3	4	5	6	7

14. Akademik çalışmamda; bir hedefe ulaşmanın diğer hedefe de ulaşmayı kolaylaştıracağı şekilde hedefler koyarım.

1	2	3	4	5	6	7

15. Akademik çalışmamda; koyduğum hedefe ulaşmak için belirli bir zaman belirlerim.

1	2	3	4	5	6	7

16. Akademik faaliyetimde zorlanınca öğretmenlerimden yardım alırım.

1	2	3	4	5	6	7

17. Akademik faaliyetimde zorlanınca diğer öğrencilerden yardım alırım.

1	2	3	4	5	6	7

18. Akademik faaliyetimde zorlanınca diğer yetişkinlerden yardım alırım.

1	2	3	4	5	6	7

19. Akademik faaliyetimde zorlanınca bir arkadaşımdan yardım alırım.

1	2	3	4	5	6	7

20. Konuyu zor bulunca akademik çalışma için kendimi motive ederim.

1	2	3	4	5	6	7

21. Konuyu sıkıcı bulunca akademik çalışma için kendimi motive ederim.

1	2	3	4	5	6	7

22. Yorgun olunca akademik çalışma için kendimi motive ederim.

1	2	3	4	5	6	7

23. Yapacak ilginç şeyler olduğunda akademik çalışma için kendimi motive ederim.

1	2	3	4	5	6	7

24. Sınıftaki derslerde not tutarım.

1	2	3	4	5	6	7

Adınız ve Soyadınız: Tarih:

Bölümünüz: Saat:

İmza: Versiyon No:

25. Ödevlerim için kütüphaneyi kullanırım.

1	2	3	4	5	6	7

26. Akademik çalışmamı planlarım.

1	2	3	4	5	6	7

27. Akademik çalışmamı düzenlerim.

1	2	3	4	5	6	7

28. Sınıfta ya da ders kitabında verilen bilgileri hatırlamaya çalışırım.

1	2	3	4	5	6	7

29. Dikkatim dağılmadan çalışmak için bir yer ayarlarım.

1	2	3	4	5	6	7

30. Konuyu zor bulunca akademik çalışmama devam edebilmek için gerekli adımları atarım.

1	2	3	4	5	6	7

31. Konuyu sıkıcı bulunca akademik çalışmama devam edebilmek için gerekli adımlar atarım.

1	2	3	4	5	6	7

32. Yorgun olunca akademik çalışmama devam edebilmek için gerekli adımları atarım.

1	2	3	4	5	6	7

33. Yapacak ilginç şeyler olduğunda akademik çalışmama devam edebilmek için gerekli adımları atarım.

1	2	3	4	5	6	7

34. Stratejiyi olması gerektiği şekilde uygulayıp uygulamadığımı kontrol ederim.

1	2	3	4	5	6	7

35. Kullandığım stratejinin işe yaramaması durumunda kullanmak üzere alternatif stratejilerim vardır.

1	2	3	4	5	6	7

36. Stratejimi doğru şekilde uygulayıp uygulamadığımı kontrol etmek için performansımı diğerlerininkilerle kıyaslarım.

1	2	3	4	5	6	7

37. Stratejimin istenen etkiyi gösterip göstermediğini görmek için çalışmamı kontrol ederim.

1	2	3	4	5	6	7

38. Hangisinin daha etkili olduğunu görmek için stratejimi diğer yöntemlerle kıyaslarım.

1	2	3	4	5	6	7

39. Ne kadar gelişme gösterdiğimi görmek için performans kaydımı tutarım.

1	2	3	4	5	6	7

40. Konuyu ne kadar iyi kavradığımı görmek için ders kitaplarının bölüm sonlarındaki problemleri çözmeyi denerim.

1	2	3	4	5	6	7

41. Konuyu ne kadar bildiğimi görmek için eski testleri çözerim.

1	2	3	4	5	6	7

42. Stratejiyi daha iyi kullanacak şekilde davranışımı ayarlarım.

1	2	3	4	5	6	7

43. Kullandığım strateji işe yaramazsa daha etkin bir stratejiye geçerim.

1	2	3	4	5	6	7

44. Testteki hatalarımı görmek için verdiğim yanıtları gözden geçiririm.

1	2	3	4	5	6	7

45. Konuyu iyice öğrenemediğimi anladığımda neyi yanlış yaptığımı belirlerim.

1	2	3	4	5	6	7

46. Belirlediğim hataları düzeltmek için harekete geçerim.

1	2	3	4	5	6	7

47. Hatayı düzelttiğimden emin olmak için kontrol ederim.

1	2	3	4	5	6	7

48. Hatalarımı düzelttiğim için kendimi ödüllendiririm.

1	2	3	4	5	6	7

APPENDIX D

PRIOR KNOWLEDGE TEST

Name and Surname:
Signature:

(EK3) Prior Knowledge Test (20 points in total)

A. Fill in the blanks with the correct form of the verbs in brackets. (1 points each) (Parantez içindeki kelimeleri boşluklara uygun şekilde yerleştiriniz.)

Yesterday _____ **1 (be)** a busy day. First, I _____ **2 (wake)** up very late because my alarm clock _____ **3 (ring, not)**, so I _____ **4 (miss)** the school bus. I _____ **5 (call)** my father. He _____ **6 (help)** me and _____ **7 (drive)** me to school. But, I _____ **8 (forget)** my homework at home, so we _____ **9 (return)** home. Finally, we _____ **10 (arrive)** at school at 11 a.m., in the middle of the third lesson.

B. Answer the following questions. Make <u>full</u> sentences. (2 points each – 1 point for the correct use of the verbs and 1 point for the correct word order) (Sorulara cevap veriniz. Tam cümle kurunuz.)

1. Where were you last Saturday?
   _____
2. What did you watch last night?
   _____
3. Where did you go last summer?
   _____
4. When did you start studying at Bilgi University?
   _____
5. What did you study yesterday?
   _____

APPENDIX E

RETENTION TEST

Name and Surname: Date:

Signature: Time:

(EK4) Retention Test

Fill in the blanks with the correct person below. (You will use some names more than once.)

Boşluklara doğru kişiyi yerleştiriniz.

Allison Gray
Mrs. Smart
Lady Elizabeth
Doctor Neil
Sir Brian

1. _____ walked to his study at 11 p.m.
2. _____ knocked the door of Sir Brian's study.
3. _____ was dead at 11.30.
4. Sir Brian had a fight with _____.
5. _____ wanted some money from Sir Brian yesterday.
6. Sir Brian gave 50000 pounds to _____.
7. _____ started working 25 years ago.
8. Sir Brian wrote a love letter to _____.
9. _____ lost the money.
10. _____ cried in the kitchen.

APPENDIX F

TRANSFER TEST

Name and Surname: Date:

Signature: Time:

(EK5) Transfer Test

Look at the table and write a short paragraph about Jack Milton's yesterday with the information below. (10 sentences)

Jack Milton'ın dünü hakkında kısa bir paragraph yazınız. Tablodaki bilgileri kullanarak 10 cümle kurunuz.

1	Be	At school
2	Have breakfast	No
3	Walk to work	Yes
4	Give	Four lessons
5	Talk about	Business
6	Write	A class report
7	Want	To have fun
8	See	An action movie
9	Love	Yes
10	Cry	No

Jack Milton_____

APPENDIX G

ETHICS COMMITTEE APPROVAL

T.C.
BOĞAZİÇİ ÜNİVERSİTESİ
Sosyal ve Beşeri Bilimler Yüksek Lisans ve Doktora Tezleri Etik İnceleme Komisyonu

Sayı: 2018-56

20 Aralık 2018

Bedi Cananoğlu
Eğitim Teknolojileri

Sayın Araştırmacı,

"Öğrenen Kontrolü ve Gereksiz Ekran Metninin Öğrenenlerin Yazma Performansına Etkileri" başlıklı projeniz ile ilgili olarak yaptığınız SBB-EAK 2018/41 sayılı başvuru komisyonumuz tarafından 20 Aralık 2018 tarihli toplantıda incelenmiş ve uygun bulunmuştur.

Prof. Dr. Feyza Çorapçı

Doç. Dr. Mehmet Yiğit Gürdal

Doç. Dr. Ebru Kaya

Doç. Dr. Gül Sosay

Dr. Öğr. Üyesi Şebnem Yalçın

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