THE EFFECT OF COGNITIVE LOAD ASSOCIATED WITH INSTRUCTIONAL FORMATS AND TYPES OF PRESENTATION ON SECOND LANGUAGE READING COMPREHENSION PERFORMANCE

Hümeyra GENÇ
Foreign Language Department
Süleyman Şah University
Turkey
gencjhu@yahoo.com

Kaine GÜLÖZER
English Language Teaching Department
Yıldız Technical University
Turkey
kgulozer@yahoo.com

ABSTRACT
The effectiveness of instructional designs has been examined in several recent educational studies. Instructional design, both traditional and technology-based, can sometimes overload a learner's cognitive effort and thus negatively influence learning performance. The same learning material can induce different amounts of memory load as a result of differences in the instructional design used for its presentation. The present study aims to investigate the cognitive load effects of instructional formats (split-attention and integrated formats) and text presentation types (paper-based and online) on students' second language reading comprehension performance. In a split-attention format, comprehension questions were placed at the end of the reading text, while in an integrated format, comprehension questions were physically integrated into relevant paragraphs of the reading text. The quantitative data was collected through reading comprehension tests from forty pre-service teachers in an English Language Teaching department. The result of this post-test-only experimental design study showed that there was no statistically significant difference across the four groups, Online Reading-Split Attention Format; Online Reading-Integrated Format; Paper-based Reading Split Attention Format; and Paper-based Reading Integrated Format, in terms of students' second language reading comprehension (L2) reading comprehension scores. On the other hand, the result showed that there was a statistically significant difference in L2 comprehension between participants who read online text and those who read paper-based text.

INTRODUCTION
The discipline of education has been heavily influenced by enormous advancements in computer technologies. Many research studies are being conducted to investigate the effects of technology-based materials on teaching and learning a language in the context of English as a Second Language (ESL) and English as a Foreign Language (EFL) (e.g., Genc & Gulozer, 2011; Genc, 2012). Many educators believe that the integration of computer technologies into instruction eases English language learning because both teachers and students can reach a great amount of resources, including authentic reading and listening materials, online dictionaries, and grammar and vocabulary exercises.

For the past two decades, the literature has focused on reading online texts and strategies that increase text comprehension. (e.g., Akyel & Ercetin, 2009**;** Anderson, 2003; Huang, Chern, & Lin, 2009)**.** Electronic documents provide new text formats for reading and new ways to interact with information that can cause difficulties for readers taught to extract meaning from traditional paper-based documents (Cairo, 2003 & Protopsaltis, 2008). According to Al-Shehri & Gitsaki (2010), online reading was found to be between 20% and 30 % slower than reading from paper-based materials based on '90s technology. However, current research studies indicate that the speed of both online and paper reading is comparable. Additionally, online ESL reading materials that have popup windows, hyperlinks to other web pages, link colors, images, video or audio files may distract students' attention. These kinds of features can prevent effective online reading because they increase individuals' cognitive load. Furthermore, Hung (2009) mentioned that reading comprehension questions placed at the end of the printed text split students' attention between the text and the questions. This process can increase individuals' cognitive load and decrease their comprehension. Therefore, the purpose of the present research was to investigate cognitive load effects of split attention and integrated formats and of text presentation types (paper-based and online) on students' second language (L2) reading comprehension. In a split attention format, comprehension questions were placed at the end of the reading text (see Appendix 1). In an integrated format, comprehension questions were integrated into relevant paragraphs of the reading text (see Appendix 2). These two reading formats were adapted from Hung's study (2009).

LITERATURE REVIEW

Sweller (1988) stated that cognitive load theory is an instructional theory derived from the field of cognitive science. According to Cierniak, Scheiter & Gerjets (2009), "the rationale of cognitive load theory (CLT) is that the designs of instruction impose cognitive load on learners' limited working memory and that the cognitive load in turn influences learning outcomes" (p. 315). If the complexity of the instructional materials is not properly considered, this will result in a cognitive overload. Increases in mental load because of incoming information are related to reduced performance on tasks. Therefore, several researchers have been trying to design instructional strategies and activities that decrease the amount of load (e.g Al-Shehri and Gitsaki, 2010; Hung 2009; Zumbach & Mohraz, 2008; Yeung, Jin & Sweller, 1997) (DeStefano &LeFevre, 2007). Cognitive load theory explains learning in terms of an information processing system involving long-term memory and working memory (Cooper, 1998). Working memory processes information by means of organizing, contrasting, or comparing. Our working memory is so limited that we can only deal with two or three pieces of information at the same time (Sweller, VanMerrienboer & Paas, 1998). This limitation, combined with too much information, reduces the effectiveness of learning outcomes (Paas, Renkl & Sweller, 2003; Sweller et al., 1998). Therefore, the limitation of working memory should be taken into consideration when designing instructional materials (Leahy & Sweller, 2004).

After new information is processed by limited working memory, the information is stored in the form of hierarchically organized schemas in long-term memory (Cooper, 1998; Kalyuga, Chandler & Sweller, 1997; Leahy & Sweller, 2004). For example, a language learner holds new words and new structures in his/her long-term memory according to the manner in which they will be used (Hung, 2009). These organized schemas can be brought from long-term memory to working memory as elements to be processed (Kalyuga et al., 1997; Paas et al., 2003). Another important learning process is automation. All information can be functioned either consciously in limited working memory or automatically without control of working memory. Automation, which is acquired through practice, reduces the cognitive load on working memory. For example, most skilled readers read without consciously noticing the letters because the letters have become automated in childhood. Unskilled readers and young children who are learning to read, however, approach each letter consciously to comprehend the text (Leahy & Sweller, 2004; Sweller et al., 1998). In order to construct knowledge as schemas in long-term memory, incoming information must first be processed in working memory. The total amount of mental activity imposed on working memory is known as cognitive load. Cognitive load theory makes distinction among three types of cognitive load that affects learning performance: intrinsic, extraneous and germane. Cognitive load that is created by the inherent complexity of the subject, rather than by instructional design, is named intrinsic cognitive load (Brunken, Plass & Leutner, 2003). For example, learning a foreign language word is intrinsically less demanding than learning the syntax of that language because sentence construction requires an understanding of the words that create a sentence, as well as the rules of word order and tenses (Antonenko & Niederhauser, 2010). Unlike intrinsic load, extraneous load is defined as unnecessary information processing which is caused by the instructional design itself (Cierniak, Scheiter & Gerjets, 2009). For example, for reading tasks in language classes, most of the reading comprehension questions are placed at the end of the reading text. Therefore, students are required to switch back and forth between the text and questions, holding the questions in their memory as they search for the answer (Hung, 2009). This is called split attention effect (Sweller & Chandler, 1991; Yeung, Jin & Sweller, 1997). Several research studies demonstrated how instructional materials can lead to demonstrating the split attention effect. These studies stated that the format of materials either increased or limited learning (e.g., Al-Shehri & Gitsaki, 2010; Hung, 2009; Kalyuga et al., 1997; Leahy & Sweller, 2004; Yeung et al., 1997).

Some instructional designs, both paper-based and online-based, impose high cognitive load, on learners working memory. Intrinsic and extraneous load are additive (Paas et al., 2003). Therefore, researchers suggest that instructional design of learning materials should be done carefully, especially when the intrinsic load, the inherent difficulty of the content, is high. An increasing extraneous load that results from the instructional presentation reduces working memory resources available for handling intrinsic and germane cognitive load (Paas, Vang Gog & Sweller, 2010).

The last type of cognitive load is germane cognitive load, which is beneficial and can lead to more effective learning. Germain cognitive load directs an individual's attention toward the learning process and is related to rich schema construction and automation. Automation of schemas overcome working memory load and decreases cognitive load. For example, frequently used skills like reading can be done automatically without a high level of conscious effort by a learner, though the associated tasks may be complex (Burkes, 2007). It is recommended by Ciernak et al. (2009) that "… an instructional design should reduce extraneous load (i.e., information processing hindering learning) and increase germane load (i.e., information processing supporting learning)" (p. 315). Although intrinsic load is unchangeable because it is integral to the subject matter,

extraneous and germane cognitive load can be manipulated by instructional design of the material. Therefore, the same learning material can induce different amounts of memory load based on the designs used for its presentation (Brunken et al., 2003).

Cognitive load theory recommends several instructional effects, including the split attention effect, the redundancy effect, and the imagination effect, for improving individual's learning performance. However, only split attention effect is of relevance to this study. Although there are many research studies examining the effects of instructional formats (split attention or integrated format) and text presentation type (paper-based or online-based) on learners' learning performance and cognitive load in fields such as science, geography, mathematics, and web-based education, few studies have been conducted in the field of English language education.

One of the most important studies that demonstrate the effects of instructional formats is by Yeung and colleagues (1997). In this study, five different experiments were conducted to investigate the effects of cognitive load for readers with different levels of expertise: 5th grade English speaking students, English speaking adults, 8th grade low-ability ESL students, and 8th grade high-ability ESL students. The aim of the study was to examine the effects of explanatory notes at both lexical level and semantic level through both the integration of vocabulary definitions into paper-based reading text (integrated format) and the placement of vocabulary explanation at the end of the paper-based text (split attention format). The result indicated that instructional formats (split attention and integrated format) used by different learners could yield different results. The authors stated that for 5th grade English speaking students and 8th grade low-ability ESL students, integrated vocabulary definitions resulted in higher comprehension scores but a lower score on a test assessing vocabulary meaning. Students learned better when the definitions were separated from the reading text. However, for English speaking adults and 8th grade high-ability ESL students, the opposite effect was found. The integrated format reduced reading comprehension but enhanced vocabulary learning. The researchers explained that for adult and high-ability ESL students, contrary to primary and low-ability ESL students, the presence of vocabulary meaning within the text increased cognitive load for comprehension. Thus, it reduced reading comprehension performance. On the other hand, for vocabulary learning, the integrated format reduced cognitive load and yielded higher scores in vocabulary learning performance.

Hung (2009) conducted a similar study with 21 adult ESL students to analyze the split attention effect in reading comprehension by comparing split attention and integrated formats. In the experiment, students were randomly divided into two groups and asked to read a paper-based text and answer the comprehension questions. The questions were placed either at the end of the text (split attention) or within the text (integrated). The study showed that the split attention format increased extraneous cognitive load and decreased learners' comprehension performance compared to the integrated format.

Al-Shehri and Gitsaki (2010) took a step further and explored the effectiveness of split attention and integrated formats on learners' cognitive load, and how they might facilitate second language online reading and vocabulary learning. For this study, 20 intermediate-level ESL adults were randomly assigned to four groups: 1) split attention with online dictionary, 2) split attention no dictionary, 3) integrated format with an online dictionary, and 4) integrated format no dictionary. Participants were asked to complete an online reading comprehension task. The result of the study showed that students who were in integrated groups performed better than students in split attention groups on reading comprehension tasks. Furthermore, students who used an online dictionary scored higher on the vocabulary test than students who did not.

In addition to studying the effect of instructional formats on learners' comprehension and cognitive load, researchers have also examined text presentation type of instructional materials. For example, Eveland & Dunwoody (2001) investigated the effects of presentation media, print text versus hypertext, on learners' perception of cognitive load. The study showed that there were no significant differences in perceived cognitive load across media (paper linear text, non-linear hypertext, and non-linear hypertext with navigation support).

Macedo-Rouet, Rouet, Epstein & Fayard (2003) conducted a similar experimental study with 47 undergraduate students. This study examined the effects of print and online presentations of multiple documents on readers' comprehension, perception of cognitive load, satisfaction, and attention. Contrary to the study of Eveland & Dunwoody (2001), Macedo-Rouet et al., (2003) found that hypertext caused higher cognitive load and poorer comprehension of documents.

These studies indicate that instructional design of reading materials, both paper-based and online-based, can affect a learner's cognitive load, and is therefore an essential element in determining reading comprehension performance in an ESL context. However, little effort has been spent to investigate the best instructional design and presentation conditions that facilitate English language learning in an EFL context such is found in Turkey. Therefore, the present study aims to investigate the cognitive load effects of instructional formats and text presentation types on students' second language reading comprehension performance.

RESEARCH QUESTIONS
The present study aims to investigate the following research questions:
1) What type of instructional format (Split Attention or Integrated Format) is more effective in facilitating L2 reading comprehension?
2) What type of text presentation (paper-based and online) leads to better comprehension in L2 reading?

METHOD
Participants and Setting
This study was conducted in an English Language Teaching (ELT) department in a state university in Istanbul, Turkey. Forty freshman, Turkish students between the ages of 19 and 21 were asked to participate in this study. All of the students were volunteer participants during the spring semester of the 2010-2011 academic year. The learners can be considered to have advanced level of English language proficiency during the present research because all were ELT pre-service teachers. Moreover, all of the participants reported that they were tech-savvy and used computers for e-mail exchange, word processing, chatting and surfing the Internet.

The present study was a post-test-only experimental design, in which students were randomly and equally divided into four instructional formats. Each group consisted of 10 students. The groups were: Online Reading-Split Attention Format (ORSA); Online Reading-Integrated Format (ORIF); Paper-based Reading Split Attention Format (PRSA); and Paper-based Reading Integrated Format (PRIF). The students who were in online groups (ORSA and ORIF) participated in the study individually in a computer lab in the school. The paper-based reading groups (PRSA and PRIF) participated in the study individually in their classroom environment. Before the reading sessions, participants were provided with a brief demonstration and information about how they would engage the tasks.

Materials and Process
Two of the four conditions were provided online (ORSA and ORIF). The other two conditions were paper-based (PRSA and PRIF). For online split attention and integrated format, two different Websites were designed. The ORSA was available at http://humeyragenc.tripod.com (see Figures 1and Figure 2) and the ORIF was available at http://humeyragenc.tripod.com/genc (see Figure 3). The PRSA and PRIF were designed as black and white printed materials for the study.

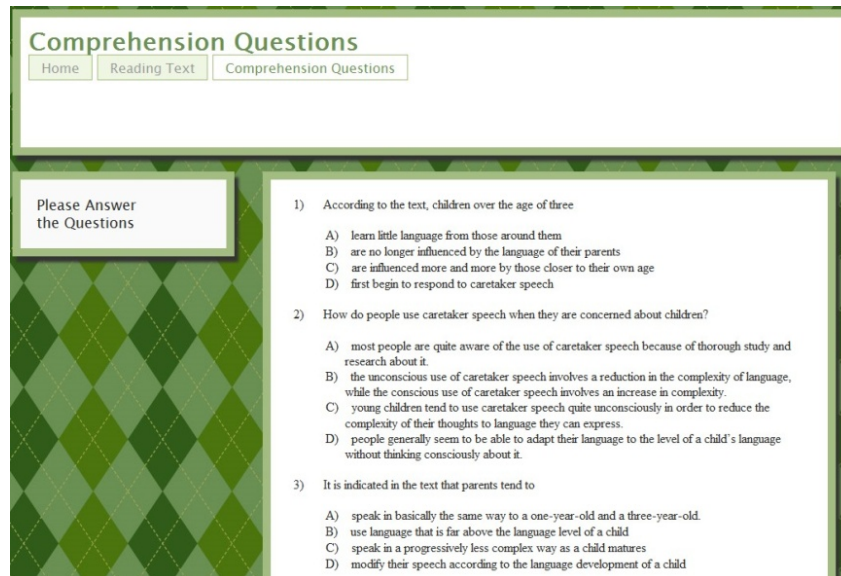Figure1. A screen shot showing the reading text in ORSA

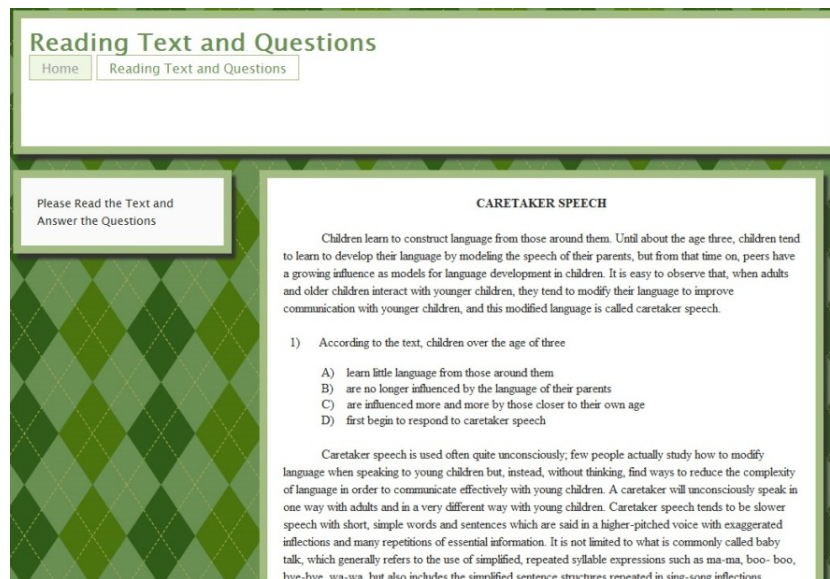Figure2. A screen shot showing the comprehension questions in ORSA

Figure3. A screen shot showing the reading text and comprehension questions in ORIF

All four conditions included a reading text and five multiple-choice reading comprehension questions. The reading text, "Caretaker Speech", which consisted of five- paragraphs and 606 words, was taken from Longman Preparation Course for the TOEFL Test: The Paper Test (Student Book with Answer Key and CD-ROM) book written by Phillips (2005). In order to eliminate the effects of background knowledge and provide an equal chance to all participants, the topic about speech development related to ELT courses was chosen. Thus, all students were familiar with the topic during the study. The comprehension questions were also taken from the same book, but two questions were paraphrased in order to eliminate unidiomatic language by the researcher.

For ORSA, the online text appeared on one Webpage and the comprehension questions were shown on a separate Webpage. In order to answer the questions, participants had to go back and forward between the reading text and the questions by clicking the "Reading Text" and "Comprehension Questions" icons. However, both the online reading text and the reading comprehension questions were shown on the same page for ORIF. Thus, the students did not have to switch back and forth between the pages to answer the comprehension questions. For both Integrated Formats (Online Reading Integrated Format and Paper-Based

reading Integrated Format), five reading comprehension questions were placed physically into the related paragraphs of the text.

Additionally, for PRSA, the reading text was shown on one paper-based page and the comprehension questions were shown on a separate page (see Appendix 1). Students switched from one page to the other in order to answer the comprehension questions. On the other hand, for PRIF, both reading text and comprehension questions appeared on the same page, with the questions placed physically near the related paragraphs of text, as in ORIF (see Appendix 2).

For the present study, the reading comprehension score was assigned as a dependent variable, whereas types of instructional formats (split-attention and integrated format), and presentation types (paper-based and online) were determined as independent variables by the researcher.

Data Analysis
The groups were considered to be equal in all respects because the participants were randomly and equally assigned to the groups. Each correct answer in the multiple-choice reading comprehension test was scored as 1 point. The maximum score on the test was 5. The data obtained from reading comprehension tests and reading speed were analyzed by using SPSS version 16.0. In order to identify the average scores in the reading comprehension tests and reading speed, inferential statistics, including t-test and Kruskal-Wallis test, and descriptive statistics were used.

RESULT
Reading comprehension scores according to instructional formats
In order to provide a depth of understanding about the cognitive effects of instructional formats and presentation types on students' L2 learning, several statistical analyses were applied in the study. Descriptive statistics and inferential statistics were conducted to analyze what type of instructional formats (Split Attention or Integrated Formats) is more effective in facilitating L2 reading comprehension. Since the number of the participants in each group was not close enough, there was no normal distribution across the four groups of subjects. Therefore, a nonparametric test called Kruskal-Wallis was conducted to find differences across the four groups of subjects in relation to L2 reading comprehension. The result of descriptive statistics (Table 1) shows that ORSA group had the highest mean value in the comprehension test. This indicates that participants in ORSA group performed better than all the other groups on the reading comprehension test. However, the PRSA group scored lowest on the test. The largest mean value difference was between the split attention groups (ORSA and PRSA). Participants who had online reading text performed far better than participants who had paper-based reading text. According to Table 1, the split attention group performed better than the integrated group in online presentation, whereas the split- attention group in paper-based presentation had a lower score than the integrated format group in paper-based presentation.

Table 1 Mean scores and standard deviation according to instructional formats

Groups	N	Mean	SD
ORSA	10	3.10	1.66
ORIF	10	2.00	1.15
PRSA	10	1.55	1.33
PRIF	10	1.63	1.20

Additionally, the Kruskal-Wallis test was used to determine whether there was a statistically significant difference across all four groups. The result of Kruskal-Wallis test (Table 2) shows that there was no statistically significant difference across the four groups in terms of students' L2 reading comprehension scores (sig(2-tailed) =. 06 ; p< 0.05). It seems that the reading comprehension score does not depend on instructional format difference in the present study.

Table 2 Kruskal-Wallis test result according to instructional formats

	Test Score
Chi-Square	7.12
df	3
Asymp. Sig.	.06

Reading comprehension scores according to presentation type
In order to find what type of text presentation (paper-based or online) leads to better comprehension in L2 reading, both descriptive and inferential statistics were conducted. Descriptive statistics (Table 3) shows that the online groups received higher mean values than paper-based groups in reading comprehension tests in the study. This result indicates that students in online reading groups performed better than students in paper-based groups on the test.

Table 3 Mean scores and standard deviation according to text presentation type

Groups	N	Mean	SD
Paper-based	20	1.60	1.23
Online	20	2.80	1.47

Furthermore, an independent sample t-test was conducted to see whether there was a statistically significant difference between the groups. As can be seen from Table 4, there was a statistically significant difference between students who did the reading task as online and students who did the reading task as paper-based in terms of L2 reading comprehension (sig(2-tailed) =. 008; $p < 0.05$). It seems from the study that reading comprehension scores are affected by differences in text presentation type.

Table 4 Independent sample t-test result according to text presentation type

	t-test for Equality of Means			
	t	df	Sig. (2-tailed)	Mean Difference
Test Score	-2.79	38	.008*	-1.20

*Significant at the .05 level

DISCUSSION
This research study, post-test-only experimental design, presents the findings of cognitive load effects of instructional formats (Split-attention and Integrated format) and text presentation types (paper-based and online) on ELT freshman students' second language reading comprehension performance.

The investigation of the cognitive load effects of instructional formats shows advantages of the Split Attention Format for reading comprehension, though there is no statistically significant difference across the four groups in the study. The participants in both integrated format groups (ORIF and PRIF) received lower scores than those in the ORSA (Online Reading-Split Attention Format) group. This finding is consistent with the result of Yeung, et al. (1997), as their study shows that vocabulary meanings which were integrated into the text reduced reading comprehension of English speaking adults and 8th grade high-ability ESL students. The authors claim that when vocabulary meanings are provided in integrated format, they become redundant and difficult to ignore during reading. Therefore, the rich knowledge of vocabulary increase students' cognitive load and decrease comprehension. However, split attention format allowed participants to ignore these vocabularies. On the other hand, the result of the present study contradict the findings of Al-Shehri & Gitsaki, (2010) and Hung, (2009), because these research papers indicate that students with integrated format presented better performance than the students with split attention format in reading comprehension tasks. The authors of these studies believe that split attention format, switching between the text and the questions, increases cognitive load, which in-turn leads to lower performance.

Based on the findings of cognitive load effects of instructional formats, participants with the split attention group compared to participants with integrated group did not suffer from cognitive load that leads to comprehension failure. According to the author of the study, the main reason for this finding is that participants were provided a topic in which they had strong background knowledge. The selected text, which was about speech development, was familiar with all ELT students in the study. Therefore, the author claims that providing comprehension questions through an integrated format caused redundancy for students who already had knowledge about the topic. Since students had to deal with redundant information during the reading, their working memories were overloaded, negatively affecting comprehension. On the other hand, in split attention, students ignored the redundant information and focused on what they were looking for in the text, without being cognitively overloaded. Thus, the increase in extraneous load decreased, rather than increased the cognitive load.

Another important finding deduced from the present study is that participants in online reading groups performed better than participants in paper-based groups in the reading task. This result contradicts with the findings of Macedo-Rouet, et al. (2003). In their study, the authors found that hypertext reading precipitated lower comprehension compared to print text. It was claimed that texts presented through computer screens increased students' perceived cognitive load. On the other hand, in a similar study, Eveland and Dunwoody (2001) did not find any significant difference in perceived cognitive load between the use of hypertext and print text for learning science subjects. The researchers believe that hypertext reading does not reduce learning because of increased cognitive load. This result confirms the findings of the present study as well. It is obvious that using online reading material did not reduce students' performance due to an increase in their cognitive load. In the study, all participants were proficient with computers, and were able to easily integrate computer technologies into both their personal and educational life. Reading on a computer screen, searching across the pages or going back and forth between web pages neither distract students' attention nor restrict their learning. Therefore, it can be claimed that the presentation of the reading material through hypertext, contrary to print text, leads to better comprehension and supported students' success in this research.

The present study provides ELT teachers few opinions about how to effectively and efficiently design instructional materials for students. The present research supports the use of online materials with a split attention format in reading tasks. Therefore, based on the students' needs, abilities and interests, teachers can integrate computer technologies into their English language instruction without concern about cognitive overload. This can be done by either selecting appropriate materials from the vast resources of the Internet or converting printed materials to hypertext, as was done in this study.   The results of this study also support the use of online bilingual dictionaries to help facilitate students' learning, as the online reading with split attention format did not interfere with reading comprehension.

CONCLUSIONS
The findings of the present study bring us a step closer to understanding how instructional formats and text presentation types affect ELT students' reading comprehension, and how these independent variables are related to cognitive load theory in terms of text comprehension. The quantitative data collected through a reading comprehension test revealed two important results. First, participants in a split attention group performed better than participants in an integrated format group on the test. Second, students who read the hypertext performed better on the test than students who read the printed text. As a result, students in the online reading with split attention group outperformed the other groups in the study.

The present study revealed useful insights into second language online reading and instructional formats in terms of cognitive load theory. However, it has a few limitations. Although the results of the quantitative research provided important findings, small sample size may limit the generalizability of the results of this study. The data was collected from participants who were in an ELT department in Istanbul. Further investigation can be conducted with larger samples in a different department in a different geographic region. Furthermore, the author of the study theorizes that the result of the present study might be different if the same research were replicated with participants who have a low-English proficiency level, no prior knowledge about the topic of the text, and are less-skilled in terms of the Internet usage. Future research may also include a triangulation approach and longitudinal design to investigate the instructional formats and text presentation types in terms of cognitive load theory.

REFERENCES
Akyel, A., and Ercetin, G. (2009). Hypermedia reading strategies employed by advanced learners of English. *System, 37*, 136-152.
Al-Shehri, S., and Gitsaki, C. (2010). Online reading: a preliminary study of the impact of integrated and split-attention formats on L2 students' cognitive load. *ReCALL, 22*(3), 356-375.
Anderson, N. J. (2003). Scrolling, clicking, and reading English: Online reading strategies in a second/ foreign language. *The Reading Matrix, 3*(3), 1-33.
Antonenko, P. D., and Niederhauser, D. S. (2010). The influence of leads on cognitive load and learning in hypertext environment. *Computers in Human Behavior, 26*, 140-150.

Brunken, R., Plass, J. L., and Leutner, D. (2003). Direct measurement of cognitive load in multimedia learning. *Educational Psychologist*, *38*(1), 53-61.

Burkes, K. M. E. (2007). *Applying cognitive load theory to the design of online learning.* (Doctoral dissertation, University of North Texas). Retrieved from http://www.sageperformance.com/drjeffallen/Dissertation-Example/KateBurkesdissertation.pdf

Cairo, J. (2003). Reading comprehension on the Internet: Expanding our understanding of reading comprehension to encompass new literecies. *The Reading Teacher, 56*(5), 458-464

Cierniak, G., Scheiter, K. and Gerjets, P. (2009). Explaining the split-attention effect: Is the reduction of extraneous cognitive load accompanied by an increase in germane cognitive load*? Computers in Human Behavior*, *25*, 315-324.

Cooper, G. D. (1998). *Research into cognitive load theory and instructional design at UNSW.* Retrieved from http://dwb4.unl.edu/Diss/Cooper/UNSW.htm

DeStefano, D., and LeFevre, J. (2007). Cognitive load in hypertext reading: A review. *Computers in Human Behavior*, *23*(3), 1616-1641.

Eveland, W., P., and Dunwoody, S. (2001). User control and structural isomorphism or disorientation and cognitive load? Learning from the Web versus print. *Communication Research, 28*(1), 48-78.

Genc, H. (2012). An evaluation study of a CALL application: With BELT or without BELT. *The Turkish Online Journal of Educational Technology. 11*(2), 44- 54.

Genc, H. and Gulozer, K. (2011). An experimental study: The EFL pre-service teachers' English language writing experience through Wiki. . In *Proceedings of Society for Information Technology & Teacher Education International Conference 2011* (pp. 1498-1503). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/p/36507

Huang, H., Chern, C., & Lin, C. (2009). EFL learners' use of online reading strategies and comprehension of texts: An exploratory study. *Computers & Education*, *52*, 13-26.

Hung, H. C. M. (2009). Applying cognitive load theory in reading comprehension. *Proceedings of the 5th CamTESOL Conference on English Language "The Globalisation of ELT: Emerging Directions"* Phnom
Penh, Cambodia, 21-22 February 2009. 5, 184-196. Retrieved from http://www.camtesol.org/Selected_Papers_Vol.5_2009.pdf

Kalyuga, S., Chandler, P. and Sweller, J. (1998). Levels of expertise and user-adapted formats of instructional presentations: A cognitive load approach. *The Journal of the Human Factors and Ergonomics Society, 40*(1), 1-17.

Leahy, W. and Sweller, J. (2004). Cognitive load and the imagination effect. *Applied Cognitive Psychology*, *18*, 857-875.

Macedo-Rouet, M., Rouet, J., Epstein, I., and Fayard, P. (2003). Effects of online reading on popular science comprehension. *Science Communication*, *25*(2), 99-128.

Paas, F., Renkl, A. and Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist*, *38*(1), 1-4.

Paas, F., van Gog, T., & Sweller, J. (2010). Cognitive load theory: New conceptualizations, specifications, and integrated research perspectives. *Educational Psychology Review, 22*, 115–121.

Philiphs, D. (2005). *Longman preparation course for the TOEFL test: The paper test (student book with answer key and CD-ROM)*, White Plains, NY: Pearson ESL.

Protopsaltis, A. (2008). Reading strategies in hypertext and factors influencing hyperlink selection. *Journal of Educational Multimedia and Hypermedia*, *17*(2), 191-213.

Sweller, J. (1988). Cognitive load during problem solving : Effects on learning. *Cognitive Science, 12,* 257-285.

Sweller, J. and Chandler, P. (1991). Evidence for cognitive load theory. *Cognition and Instruction, 8*(4), 351-362.

Sweller, J., VanMerirenboer, J. J. G. and Paas, F. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, *10*(3), 251-296.

Yeung, A., Jin, P. and Sweller, J. (1997). Cognitive load and learner expertise: Split attention and redundancy effects in reading explanatory notes. *Contemporary Educational Psychology*, *23*(1), 1-21.

Zumbach, J. and Mohraz, M. (2008). Cognitive load in hypermedia reading comprehension: Influence of text type and linearity. *Computers in Human Behavior, 24*, 875-887.

Appendix 1

CARETAKER SPEECH
Children learn to construct language from those around them. Until about the age three, children tend to learn to develop their language by modeling the speech of their parents, but from that time on, peers have a growing influence as models for language development in children. It is easy to observe that, when adults and older children interact with younger children, they tend to modify their language to improve communication with younger children, and this modified language is called caretaker speech.

Caretaker speech is used often quite unconsciously; few people actually study how to modify language when speaking to young children but, instead, without thinking, find ways to reduce the complexity of language in order to communicate effectively with young children. A caretaker will unconsciously speak in one way with adults and in a very different way with young children. Caretaker speech tends to be slower speech with short, simple words and sentences which are said in a higher-pitched voice with exaggerated inflections and many repetitions of essential information. It is not limited to what is commonly called baby talk, which generally refers to the use of simplified, repeated syllable expressions such as *ma-ma, boo- boo, bye-bye, wa-wa*, but also includes the simplified sentence structures repeated in sing-song inflections.

Caretaker speech serves the very important function of allowing young children to acquire language more easily. The higher-pitched voice and the exaggerated inflections tend to focus the small child on what the caretaker is saying, the simplified words and sentences make it easier for the small child to begin to comprehend, and the repetitions reinforce the child's developing understanding. Then, as a child's speech develops, caretakers tend to adjust their language in response to the improved language skills, again quite unconsciously. Parents and older children regularly adjust their speech to a level that is slightly above that of a younger child; without studied recognition of what they are doing, these caretakers will speak in one way to a one-year-old and in a progressively more complex way as the child reaches the age of two or three.

An important point to note is that the function covered by caretaker speech, that of assisting a child to acquire language in small and simple steps, is an unconsciously used but extremely important part of the process of language acquisition and as such is quite universal. Studying cultures where children do not acquire language through caretaker speech is difficult because such cultures are difficult to find. The question of why caretaker speech is universal is not clearly understood; instead proponents on either side of the nature vs. nurture debate argue over whether caretaker speech is a natural function or a learned one. Those who believe that caretaker speech is a natural and inherent functions in humans believe that it is human nature for children to acquire language and for those around them to encourage their language acquisition naturally; the presence of a child is itself a natural stimulus that increases the rate of caretaker speech among those present.

In contrast, those who believe that caretaker speech develops through nurturing rather than nature argue that a person who is attempting to communicate with a child will learn by trying out different ways of communicating to determine which is the most effective from the reactions to the communication attempts; a parent might, for example, learn to use speech with exaggerated inflections with a small child because the exaggerated inflections to a better job of attracting the child's attention than do more subtle inflections. Whether caretaker speech results from nature or nurture, it does play an important and universal role in child language acquisition.

QUESTIONS
1) According to the text, children over the age of three

   A) learn little language from those around them
   B) are no longer influenced by the language of their parents
   C) are influenced more and more by those closer to their own age
   D) first begin to respond to caretaker speech

2) How do people use caretaker speech when they are concerned about children?

   A) most people are quite aware of the use of caretaker speech because of thorough study and research about it.
   B) the unconscious use of caretaker speech involves a reduction in the complexity of language, while the conscious use of caretaker speech involves an increase in complexity.

C) young children tend to use caretaker speech quite unconsciously in order to reduce the complexity of their thoughts to language they can express.
D) people generally seem to be able to adapt their language to the level of a child's language without thinking consciously about it.

3) It is indicated in the text that parents tend to

A) speak in basically the same way to a one-year-old and a three-year-old.
B) use language that is far above the language level of a child
C) speak in a progressively less complex way as a child matures
D) modify their speech according to the language development of a child

4) What is people's opinion about children's developing the use of caretaker speech ?

A) people who believe in nature over nurture feel that adults or older children who are around younger children will naturally make changes in their language.
B) caretaker speech is one of many natural functions that are used to stimulate young children to develop more rapidly.
C) the natural human tendency to acquire language makes caretaker speech unimportant in improving the rate of language acquisition by children.
D) it is human nature for children to develop the use of caretaker speech in order to take part effectively in conversations around them.

5) According to the text, it is not expected that someone who believes in nurture over nature
A) would believe that caretaker speech is more of a learned style of language than a natural one
B) would use different styles of caretaker speech with children in response to what is working best
C) would learn to use different styles of caretaker speech with different children
D) would use less caretaker speech than do those who believe in nature over nurture.

Appendix2

CARETAKER SPEECH
Children learn to construct language from those around them. Until about the age three, children tend to learn to develop their language by modeling the speech of their parents, but from that time on, peers have a growing influence as models for language development in children. It is easy to observe that, when adults and older children interact with younger children, they tend to modify their language to improve communication with younger children, and this modified language is called caretaker speech.
   1) According to the text, children over the age of three

E) learn little language from those around them
F) are no longer influenced by the language of their parents
G) are influenced more and more by those closer to their own age
H) first begin to respond to caretaker speech

Caretaker speech is used often quite unconsciously; few people actually study how to modify language when speaking to young children but, instead, without thinking, find ways to reduce the complexity of language in order to communicate effectively with young children. A caretaker will unconsciously speak in one way with adults and in a very different way with young children. Caretaker speech tends to be slower speech with short, simple words and sentences which are said in a higher-pitched voice with exaggerated inflections and many repetitions of essential information. It is not limited to what is commonly called baby talk, which generally refers to the use of simplified, repeated syllable expressions such as *ma-ma, boo- boo, bye-bye, wa-wa*, but also includes the simplified sentence structures repeated in sing-song inflections.

   2) How do people use caretaker speech when they are concerned about children?

E) most people are quite aware of the use of caretaker speech because of thorough study and research about it.
F) the unconscious use of caretaker speech involves a reduction in the complexity of language, while the conscious use of caretaker speech involves an increase in complexity.

G) young children tend to use caretaker speech quite unconsciously in order to reduce the complexity of their thoughts to language they can express.

H) people generally seem to be able to adapt their language to the level of a child's language without thinking consciously about it.

Caretaker speech serves the very important function of allowing young children to acquire language more easily. The higher-pitched voice and the exaggerated inflections tend to focus the small child on what the caretaker is saying, the simplified words and sentences make it easier for the small child to begin to comprehend, and the repetitions reinforce the child's developing understanding. Then, as a child's speech develops, caretakers tend to adjust their language in response to the improved language skills, again quite unconsciously. Parents and older children regularly adjust their speech to a level that is slightly above that of a younger child; without studied recognition of what they are doing, these caretakers will speak in one way to a one-year-old and in a progressively more complex way as the child reaches the age of two or three.

3) It is indicated in the text that parents tend to

E) speak in basically the same way to a one-year-old and a three-year-old.
F) use language that is far above the language level of a child
G) speak in a progressively less complex way as a child matures
H) modify their speech according to the language development of a child

An important point to note is that the function covered by caretaker speech, that of assisting a child to acquire language in small and simple steps, is an unconsciously used but extremely important part of the process of language acquisition and as such is quite universal. Studying cultures where children do not acquire language through caretaker speech is difficult because such cultures are difficult to find. The question of why caretaker speech is universal is not clearly understood; instead proponents on either side of the nature vs. nurture debate argue over whether caretaker speech is a natural function or a learned one. Those who believe that caretaker speech is a natural and inherent functions in humans believe that it is human nature for children to acquire language and for those around them to encourage their language acquisition naturally; the presence of a child is itself a natural stimulus that increases the rate of caretaker speech among those present.

4) What is people's opinion about children's developing the use of caretaker speech ?

E) people who believe in nature over nurture feel that adults or older children who are around younger children will naturally make changes in their language.
F) caretaker speech is one of many natural functions that are used to stimulate young children to develop more rapidly.
G) the natural human tendency to acquire language makes caretaker speech unimportant in improving the rate of language acquisition by children.
H) it is human nature for children to develop the use of caretaker speech in order to take part effectively in conversations around them.

In contrast, those who believe that caretaker speech develops through nurturing rather than nature argue that a person who is attempting to communicate with a child will learn by trying out different ways of communicating to determine which is the most effective from the reactions to the communication attempts; a parent might, for example, learn to use speech with exaggerated inflections with a small child because the exaggerated inflections to a better job of attracting the child's attention than do more subtle inflections. Whether caretaker speech results from nature or nurture, it does play an important and universal role in child language acquisition.

5) According to the text, it is not expected that someone who believes in nurture over nature
E) would believe that caretaker speech is more of a learned style of language than a natural one
F) would use different styles of caretaker speech with children in response to what is working best
G) would learn to use different styles of caretaker speech with different children
H) would use less caretaker speech than do those who believe in nature over nurture.