Context-Specific Computer-Assisted Language Learning

Research, Development and Practice

Edited by
Jeong-Bae Son

APACALL

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Context-Specific Computer-Assisted Language Learning:
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Preface

This book is an examination of contemporary topics of computer-assisted language learning (CALL) research, development and practice. It explores several different dimensions of CALL while looking at the ever-changing faces of CALL in different contexts. Topics covered in the book include teacher capacity building, learner training, massive open online courses, mobile learning, grammar instruction, process writing and peer evaluation. The book draws on context-specific studies and activities conducted by CALL researchers and practitioners and provides a valuable resource for postgraduate students, language teachers, teacher educators and researchers.

The book includes seven chapters anonymously peer-reviewed by independent reviewers and divided into three sections: research (Chapters 1-5), development (Chapter 6) and practice (Chapter 7). Chapter 1 examines the use of a learning management system (LMS) in a teacher capacity building initiative for blended learning sustainability. Chapter 2 looks into the implementation of learner training in CALL for a special target group. Chapter 3 explores connectivist massive open online courses (cMOOCs), flipped classrooms and conventional classrooms. Chapter 4 investigates English as a foreign language (EFL) learners' engagement, interaction and autonomy on a social networking site. Chapter 5 deals with different types of signalling in online grammar instruction. Chapter 6 discusses the instructional design of technology-enhanced process writing with sample activities. Finally, Chapter 7 presents a mobile peer evaluation system for in-class presentations. Each chapter finishes with four questions for further discussion and investigation.

As the fourth volume of the Asia-Pacific Association for Computer-Assisted Language Learning (APACALL) Book Series, the book presents the findings and outcomes of recent work in the field of CALL and offers opportunities for readers to engage in meaningful discussions on the use of technology for language learning and teaching in the digital age. A collaborative effort has been made again in publishing this refereed volume. I would like to thank all authors whose work appears in the book and all reviewers of submitted manuscripts. My thanks also go to my family for their love and support.

Jeong-Bae Son
July 2019

[Research]

Chapter 5

Using Different Types of Computer-Supported Signaling in Explicit Online Grammar Instruction

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Abstract
Much has been written about the influence of various factors that affect learners' retention of course contents in various contexts and at various levels. However, few studies have focused on the factors that may both affect and indicate the organization of materials or contents presented to learners. This study aims to determine the effects of using different types of signaling on learners' retention in the post and delayed tests on the reduction of adverb clauses in an instructed online English grammar class. The quasi-experimental design recruited three groups, each of which included 20 pre-service language teachers. The control group was instructed on reducing adverb clauses with no use of signaling. However, visual signaling such as using texts in bold type was introduced into the materials for the Experimental Group 1, while the Experimental Group 2 used the materials supported with visual signaling in the form of graphic organizers as flowcharts. The scores from a researcher-developed assessment for the three groups were analyzed with a one-way ANOVA. The results of the study indicate that the participants in both experimental groups scored higher than the control group in the post and delayed retention tests; and the Experimental Group 2 scored relatively higher than the Experimental Group 1. Semi-structured interviews uncovered several advantages of using verbal and visual signaling in the materials used for grammar instruction.

Keywords
Visual signaling, verbal signaling, graphic organizers, grammar instruction, retention tests

INTRODUCTION

Signaling, a well-known principle of cognitive multimedia learning, entails that students can learn easily when provided with several cues which show the organization of the material presented to them (Mayer, 2009). The rationale behind this principle is that when learners' attention is directed towards the main points in the large context of a lesson, learners tend to build connections between these main points without dwelling on unnecessary details, which helps reduce extraneous processing (Jiang, Renandya, & Zhang, 2017). Signaling can be integrated into learning and teaching materials in two ways: verbal and visual signaling. Verbal signaling benefits from "underlining", "bolded words", and "vocal emphasis", while visual signaling includes "visual cues such as arrows, distinctive colors, and flashing" (Mayer, 2009, p. 110).

Regarding the use of signaling in research on teaching and learning languages, it is seen that input or textual enhancement is the concept frequently noted down in various studies (e.g., Izumi, 2002; Kian & Gorjian, 2018; Leow et al., 2003; Winke, 2013). Input enhancement is a concept coined by Sharwood Smith (1993) to refer to the techniques that make language provided to learners more salient, which helps teachers draw learners' attention to language features so that learners can consciously be aware of these features. In other words, when the input is enhanced through textual techniques such as using bolded or underlined words, it is more likely for learners to notice the form and to keep it in the long-term memory. Likewise, textual enhancement, considered one of the various approaches to enable learners to notice and pay attention to linguistic forms, aims:

> to raise learners' attention to linguistic forms by rendering input perceptually more salient. Textual enhancement aims to achieve this by highlighting certain aspects of input by means of various typographic devices, such as bolding, underlining, and italicizing in written input, or acoustic devices such as added stress or repetition in oral input. (Nassaji & Fotos, 2011, p. 36)

Much has been written about the influence of various factors that affect learners' retention of course contents in various contexts and at various levels. It is acknowledged that the studies conducted on the use of signaling and textual enhancement underscore overall positive effects on using verbal and visual techniques. However, despite these positive overall effects, most fail to provide any evidence that shows improvement in learning. Moreover, few studies have focused on comparing the effects of using different types of signaling while presenting materials to learners, especially courses such as English Grammar in language teaching and learning contexts.

LITERATURE REVIEW

Research on the use of signaling principles has indicated the crucial role in benefiting students on transfer tests conducted in content courses (e.g., Mautone & Mayer, 2001; Mayen, 2013) and transfer performance when multimedia representations support the content in textbooks (e.g., Cheng, Chou, Wang, & Lin, 2015). There are a variety of studies examining the effectiveness or ineffectiveness of enhancements introduced to teaching and learning contexts and showing varying results. The studies to be reviewed in this section are organized and discussed based on the effects of verbal and visual signaling on learner performance (see Table 1).

Table 1
Previous Research on Verbal and Visual Signaling and Learner Performance

Author(s)	Verbal signaling used	Target language structure / component	Major finding(s) / effect of signaling
Verbal signaling and learner performance			
Shook (1994)	font size and bolding	Present perfect tense and relative pronouns	Leading to higher scores
Lee (2007)	larger, boldfaced letters in different fonts	English passive construction and topic familiarity	beneficial for the intake of target forms
Kian & Gorjian (2018)	choice and underlining	English connectors	Increasing learners' noticing and intake
Izumi (2002)	bolding, different fonts and font sizes	Acquiring English relative clauses	No significant gains; use of tasks becoming more important
Leow et al. (2003)	underlining, bolding, and larger fonts	Present perfect and subjective mood in Spanish	No significant improvement in scores
Winke (2013)	Underlining and font	Modified replication of the study conducted by Lee (2007)	No improvement in gain scores; learner's noticing of passive structures increasing

Visual signaling and learner performance

Robinson et al. (2006)	Partially complete graphic organizers	Retention of course content	Scoring higher on the examination.
Lust (2014)	Graphic organizers	Learner gains based on course content	statistically significant gains
Mann (2014)	Concept/event maps and sequence chains	Comprehension of classroom discussions and readings	an increase in students' scores.
Evmenova et al. (2016)	Computer-based graphic organizer	Writing (quality and quantity of writing essays)	Improvement in writing
Casteleyn, Mottart, & Valcke (2013)	Concept and mind maps	Lectures provided with concepts and mind maps	Participants' preferring lectures based on maps, but no significant difference in knowledge gain

Verbal Signaling and Learner Performance

Shook (1994) investigated the effects of textual (verbal) enhancement on present perfect tense and relative pronouns in Spanish in a study conducted with 125 university students. The findings of the study indicate that experimental groups provided with reading passages with enhancements obtained higher scores than control groups. Likewise, Lee (2007) reported similar results in a study that investigated the effects of textual enhancement (larger and boldfaced letters in different fonts) on English passive construction in addition to topic familiarity. The study included 259 Korean participants learning English passives, who were divided into several groups with existing and non-existing textual enhancement. The results of the study indicate that textual enhancement proved to be beneficial for the intake of target forms in English. Using two different attention drawing techniques, choice and underlining, Kian and Gorjian (2018) have investigated the effects of these two techniques on 69 pre-intermediate students of English learning English connectors, who were divided into two experimental groups,

and a control group. The experimental groups were exposed to two techniques, while the control group was exposed only to drills of grammar provided in the reading texts. The study found that both the underlining and choice techniques were effective in the participants' noticing and the intake of English connectors.

Unlike the aforementioned studies that found positive and promising results in integrating textual enhancement using different techniques into grammar instruction, several other studies resulted in non-significant gains regarding learner performance. The study conducted by Izumi (2002), for example, compared the effects of textual enhancement (bolding, different fonts, and font sizes) and output on acquiring relative clauses in English. The participants in the study were 61 adults with different mother tongues. The results of the study indicate that the participants who were exposed to instruction with textual enhancement did not perform significantly, while the ones exposed to output-input tasks showed significant gains in acquiring relative clause forms. Similarly, the study conducted by Leow et al. (2003), who investigated the effects of textual enhancement on present perfect and subjective mood in Spanish on 72 university learners' performance, found that textual enhancement did not lead the participants to perform better than other participants who were not exposed to enhanced reading passages that included the target forms. In a recent work that replicated Lee's study, Winke (2013) reported that enhancement did not lead to an increase in gain scores. However, it has been noted that, based on the data obtained from the participants' eye movements, enhancement introduced to readings positively affected learners' noticing of passive structures.

Visual Signaling and Learner Performance

The studies reviewed so far focus on verbal enhancements introduced to target grammatical forms. However, to the best knowledge of the author, there is no study conducted on the use of visual signaling in learners' noticing of language structures. As previous research on using graphic organizers as visual signaling indicates that graphic organizers can be utilized as effective signals that might promote learners' noticing and retention of course content (Stull & Mayer, 2007), it is believed that the review of these studies might also indicate the possible use of graphic organizers in other language skills and components. For example, the study conducted by Robinson et al. (2006) investigated how graphic organizers affected exam performance in an undergraduate educational psychology course. The participants included 114 students enrolled in two sections of the course. The participants in the study completed graphic organizers partially or studied complete graphic organizers based on the course content in three quasi-experiments. The results of the study indicate that the partial tasks led the students to score higher on examination and that, in all experimental conditions, the participants' note-taking increased. In another study, Lusk (2014) investigated

the effect of using graphic organizers in a special education classroom and compared this effect with the effectiveness of lecture-style teaching. The study benefited from pre- and post-test measures to analyze the effects. The participants in the study included two classrooms of tenth-grade students and were divided into two groups: special education classroom and general education classroom. The results of the study indicate that using graphic organizers benefited both groups, leading to statistically significant differences. They also indicate that using graphic organizers was more effective in the special education classroom.

Mann's (2014) study, on the other hand, focused on the effectiveness of concept/event maps and sequence chains as graphic organizers that were used during classroom discussions, reading, and assignments in social studies content. The study involved 92 students in eighth-grade West Virginia Social Studies classes, and data were collected from pre and post-test assessments to determine student improvement in comprehension. The study found that scores of the students with and without disabilities increased due to the use of graphic organizers. Evmenova et al. (2016) investigated the effects of a computer-based graphic organizer (Microsoft Word) on the quantity and quality of essay writing by ten seventh- and eighth-grade students with disabilities such as emotional and attention deficit. The results of the study revealed in their visual analysis that all participants in the study improved their performances in writing, leading to improvements in the quantity and quality of their essays.

While the studies reviewed so far have indicated the relative improvements in learning through graphic organizers, the study conducted by Casteleyn, Mottart, and Valcke (2013) did not report any gains. Their study aimed to determine how graphic organizers such as concept maps and mind maps affected learning outcomes and a variety of variables such as cognitive load and appreciation of e-materials prepared by the lecturer cognitive theory of multimedia learning. One group was exposed to audio-recorded lectures, while the experimental one received lectures based on graphic organizers. The results of the study indicate that, although the participants preferred the lectures based on graphic organizers, there was no statistically significant difference in knowledge gain, cognitive load, or self-efficacy.

In summary, previous studies, which investigated the effectiveness and ineffectiveness of verbal and visual enhancements introduced to teaching and learning contexts, have provided varying results, from positive effects that lead to improvements in learners' performance to no significant results. It is well noticed that most of the studies suggest an overall positive effect for both verbal and visual signaling or enhancements and indicate that these enhancements, at least, lead learners to notice target grammatical forms and in various contexts, result in student improvement in comprehension and retention of course content.

In other words, the verbal and visual signaling is found to increase noticing, which is considered necessary but not sufficient for acquisition of grammatical forms (Nassaji & Fotos, 2004). Based on the findings of the studies reviewed in this section, it also appears that these enhancements are viewed as effective techniques to make target forms more salient, thereby leading learners to notice the target forms.

THE STUDY

Aims

This pilot study aims to determine the effects of using different types of signaling on learners' retention in post-tests on reducing adverb clauses in an instructed grammar class. Different types of signaling included no signaling, verbal signaling through using texts in bold type, underlined, italicized and written in capital letters, and visual signaling using graphic organizers such as flowcharts supported with colorful and blinking texts. In line with the aim of the study, the following research questions were stated:

1. Does the type of signaling affect the production of the target L2 form (reducing adverb clause), as measured by the participants' performance on a re-write task that included sentences of adverb clauses?
2. Does the type of signaling affect the target L2 form (reducing adverb clauses) recognition, as indicated by the participants during interviews?

Participants

The participants in the study included 60 senior pre-service language teachers in three groups (Control, Experimental 1, and Experimental 2) enrolled in an elective course titled 'Advanced English Grammar II' offered by the Department of Foreign Language Education at a state university in Turkey. The participants (40 female and 20 male) were assigned to groups based on the diagnostic test scores of a pre-test at the beginning of the semester. Each group consisted of 20 participants. The participants' age ranged from 22 to 27, with an average of 23.5. Most of the participants were graduates of high schools, while some of them were also graduates of a 4-year program. Convenience sampling was used in the study since resources as well as the logistical network were not available and sufficient to randomly select the participants from an entire population. Another reason was that the potential source of participants was easily accessible to the researcher.

Materials

The researcher benefited from explanations and exercises on Unit 16 Reducing Adverb Clauses of the book by Frodesen and Eyring (2007), which was the main textbook of the Advanced English Grammar II class. This class was offered during 2017-2018 Spring semester and aimed to refresh students' linguistic competence in English covered in previous courses such as Contextual Grammar and Advanced English Grammar I to review basic and advanced linguistic structures, to create an awareness of the relationship between the linguistic structures and lexical items and meanings, and to analyze the language structures within the framework of a context. The researcher first created explanations and exercises based on the unit materials on reducing adverb clauses of time and reducing adverb clauses that show cause. The same materials were created; however, the following changes were made to those materials:

Control Group: No signaling introduced to explicit instruction and exercises in terms of enhancement.

Experimental Group 1: Verbal signaling such as bold type, underlined, italicized, and written in capital letters was introduced to explicit instruction and exercises.

The following is the exemplary material provided to the Experimental Group 1:

(a) While **we** were hiking, **we admired** the scenery around us.

We can only reduce adverbial clauses of time including words such as "While", "before", and "after" when the subjects in each clause are the same. That is, the subject of the main clauses and the adverbial clause are must be the same.

(b) While we were hiking, we admired the scenery around us.

In order to reduce or write an adverb clause, we must first consider the subjects and then the voice of tense: active or passive.

(c) While hik*ing*, we admired the scenery around us.
The reduced clauses use **"verb + ing".**

(d) Hiking, we admired the scenery around us.

It is also possible to omit "While".
The sentences in (a), (b), and (c) have the same meaning.

Experimental Group 2: The grammar instruction included graphic organizers in the form of flow charts to provide explanation and examples (see Figure 1).

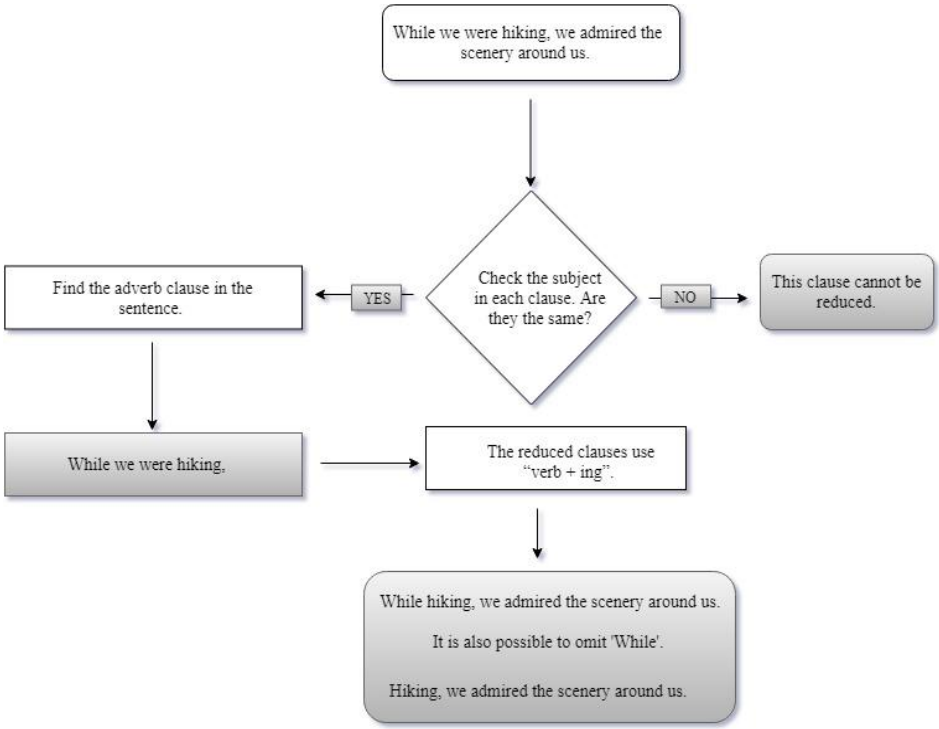

Figure 1. The flowchart explaining the reduction of an adverbial clause.

For all groups, the materials also included explicit instruction and contained 15 examples of the targeted structures for adverb clauses of time and cause. While the control group did not benefit from verbal or visual signaling, the experimental groups benefited from explicit instruction and examples enhanced verbally and visually in order to make the reduced adverb clauses more salient.

To investigate whether the type of signaling affects the participants' recognition of the target grammatical form, reducing adverb clauses, semi-structured interviews were conducted with the participants in the experimental groups. To measure the effect of the type of signaling on the production of the target L2 form, the participants' performance was assessed through a re-write task that included sentences of adverb clauses, which included 25 items and two sections. The first section included 15 items that required rewriting the given sentences by reducing

the adverb clauses if it was possible to do so. The second section of the task included 10 items that required writing the complete adverbial clauses of the reduced adverb clauses. The verbal signaling features were introduced to the explicit explanations and exercises by using *Microsoft Word*, while the visual signaling was created using draw.io, available at https://www.draw.io/.

Procedures

A mixed-methods design for data collection was adopted. The quantitative data collected included a quasi-experimental (pre-test, post-test and delayed test). The unit Reducing Adverb Clauses was selected from the coursebook, Grammar Dimensions 4, and the materials were redesigned based on the groups. In the Control Group, no signaling was introduced in the materials. However, in the Experimental Group 1, the materials included verbal signaling through using grammar instruction in bold type, underlined, italicized, and written in capital letters, while in the Experimental Group 2, the grammar instruction included graphic organizers in the form of flowcharts to provide explanation and examples on reducing adverb clauses. The flow charts also included colorful and blinking texts, which were inserted into PDF documents as Flash content and converted to a format that can be played by *Adobe Reader*, the free version of which allow users to view the flash content without additional software.

During the first week of the semester, the participants were informed about the course policy, the coursebook to be used, and requirements. They were also informed that a study would be conducted with *Unit 16 Reducing Adverb Clauses* on the seventh week, and their consent was obtained. A pre-test including 25 items on reducing adverb clauses was given as a diagnostic test to the participants, and, based on the results of the pre-test, they were divided into three groups.

Two weeks before discussing reducing adverb clauses, an online class on *Edmodo* has been activated, and necessary explanations and exercises have been uploaded. As different groups would be exposed to different signaling, three classes were created. As the study included online grammar instruction on *Edmodo*, the participants were provided with hands-on experience on how to use the website and access the materials. The study lasted only for a week, during which the participants practiced reducing adverb clauses of time and reducing adverb clauses that show cause without any time limitation. They were free to do the activities without being limited to any time or place.

One week after the study was completed, the participants were given the post-test that included the same questions in the pre-test that required reducing the adverb clauses and writing the complete adverb clauses in reduced adverb clauses. The delayed test was administered at the end of the semester as part of the final

exam. The pre-test was used as the post-test and the delayed test that included the same 25 questions. Example items are shown below:

Writing reduced adverb clauses if possible

- While I was trying to help my brother with his math, I got impatient because he would not pay attention to what I was saying.
- As the door was locked, it could not be opened.
- Because we took the bus, we saved a lot of money.
- Because I arrived at my first class late, I waited outside the classroom and missed the entire lecture.

Writing the complete adverbial clauses of reduced adverb clauses

- Having hiked around the park, we were exhausted.
- Never having gone to skating, I want to take lessons.
- Not being watched by the police, he is free to move.

In order to address the first research question, one-way between-groups analysis of variance (ANOVA) was used to determine whether there were any statistically significant differences between the means of three groups regarding the post-test and delayed test. For the second research question, qualitative data collection included semi-structured interviews conducted with five students selected from each experimental group (10 participants in total) regarding the use of different types of signaling. The semi-structured interviews took place in the researcher's office in the participants' L1 (Turkish) and lasted 8 minutes on average. The participants were directed the following questions regarding their views on how the verbal and visual signaling affected their recognition of the target L2 form. However, in order not to limit the participants' responses, they were also reminded that they could also bring up the issues that they thought were important or relevant:

1. Was your attention directed towards the target forms in the explanations/exercises?
2. How was your attention directed in the explanations and exercises?
3. Do you think that directing attention in this way affected your recognition of the target L2 form (reduced adverb clauses)?

RESULTS

As previously mentioned, the participants were divided into three groups according to the type of signaling (Control Group: no signaling; Experimental Group 1: verbal signaling; Experimental Group 2: visual signaling). There was a

statistically significant difference at the $p < .05$ level in post-test results for the three groups: F (2, 57) = 20.136, p = .00 (see Table 2). The effect size was calculated using eta squared and determined as.41, which suggests a very large effect size.

Table 2
One-Way Between-Groups Analysis of Variance (ANOVA) Post-Test Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	412.433	2	206.217	20.136	.000
Within Groups	583.750	57	10.241		
Total	996.183	59			

Table 3 indicates the post-test results that reveal the differences between the control and experimental groups. The results show that the participants in the experimental groups outperformed the ones in the control group. In other words, the participants exposed to verbal or visual signaling in explicit online grammar instruction obtained higher scores in the re-write task. The post-test results also indicated that no statistically significant difference existed between the Experimental Groups 1 and 2.

Table 3
Post-Test Results Showing Differences between the Control and the Experimental Groups

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
no_signaling	verbal_signaling	-4.550*	1.012	.000
	visual_signaling	-6.200*	1.012	.000
verbal_signaling	no_signaling	4.550*	1.012	.000
	visual_signaling	-1.650	1.012	.241
visual_signaling	no_signaling	6.200*	1.012	.000
	verbal_signaling	1.650	1.012	.241

Regarding the delayed test results, there was a statistically significant difference at the $p < .05$ for the three groups: F (2, 57) = 30.195, p = .00 (see Table 4). The effect size, which was calculated using eta squared, was .51, indicating a very large effect size.

Table 4
One-Way Between-Groups Analysis of Variance (ANOVA) Post-Test Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	510.833	2	255.417	30.195	.000
Within Groups	482.150	57	8.459		
Total	992.983	59			

The post-hoc comparisons using the Tukey HSD test indicated the mean scores for the Experimental Group 1 (M = 16.15, SD = 3.31) and Experimental Group 2 (M = 18.40, SD = 2.47) were significantly different from the Control Group (M = 11.40, SD = 2.87). Moreover, although in the post-test, there was no statistically significant difference between the experimental groups, in the delayed tests results, the Experimental Group 2 differ significantly at the $p < .05$ level ($p = .04$) from the Experimental Group 1 (see Table 5).

Table 5
Delayed Post-Test results Showing Differences between the Control and the Experimental Groups

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
no_signaling	verbal_signaling	-4.750*	.920	.000
	visual_signaling	-7.000*	.920	.000
verbal_signaling	no_signaling	4.750*	.920	.000
	visual_signaling	-2.250*	.920	.046
visual_signaling	no_signaling	7.000*	.920	.000
	verbal_signalling	2.250*	.920	.046

The semi-structured interviews were conducted with five participants from each experimental group. The responses provided to the interview questions indicated that the participants viewed signaling positively. A great majority of the participants (n=8) in the Experimental Group 1 indicated that the explanations and examples provided in underlined and written in capital letters in the lecture notes helped them pay attention to the forms. In other words, they noticed the target grammatical forms presented in contexts. One of the participants expressed this point as follows:

> *The texts underlined or written in capital letters drew my attention to how adverb clauses could be reduced. These changes provided me with the*

opportunity to focus more on the forms in the given explanations and examples without dealing with unnecessary details.

This finding is in line with one of the findings proposed by Jiang, Renandya, and Zhang (2017), indicating that learners learn better when their attention is drawn towards important points, which reduces extraneous processing. Five participants also indicated that they started benefiting from text modifications such as underlining or writing in capitals while they were studying the other course contents since they found it very useful. One of the participants expressed this:

I started writing capital letters or underlining in different courses while I was studying to indicate the main points. This helps me a lot, as I do not have to deal with minor details.

Similar responses were provided by the participants in the Experimental Group 2 regarding the use of flowcharts. However, eighteen participants (90%) acknowledged that the graphic organizers helped them learn better as the charts made easier to understand reducing the relative clauses. This group of participants differed significantly in the results of the delayed tests as one of the participants pointed out:

The flow charts summarized how the adverb clauses can be reduced on a single page. I think it greatly helped me, as I did not have to read pages of explanation. The main points were summarized briefly.

As this participant pointed out, flowcharts seem to have an advantage over the verbal signaling as the learners' attention are drawn to the main points or grammatical forms on a single page, which makes reviewing and learning easier.

DISCUSSION

Statistically significant differences were obtained among the groups, favoring the participants in the experimental groups that were exposed to verbal and visual signaling. Regarding these results, one might suggest that these significant differences might be attributed to the initial group differences. However, the groups were divided into control and experimental groups based on the pre-test results. Moreover, no significant differences were found between the groups based on the pre-test results. Hence, the statistically significant differences obtained both on the post-test and delayed test results can be attributed to the type of signaling that the participants were exposed to, rather than the initial group differences.

In this study, the type of signaling (verbal and visual) was only used on reducing adverb clauses in English, and the results of the study indicated that when the participants were supported with verbal and visual signaling, they obtained higher scores compared to the participants who were not provided with any kind of signaling. In other words, the results suggest that when the participants' attention was drawn to specific structures and explanations, this can be more beneficial for the production of the target language forms. This finding can be attributed to the fact that when the participants are presented with verbal or visual cues, their attention is easily directed towards the main points without dealing with unnecessary details, which also decreases the cognitive load. This finding was in consistent with the findings of the studies conducted by Shook (1994), Lee (2007), and Kian and Gorjian (2018), which indicated that when their participants were provided with enhanced texts or explanations, they obtained higher scores than those who were not.

Different from the findings of these studies, this study also found that there was a slightly significant difference between the participants who were exposed to verbal and those who were exposed to visual signaling. The results of the study favored the participants who were exposed to visual signaling. This might be attributed to the fact that the use of flowcharts as visual signaling might provide a better organization of the explanations and examples and learners' attention is drawn to the main points and grammatical structures easily as they can be provided on a single page. As the students did not dwell on unnecessary details, it is possible that it reduced extraneous processing of unnecessary details, sparing more cognitive resources for the main points in the explicit grammar instruction (Jiang, Renandya, & Zhang 2017). However, the finding favoring verbal or visual signaling is not in line with the findings of several other studies such as Izumi (2002), Leow et al. (2003), and Winke (2013), which revealed that the enhancements or signaling introduced to the target forms or the texts did not lead to an increase in learners' performance, especially in gain scores. However, as has been noted by Winke (2013), although no better performance was observed compared to other participants who were not exposed to enhancements, the participants' eye movements indicated that enhancements positively contributed to the learners' noticing of passive target forms.

The second research question aimed to investigate whether the type of signaling would be more beneficial in participants' recognition of the target L2 form based on the participants' responses during the semi-structured interviews. The results of the study indicate that the hypothesis for this question was supported, with the participants' responses indicating that they could easily notice or, in participants' words, 'pay attention to' the target forms and explanations with the help of visual signaling as flowcharts and the use of blinking text and colorful arrows. This finding corroborates the finding of the study conducted by Winke (2013),

indicating that verbal and visual enhancements contribute to the participants' recognition of the targeted linguistic forms.

As aforementioned, the delayed test results indicate that the participants exposed to visual signaling including flowcharts supported with colorful and blinking texts led the participants in the experimental group to obtain higher scores in the production test. This finding is consistent with those of the studies (Mautone & Mayer 2001; Stull & Mayer 2007), indicating that visual signaling such as graphic organizers help learners understand the organization better. Supporting these quantitative data, the participants' responses have also revealed that visual enhancements not only affect their production of the target forms but also notice them easily.

Overall, the findings from the current study suggest that computer-supported verbal and visual signaling leads learners to perform better on re-write task that included sentences of adverb clauses when the instruction is provided online explicitly. However, the findings also reveal that visual enhancements prove to be more beneficial as the participants in the second experimental group obtained higher scores, which might also reveal that visual enhancements help learners recall content more than the types of signaling. Contrary to the findings of previous studies that found no statistically significant results in learners' performance when they are exposed to enhancements, the current study favored signaling, especially, when provided with visual enhancements such the use of flowcharts.

However, some limitations of the study must also be addressed. First, the study was conducted only for a week, which suggests that further research might include data collection in a longer period. Moreover, the quasi-experimental design included groups that included twenty participants each. Therefore, the statistically significant results obtained based on the data might change if a larger number of participants were included in each group and in a longer period. Second, this study included and investigated the use of no signaling, verbal signaling through using texts in bold type, underlined, italicized and written in capital letters, and visual signaling using graphic organizers as flowcharts supported with colorful and blinking texts. Verbal signaling included the changes in the explanations and examples by using a combination of bold type, underlining, italicizing, and writing in capital letters. Further research, hence, can also focus on the effects of the individual use of bold type or underlying, rather than combining them and check whether this would lead to an increase in learners' performance on the tests.

Additionally, this study investigated the effect of signaling on teaching reducing adverb clauses that show time and clause. This specific targeted linguistic

structure itself, rather than the type of signaling introduced to explanations and example, might have contributed to the effectiveness or ineffectiveness of the signaling on the production and recognition of this targeted linguistic item. Therefore, further research should also consider teaching and learning new linguistic items. Finally, regarding the effects of type of signaling on recognition, this study only benefited from the participants' responses to the interview questions, which might be misleading as the findings are based on the participants' perceptions. Further research can also consider analyzing learners' eye movements when they are reading the texts enhanced with different types of signaling.

CONCLUSION

This study aimed to determine the effects of various types of signaling on learners' performance in retention tests on reducing adverb clauses. The results of the study indicate that verbal and visual signaling used in teaching materials improved the learners' retention compared to the no-signaling classroom context. They also indicate that, when learners are provided with graphic organizers such as flowcharts, their performance increases more compared to other types of signaling. Considering that the study was conducted in an instructed grammar class with a limited number of students in the Turkish context, it is well acknowledged that the findings may not be generalizable to a larger population but transferable to similar contents.

The findings of the study have some pedagogical and practical implications for introducing signaling in similar contexts. They suggest that verbal and visual signaling is beneficial for drawing learners' attention to explanations and examples on a specific linguistic item and can be beneficial for L2 form recognition and production. As such, teachers, as well as instructors, might consider introducing various forms of signaling while using materials. Using signaling is believed to benefit learners when, especially, coursebooks used in the classroom lack sufficient verbal or visual signaling that draw learners' attention to main details. Moreover, as indicated by Son (2018), teacher training programs can also provide pre-service language teachers with training on tools that would enhance language learning and teaching practices, including the ones that will pave the way for different enhancement techniques.

Note

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Questions for Further Discussion and Investigation

1. Do you think that verbal signaling or visual signaling draws learners' attention to specific linguistic forms? If yes, in which way? If no, why not?
2. Why is noticing or recognizing a linguistic item insufficient for producing it?
3. Several studies reviewed in this study have indicated that while verbal or visual enhancements lead learners to become aware of the target linguistic forms, they are not sufficient to lead them to learn these forms. What might be possible reasons for this and how can these enhancements lead learners not only to notice the structures but also to learn them?
4. How can teachers benefit from technology so that verbal and visual signaling can be of more beneficial to language learners?