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Learner- vs. expert-constructed outlines: Testing the associations with L2 text comprehension and multiple intelligences

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Abstract
Cognitive organizers (COs) are text aids which represent objects, concepts, and their relations by the use of symbols and spatial arrangements without adding to semantic content. The present study examines language learners' text comprehension through outlines, a popular CO, compared with text-only condition, and further investigates the effect of learner-constructed outlines (i.e., systematic note-taking) and expert-constructed outlines (i.e., readymade displays) on comprehension. Finally, the predictive power of multiple intelligences (MI) across different input modalities is scrutinized. Following stratified random sampling, a total of 111 EFL undergraduates were divided into text-only (receiving a text twice), expert-constructed (the text followed by an outline), and learner-constructed (the text followed by an outline to be drawn

up by the learner) groups. A TOEFL examination, a 1218-word expository text on systematic sleep disorder, a follow-up reading comprehension test, and a multiple intelligences inventory constituted the data collection measures. The results of multiple regression and ANOVA were as follows: (a) COs lead to more content recall than text displays; (b) expert-constructed and learner-constructed outlines are equally effective; (c) MI significantly predicts the groups' reading comprehension; (d) interpersonal and intrapersonal intelligences are significant correlates of text-only groups' performance; and (e) visual, verbal, and intrapersonal intelligences are significantly associated with learner-constructed groups' reading scores. The study offers several implications for theory and practice.

Keywords: textual enhancement techniques; cognitive organizers; expert-constructed outlines; learner-constructed outlines; multiple intelligences; expository texts

1. Introduction

As a predominant text genre in the present academic environments, expository (or scientific) texts are characterized by (a) the high density of unfamiliar and/or technical vocabularies, (b) the frequent use of causal and sequential text schemas, and (c) the need to integrate and draw numerous elaborative inferences with current segments of text (Diakidoy, Kendeou, & Ioannides, 2003). The ubiquitous presence of concepts and concept relations in expository texts calls for the implementation of techniques and/or strategies to render implicit connections more explicit (van Gog, Kester, Nievelstein, Giesbers, & Paas, 2009).

An approach that has been used over the past two decades to compensate for poor text structure (the other approach being text restructuring) is the use of *cognitive organizers*. Cognitive organizers (COs) or adjunct displays are broadly defined as text aids which represent objects, concepts, and their relations by the use of symbols and their spatial arrangements without adding to the semantic content (McCrudden, Schraw, & Lehman, 2009). They hold great potential for helping readers *see* the unseen phenomenon by clearly and efficiently representing multiple intra- and inter-concept relations for the reader to view at a single glance (Amundsen, Weston, & McAlpine, 2008; Redford, Thiede, Wiley, & Griffin, 2012). According to Manoli and Papadopoulou (2012), COs differ in the ways they depict the relations between concepts (e.g., vertical hierarchical vs. nonlinear coordinate displays). A reader-friendly and easy-to-construct type of CO is an outline.

Research on the effectiveness of COs, in general, and outlines, in particular, on text comprehension has been inconclusive, with some investigations suggesting no significant difference between control and experimental groups and others showing "significance for certain types of students when responding to certain types of questions" (Kinchin, 2014, p. 39). Despite second language (L2) learners' more complex reading challenges as a result of their limited L2 competence and their higher demand for input enhancement techniques as supplementary aids, little research to date has studied the effectiveness of outlines for L2 learners (see below for the few exceptions). To bridge these gaps in the literature, the present study investigates the contributions of two forms of COs, namely learner-constructed outlines (i.e., students' systematic note-taking as a productive strategy) and expert-constructed outlines (i.e., students' review of readymade outlines as a receptive strategy) in comparison with the text-only condition (presentation of a text twice), on L2 learners' comprehension. It is worth mentioning that in this study, following the conventions in the literature, the terms *adjunct displays*, *adjunct aids, concept maps, advance organizers*, and *cognitive organizers* are used interchangeably, since outlines, as the focus of the study, belong to all the categories (for more on this see Tzeng, 2010).

2. Literature review

In this section, initially, the most noticeable theories supporting the use of COs are introduced and described. Then, outlining, as a popular CO, will be presented by reviewing its different forms and advantages, the empirical studies into its impact on learning and comprehension, and potential research areas. Finally, the effect (or association) of individual differences, particularly cognitive and affective characteristics, with the use of COs will be addressed by reviewing relevant studies.

2.1. COs: Theoretical background

A major concern of educational practitioners has long been to find a solution to the difficulties in comprehending the content (or expository) texts. Expository texts comprehension, as postulated by Robinson, involves "learning concepts [which] define attributes, recognizing defining attributes when presented with a range of examples, learning hierarchical and coordinate relations among concepts and finally, transferring this knowledge by correctly identifying concepts given new examples" (1998, p. 86). Some of the problems with comprehending these texts may be related to students and caused, for example, by their inability to draw inferences across sentences, lack of relevant content knowledge, or unawareness of useful reading strategies. Other comprehension barriers can be attributed to the nature of the *text* and its poor organization or structure (Kendeou, van den Broek, Helder, & Karlsson, 2014; Schnotz, 2014). COs or adjunct displays (ADs) are among the strategies used for facilitating text comprehension.

COs can be simply defined as those supportive materials which include only important text information and which differ in their formats and in the way(s) they communicate ideas. They are supposed to be abstract and inclusive, provide a means of organizing the new material, avoid distractions, save information processing resources, and enhance later recall and retrieval (Gurlitt & Renkl, 2010).

There are several theoretical explanations in support of the *adjunct display effect* (ADE) (Darsh & Gersten, as cited in Robinson, Katamaya, & Fan, 1996). According to the *selective cued hypothesis* (Mayer, 1984), the learning and recall effects of COs are explained by the double presentation of the information, once in the text and once in the displays. Alternatively, the *conjoint retention hypothesis* (Kulhavy, White, Topp, Chan, & Adams, 1985) and *dual coding theory* (Paivio, 1983) maintain that "textual information referenced in a display is dually [conjointly] encoded in memory, both verbally and spatially," thereby leading to increased retrieval effect (Marefat & Ghahari, 2009, p. 181). The third category of theories supporting ADE includes the *visual argument* (Waller, 1981) and *computational efficiency* (Larkin & Simon, 1987) *hypotheses*, which suggest that viewing objects in a two-dimensional position results in a quicker and easier computation of concept relations and facilitates later retrieval. Apart from being computationally efficient, COs are potentially *search efficient*. According to the *search efficiency hypothesis* (O'Donnell, 1993) and based on empirical research, COs are effective in locating information at both local (for scanning specific or local information) and global (for detecting the main idea) levels (Robinson & Skinner, 1996).

2.2. Expert- and learner-constructed outlines: Overview of existing research

COs have been largely studied over the past two decades as a potential breakthrough in easing off the problems associated with text comprehension (Marefat & Ghahari, 2009). Examples include graphic organizers, concept maps, and outlines of Robinson et al. (1996), knowledge maps with lists of Griffin and Robinson (2000), graphic organizers of Rowland-Bryant et al. (2009), and graphic overviews of Shaw, Nihalani, Mayrath, and Robinson (2012).

The current literature provides evidence that outlines, as a type of CO, are favored over others (e.g., graphic organizers, knowledge maps, graphic overviews) for the following reasons: (a) they have a highly convenient and reader-friendly format, (b) they convey hierarchical concept relations, and (c) they are easy to design and construct (even by a layman; Robinson & Kiewra, 1995). In this study, the effectiveness of expert-constructed outlines (as an input-based receptive strategy) on reading comprehension was compared with learners' self-generated outlines (as an output-based and productive strategy).

Expert-constructed outlines enjoy a number of advantages: (a) they contain the most salient ideas of the text, which are most likely to be included in assessment measures too, (b) the ideas are organized in a logical sequence (i.e., superordinate ideas are followed by the subordinates), (c) they help students grasp the content better through a simplified presentation of the text, (d) they may assist instructors at identifying subtle nuances of certain contents and detect possible areas of difficulty prior to teaching, and (e) they can be interjected at different parts of a text without requiring extensive student training or taking much class time (McCagg & Dansereau, 1991). On the other hand, Boyle and Weishaar (1997) enumerate four advantages of having students generate their own outlines. First, students gain a better understanding of the main points of the material and relations between them when constructing their own displays. Second, students can personalize the outlines by using their own terms, abbreviations, and symbols. Third, once trained, students can construct them with similar content in other classes. Finally, students get more actively and autonomously involved in an activity (e.g., reading assignment or lecture) when they develop outlines on their own, as opposed to reviewing a readymade display.

The literature on the effect of adjunct aids on students' text comprehension, however, is limited, context-specific (e.g., students with learning disabilities), and inconclusive (Kinchin, 2014; Manoli & Papadopoulou, 2012; Stull & Mayer, 2007). Even fewer studies have researched the cross-linguistic dynamics of the COs and their effectiveness in L2 learning contexts. Through a pre-/post-test design study, Chularut and DeBacker (2004) scrutinized the possible facilitative effect of concept mapping on ESL students' (N = 79) learning from English texts. The results revealed that students' language achievement as well as learning self-regulation and self-efficacy improved as a result of studying English-language texts accompanied by COs. Suzuki, Sato, and Awazu (2008) also investigated the instructional effectiveness of the spatial graphic representation of an English sentence with coordinators in EFL reading settings. They used two different types of displays (a linear sentential representation and a spatial graphic representation) and studied 56 first-year undergraduates as participants. The results indicated that the readers comprehended graphic representation of texts significantly better and more effectively than sentential displays.

Having conducted a comparative study on two types of expert-constructed displays (i.e., outlines and graphic organizers), Marefat and Ghahari (2009) observed that adjunct aids were more efficient than text aids for reading comprehension of L2 readers (71 undergraduates). However, multiple-choice reading tests revealed that neither of the displays was superior to the other. Similarly, Rahmani and Sadeghi (2011) examined the product and process effects of two expert-constructed aids, namely note-taking instruction and graphic organizers, on the comprehension and retention of L2 written input. The results revealed that students who completed and studied graphic organizers performed considerably better in both comprehension and recall conditions than did students who studied their conventional outlines. That is, both the product and process effects of note-taking instruction were approved.

Despite ample evidence in support of the effectiveness of COs, "there are some studies that yield conflicting results regarding [their] use" (Manoli & Papadopoulou, 2012, p. 353). For instance, Alvermann (1981) evaluated the compensatory effect of graphic organizers on descriptive texts. Participants (114 tenth graders) were required to read two versions of an expository passage (comparison versus description) and a graphic organizer. Immediate and delayed recall measures suggested that the experimental group outperformed the control group under the descriptive text condition. Results indicated that graphic organizers were useful for reorganization of information but ineffective when the reorganization was unnecessary. Bean, Singer, Sorter, and Frazee (1986) compared the effectiveness of graphic organizers and outlining for students in 10th-grade world history classes. The participants were randomly assigned to one of the three groups (graphic organizer with previous training in summarization, graphic organizer alone, and outlining). No differences were detected between graphic organizers, outlines, and traditional instruction for comprehension and recall of text information. Balajthy and Weisberg (1990) and Davis (1994) were also among the studies which found that COs were effective for certain groups rather than for all learners, that is to say, for low ability and beginning level students. Rice (1994) and Griffin and Tulbert (1995) questioned the "facilitative effects of graphic organizers on text comprehension" (as cited in Manoli & Papadopoulou, 2012, p. 353). Likewise, Kools, van de Wiel, Ruiter, Crüts, and Kok (2006) examined the effect of graphic organizers on the comprehension of a health education brochure text and compared subjective and objective comprehension measures. Participants were asked to read a brochure text about asthma with and without these organizers, and subjective and objective measures of text comprehension were administered. Findings suggested that, in contrast to the effects of graphic organizers on objective text comprehension, there was no difference between the groups on the subjective measures of comprehension (i.e., open-ended comprehension questions). Finally, Ciullo and Reutebuch's (2013) summary of 12 studies into the effect of graphic organizers or concept maps for students with learning disabilities suggested that mapping was not effective for improving learning unless the instruction was explicit.

2.3. COs and individual differences

Research has suggested that the beneficial effects of COs are mediated by learners' individual characteristics, namely cognitive and affective variables. Basque and Lavoie

(2006), in their overview of the studies into the effectiveness of collaborative concept maps, found that success in the use of COs depends to a large extent on learner characteristics such as motivation and situational factors like the mode of learning. They documented that COs are most effective for highly motivated learners and in face-to-face learning situations. There is also evidence that, similar to most learning strategies, students with low verbal ability benefit more from COs-supported materials than do high-ability learners (Manoli & Papadopoulou, 2012). As Nesbit and Adesope ascertain, the structural form of COs, "specifically the use of brief labels and simple node-link-node syntax to represent propositions, may be more easily comprehended and constructed by learners who have lower verbal ability" (2006, p. 420).

Besides, COs have been more efficient for the students with low prior knowledge than those with high background knowledge. Comparing the effects of three types of aids (i.e., knowledge maps, outlines, and lists) on students' recall of college-level biology lectures, Lambiotte and Dansereau (1992) revealed that knowledge maps were more effective than the other two aids for the students with low prior knowledge of biology. They reasoned that "the specific macrostructure signaled by [them] might guide the knowledge construction of less knowledgeable students but conflict with the cognitive structures already established in more knowledgeable students" (as cited in Nesbit & Adesope, 2006, p. 420). The literature also supports the association between students' self-regulation and self-efficacy competencies with their effective use of COs (Chularut & DeBacker, 2004).

According to Gardner (1983), multiple intelligence theory (MIT) is a learner-centered theory that considers learners as different individuals possessing varying types of intelligences and learning dispositions. Accordingly, learners with different intelligence types come across a problem-solving task (like an L2 reading comprehension assignment) with different sets of strategies. Gardner defined multiple intelligence as "the ability to solve problems, or to create products, that are valued within one or more cultural settings" (1983, p. 81). There are at least nine ways that people have of comprehending and realizing the world. Table 1 summarizes the definitions of these nine micro-intelligences.

Table 1 MI and its subscales

Micro-intelligence	Definition
Verbal intelligence	The ability to produce and perceive language in oral and written forms effectively
Logical intelligence	The effective use of numbers and reasoning in problem solving tasks
Visual intelligence	The graphical ability to use visual things and ideas in space, color, form, and shape
Kinesthetic intelligence	The effective use of whole or parts of body to solve problems
Musical intelligence	The sensitivity to rhythm, pitch, and melody to express emotions and thoughts
Naturalist intelligence	The capacity to perceive and classify the natural world and environment
Existential intelligence	The philosophical ability to tackle deep questions about life and human existence
Intrapersonal intelligence	The ability to recognize and accept one's capabilities and limitations
Interpersonal intelligence	The ability to manage one's relationships and interactions with others

Notes. verbal = linguistic; logical = mathematical; kinesthetic = bodily; visual = spatial.

Based on an extensive literature review, MI is a significant determiner and/or correlate of a variety of learning mechanisms and outcomes; among them are learning strategies awareness and use (Akbari & Hosseini, 2008), learning styles (Denig, 2004; Vincent & Ross, 2001), knowledge retention and recall (Ozdemir, Guneysu, & Tekkaya, 2006), literacy skills (Brand, 2006), reading achievement (Armstrong, 2003; McMahon, Rose, & Parks, 2004), writing proficiency (Looi & Mustapha, 2010; Saricaoglu & Arikan, 2009), and learners' beliefs and attitudes (Bas & Beyhan, 2010). Given the fact that COs are among the popular learning strategies, it was presumed in this study that their application may be mediated by learners' MI, too. Such an association, however, has not yet been investigated. For this reason, MI is studied here as a potential moderator for text comprehension across three input modalities.

3. Aims of the study

Notwithstanding the pressing demands of language learning settings for versatile input enhancement techniques and despite language learners' more complex reading challenges as a result of limited L2 competence, little research to date has investigated the effectiveness of expert- and learner-constructed adjunct aids in this certain context. As Manoli and Papadopoulou contend, "allowing for the non-supportive findings of studies, room for research is left in further exploring the effectiveness of [COs] as a reading strategy, especially in the language teaching courses" (2012, p. 354). In addition, there has been no attempt to examine the mediating effect of multiple intelligences on the optimal use of COs.

The present study is guided by four motivations: (a) the high proportion of expository texts in academia and their comprehension complexity, (b) the limited language competency of some L2 readers, which compounds their comprehension difficulties, (c) the scant and inconsistent literature on outlines, as a leading input enhancement technique and CO, in L2 reading contexts, and (d) the absence of empirical research into the mediatory role of multiple intelligence on the efficiency of COs, in general, and outlines, as a particular subcategory of them. The following research questions were addressed in the present study:

1. Is there any significant difference between the effect of text displays and outline displays on L2 readers' text comprehension?
2. Is there any significant difference between the effects of expert- and learner-constructed outlines on L2 readers' text comprehension?
3. Does L2 learners' multiple intelligence predict their text comprehension across the input modalities?

4. Methodology

The research features a descriptive case study and adopts an ex-post facto design for it examines the effect of a single treatment across several groups. In the first part, input enhancement with three levels of text-only (no advance organizer), learner-constructed outlines, and expert-constructed outlines served as the independent variable and text comprehension was the dependent variable. In the next stage of data coding, the independent variable (or predictor) was multiple intelligence with its nine subscales and the dependent variable was text comprehension across the three modalities.

4.1. Participants

A total of 120 students (aged from 18 to 30, $M = 21.30$) from six different classes took part in the current study for some course credit. They were all junior students (80 females and 40 males) majoring in English literature and translation at two state-run universities in the southeast of Iran. Therefore, respondents in this study were homogenized in terms of their first language, field of study, experience with expository texts structures, and reading practices.

A convenience sampling technique was employed by administering the tests to six classes the instructors and students of which agreed to cooperate. The English learners in the present study live in a typical foreign language environment and, like many Asian L2 English learners, do not have sufficient exposure to the target language; therefore, they tend to receive a good portion of their L2 input from reading (Ghahari & Ahmadinejad, 2016a, 2016b; Ghahari & Basanjideh, 2015, 2017; Ghahari & Heidarolad, 2015). After coding and scoring the data, nine of the participants were excluded because their answer sheets were filled either incompletely or inaccurately. As a result, a total of 111 data sheets remained for further analyses.

The English proficiency level of the sample was examined via a TOEFL examination (Educational Testing Service, 2004). A one-way ANOVA revealed no significant difference between the three groups, suggesting that the sample's proficiency level was homogeneous and, considering their average scores, was the (upper)intermediate level (see Table 2).

Table 2 Sample composition and proficiency check results

Group	Mean	*SD*	*F*	Sig.
Text-only ($n = 36$)	20.42	6.15	1.322	.271
Outline ($n = 35$)	21.97	5.96		
Learner-constructed ($n = 40$)	22.50	5.14		

Thus, level of proficiency, field of study, age, L1 background, educational level, and nationality were controlled, but learners' individual differences like gender, learning styles, and study habits were possible confounding variables.

4.2. Materials

The study involved three instruments: (a) a TOEFL examination (ETS, 2004), (b) the CO package (including a text, an outline, and a multiple-choice test) (Katayama & Robinson, 2000), and (c) the multiple intelligence inventory (McKenzie, 2005). Each instrument is described in detail below.

4.2.1. The proficiency test

The TOEFL used in this study was one of the six full-length paper-based tests administered by ETS (2004). The test, which aimed at determining the subjects' language proficiency, contained a total of 40 questions including structure, written expression, and reading comprehension subtests. The whole test lasted 40 minutes to complete. Using a Cronbach's alpha formula, the reliability was estimated to be .73, which is acceptable according to Cohen's (as cited in George & Mallery, 2003) criteria.

4.2.2. COs package: The original draft

The original package of CO was designed by Katayama and Robinson (2000). The criteria for this selection were two-fold: (a) the materials were already developed and validated by a panel of experts in the field, and (b) they were closely relevant to our objectives in this study. In their research, the variable under study was text length; therefore, they provided their subjects with a chapter-length expository text covering the topic of *sleep disorders*. As stipulated earlier, a text is characterized as expository if it encompasses numerous unfamiliar and technical terms, a causal and sequential text structure, and multiple interconnected concepts to be elaborately inferred (Diakidoy et al., 2003). Following these criteria, Katayama and Robinson (2000) selected a text which addressed six specific types of sleep disorder. It contained approximately 3,500 words (with nearly 1,500 technical terms) and was distributed on eight single-spaced pages.

The text was followed by a 30-item, four-option multiple-choice test measuring the factual knowledge of information explicitly stated in the text (i.e., display items). The reason for the inclusion of factual questions was to minimize the intervening effect of mental processes since display and inferential items call for different information processing paths: Inferencing refers to "the abstraction of information that is not explicitly presented" and is a non-linear and multifaceted ability, where more than single information should be effectively comprehended, restored, and retrieved at the time of task completion (Botting & Adams, 2005, p. 50). Display items, on the other hand, require learners to readily and accurately recall text information in a linear manner. Hence, in answering display items, intensive reading and linguistic knowledge are the responsible parameters, whereas answering inferential items needs a strategic approach (an awareness of cognitive and metacognitive strategies) towards a text (Jaswal & Markman, 2001). Katayama and Robinson (2000) also administered a 10-item matching test of application to assess the students' ability to apply knowledge from the text to novel examples.

4.2.3. COs package: The modified draft

The materials used in Katayama and Robinson's (2000) study were modified by Marefat and Ghahari (2009) to adjust to the limitations of class time, students' tolerance, and their research objective. They divided the original text, which was a complete chapter on different types of sleep disorder, into three texts each covering one type of sleep disorder. The COs were the same as the original version with regard to their type and number. They did not make any changes in the number and format of the test items either. The instruments were in three sets: Each set included a text, an outline, a graphic organizer, and a test consisting of 10 four-option multiple-choice factual items. The number of words ranged from an approximate of 600 to 1,000, typed on single-spaced pages. The package was piloted before the main study and the test reliability was computed (α = .76).

For the purpose of this study, one set of materials used in Marefat and Ghahari's (2009) research was chosen and used iteratively. This set consisted of a 1,218-word text focusing on one type of sleep disorder (i.e., systemic sleep disorder), an outline of the same text (i.e., the expert-constructed display), and a test consisting of 10 four-option multiple-choice display items. The internal consistency of the test was found to be acceptable (α = .71).

4.2.4. The multiple intelligence checklist

The multiple intelligence (MI) test designed by McKenzie (2005) was employed in this study. It consists of 9 sections each containing 10 questions. In the order of appearance, the sections reflected the participants' naturalistic, musical, logical, existential, interpersonal, kinesthetic, verbal, interpersonal, and visual strengths. The reliability of the test fell within the acceptable range (*a* = .78).

4.3. Procedure

The data collection procedure was completed over the period of two months (from early May through to late June 2015) in six academic classes. The participants gave their informed consent to take part in the study and were assured that their anonymity was strictly protected. To control for the effect of background knowledge, the text topic was disclosed to the participants prior to the study and their familiarity with it was inquired. They all admitted that the topic was novel and fairly unknown to them. The instruments were administered over two sessions (90 min) outside of the regular class time.

Using stratified random sampling, each class was divided into three groups. The study was carried out differently in the three groups, namely expert-constructed display, learner-constructed display, and text-only display groups. However, activities like taking the TOEFL, completing the MI test, studying the expository text, answering the follow-up reading comprehension test, as well as the time allotted to each task were common across them. Below is the full description of the procedure in each group.

4.3.1. Expert-constructed groups

The groups received the text and were given 10 minutes to study it. They were notified that the text would be collected before they received the comprehension test and that it was a text-for-test task requiring a detailed study.

Having returned the texts, the participants received the outline of the same text. They were briefly notified that the outline was based on the same text and would help them answer the follow-up questions. Ten minutes were allotted for the study of the displays. The added materials were then collected and the students started the testing part of the experiment which included 10 multiple-choice questions (10 min). After submitting the test, they were asked to fill out the MI survey checklist.

4.3.2. Learner-constructed groups

A week before the experiment, the researcher practiced over the course of a 90-minute session with the students how to develop a standard outline. The procedure in this group is consistent with the guidelines suggested by Haugwitz, Nesbit, and Sandmann (2010) and Schroeder, Nesbit, Anguiano, & Adesope (2018). At the end of the practicum, most of the students' notes were in the shape of standard outlines. Thus, they were partly familiar with the construction and organization of outlines and no confusion and questions were raised during the main study. In the treatment session, the students received the text and were given 10 minutes to read it. They were asked to review it carefully and were notified that the text would be collected before test administration.

Having submitted the texts, the participants were asked to develop an outline out of it. They were given 10 minutes to do the task. The constructed materials were then collected and the participants started doing the multiple-choice comprehension test (10 min). After completing the test, the students went through the MI checklist.

4.3.3. Text-only groups

The text-only groups received the same text and reviewed it over 10 minutes. They were notified that they had to read it carefully and return it before test administration. The groups were then offered another 10 minutes to study the text for the second time. Next was the testing part in which the subjects, like the expert- and learner-constructed groups, sat for the multiple-choice comprehension test (10 min) and the MI checklist.

4.4. Data analysis

For the effect of input enhancement type on text comprehension, a *t* test and a one-way ANOVA with a follow-up post hoc Scheffe test were used. To examine the predictive power of multiple intelligence (with nine layers) in relation to reading comprehension (under the three conditions), a multiple regression analysis was run.

5. Results

As depicted in Table 3, the expert-constructed groups achieved the highest mean score (M = 6.86, SD = 2.14) followed by the learner-constructed condition, which stood at the second place (M = 6.35, SD = 1.72). The lowest mean score in the comprehension test was achieved by the text-only group (M = 5.61, SD = 2.17).

Table 3 Descriptive statistics for the input groups' reading comprehension (N = 111)

Groups	Min	Max	Mean (*SD*)
Text-only (n = 36)	2	9	5.61 (2.17)
Expert-constructed concept map (n = 35)	2	9	6.86 (2.14)
Learner-constructed concept map (n = 40)	3	10	6.35 (1.72)

In order to examine whether there is any significant difference between the effect of COs (i.e., expert- and learner-constructed groups) and the text-only condition on L2 learners' text comprehension, an independent samples *t* test was run. Preliminary Levene's test confirmed the equality of variance (F = .116, p = .73). It was revealed that the outline groups significantly outperformed the text-only groups, implying that the provision of outline as a textual enhancement technique successfully enhanced reading achievement (t = -2.43, df = 69, p = .018).

In order to get a clearer picture of the effect of outlines and to allow for a cross-comparison, a one-way ANOVA was run for the three groups. As Table 4 demonstrates, the ANOVA result was significant (F = 3.46, p = .035) and the effect size was moderate (η^2 = *.06*) following Cohen's (1988) criteria. It implies, therefore, that there is a significant difference among the given input modes.

Table 4 ANOVA results for the three input modes

	Sum of squares	*df*	*F*	η^2
Between groups	27.951	2		.06
Within groups	435.941	108	3.462*	
Total	463.892	110		

Notes. * $p < .05$.

In order to specifically address the second question and to find out the most effective outline presentation mode, a post-hoc Scheffe test was run. According to Table 5, the learner-constructed and expert-constructed conditions did not significantly differ in terms of their effectiveness on text comprehension (p = .554). When compared in pairs, then, the only significant difference in Table 5 lies between the expert-constructed and text-only groups (p = .037).

Table 5 Post-hoc comparisons among the three input modalities

Group	Mean difference	Std. error	Sig.
TO vs. LC	-.739	.462	.282
TO vs. EC	-1.246	.477	.037
LC vs. EC	-.507	.465	.554

Notes. TO = text-only; LC = learner-constructed; EC = expert-constructed.

To sum up, outlines in general were effective for expository texts comprehension compared with presenting a text twice; there existed, however, no difference between the two modes of input-based (expert-constructed) and output-based (learner-constructed) displays, to use Van Patten's (1996) term.

Finally, to test the prediction power of multiple intelligences in relation to text comprehension across the input modes, a multiple regression analysis was run, the results of which are as follows. As Table 6 suggests, text-only (F = 1.11, r^2 = .27, $p < .05$) and learner-constructed (F = 2.54, r^2 = .43, $p < .01$) groups' performance could be predicted by MI. Of the multiple intelligence subscales, interpersonal (*t* = 2.28, $p < .01$) and intrapersonal (*t* = 2.17, $p < .01$) intelligences were significant predictors of text-only groups' performance; that is to say, those with a higher level of interpersonal and intrapersonal intelligences outperformed the text-only condition.

Table 6 Correlational and regressional results with input modality as criterion variable ($N = 111$)

Predictor (intelligence type)	Text-only			EC			LC		
	R	Beta	*T*	*R*	Beta	*t*	*R*	Beta	*t*
Naturalistic	-.02	-.31	-1.48	-20	.22	.88	-.15	.00	.01
Musical	.03	.39	1.70	.04	.18	.80	-.05	-.32	-1.90
Logical	-.11	-.38	-1.80	-25	-.08	-.30	-.10	-.18	-1.07
Existential	.13	-.14	-.69	.26	-.11	-.54	.17	-.04	-.30
Interpersonal	.22	.47	2.28*	-13	-.03	-.14	.07	-.01	-.07
Kinesthetic	.05	.14	.64	-42	-.02	-.10	-.00	.34	1.83
Verbal	-.07	-.49	-1.99	-15	-.09	-.36	.03	.61	2.84**
Intrapersonal	.13	.54	2.17*	-05	-.09	-.31	.16	.50	2.62*
Visual	.11	.10	.54	.18	.02	.075	.24	-.62	-3.17**
	F		R^2	*F*		R^2	*F*		R^2
	1.11*		.27	.20		.06	2.54*		.43

Notes. EC = expert-constructed; LC = learner-constructed; * $p < .05$; ** $p < .01$.

With respect to the learner-constructed condition, verbal (*t* = 2.84, $p < .01$) and visual intelligences (*t* = -3.17, $p < .01$) were found to be the strongest predictors of group performance, followed by intrapersonal intelligence (*t* = 2.62, $p < .05$). No other significant interaction was detected among the MI subscales and the three input modes.

6. Discussion

Three research questions were investigated in this study. First, we asked whether adjunct displays lead to better text comprehension than text displays do, as well as which text enhancement technique (input-based vs. output-based) is more suitable for L2 learners' text comprehension. The analysis showed that adjunct aids (outlines) were more efficient than texts as they produced significantly higher scores on comprehension than texts did. Our findings provide evidence in support of ADE (i.e., adjunct displays effect) and are consistent with the results of previous studies (e.g., Amundsen et al., 2008; Marefat & Ghahari, 2009; Jiang & Grabe, 2007; Rowland-Bryant et al., 2009; Schroeder et al., 2018; Shaw et al., 2012), affirming that when text is accompanied by adjunct aids, comprehension of text information is improved.

There are several justifications for the better performance of the outline groups over the text-only group. Firstly, as maintained by Krug, George, Hannon, and Glover (1989), outlines can contribute to decoding a passage by activating both form schemata (i.e., keywords) and context schemata (i.e., main ideas). An alternative explanation is related to the *form of presentation*: An outline presents topics and subtopics in a hierarchical form and sequences the concepts and their relationships from the most general through to the most specific. This hierarchical organization and connection of prior knowledge to the new information matches the knowledge structure in the brain and, therefore, results in *meaningful learning* (Marefat & Ghahari, 2009). Another plausible rationale for the contribution of outlines to text comprehension may refer to their structure, in that they are more computationally effective and search-efficient (both locally and globally) than a plain text. As Redford et al. (2012) maintain, they increase the salience of the cues, lessen the working memory requirements, and provide more resources for text comprehension. This is in line with the major tenets of *search efficiency*, *conjoint retention*, *dual coding*, *visual argument*, and *computational efficiency hypotheses*, all of which suggest that the contribution of outlines to searching and locating information (local and global) lies in their physical structure. According to McCrudden et al. (2009), outlines (as a CO) promote text comprehension and recall by minimizing the cognitive load needed to get the intended message and activating relevant background knowledge (i.e., schemata). This reasoning is also in conformity with *cognitive load theory* (Sweller, Van Merrienboer, & Pass, 1998), and *meaningful learning hypothesis* (Ausubel, 1963), which reckon an optimal level of information load and input quality as a key to learning and retrieval.

Comparing outlines with text displays, however, provides counterevidence to *selective cued hypothesis* (Mayer, 1984). According to the hypothesis, better recall of information induced by the displays pertains, more than anything else, to the presentation of the information twice, once in the text and once in the displays. However, as it was indicated earlier, the text-only groups received the same text twice but still underperformed in the comprehension test in comparison to the outline groups. Finally, and more specifically related to language learning contexts, Schmidt's (1990) *noticing hypothesis* warrants discussion. According to the hypothesis, for any kind of learning and recall to happen, learners have to consciously attend to the target features in the input. It can be rationalized that by inserting appropriate displays in the texts, teachers and materials developers can direct learners' attention to certain points (usually the main ones) and maximize their learning outcome.

The second research question was whether the type of display the students viewed (expert- vs. learner-constructed) would differentially affect their performance on the comprehension test. No significant difference was observed between the expert- and learner-constructed groups. According to Kiewra (1985), note-taking can facilitate learning by boosting attention, raising awareness of text organization, storing the information into memory, and encouraging the learner to compare the material with previously learned, which is known as the *encoding hypothesis*. The fact that no significant difference was detected between the two display types in this study is in contradiction to the results of Schroeder et al. (2018), Kiewra (1985), and Katayama and Robinson (2000) in L1 settings and Rahmani and Sadeghi (2011) in L2 reading contexts. One justification for this contradictory finding can be the *reviewing* factor. According to Crooks, White, and Barnard (2007), the value of note-taking lies in its two salient properties: as a technique that scales up encoding of the content (i.e., encoding hypothesis) and as a device for externally storing the material (i.e., external storage idea). The *external storage hypothesis* postulates that "note-taking per se is not facilitative of recall, unless learners are given the opportunity to review their notes prior to recall" (Rickards & Friedman, 1978, p. 136). Rahmani and Sadeghi (2011) also maintain that notes serve as a storage device of information that can assist in retrieving the content in delayed recalls and in answering exam questions provided that they are systematically reviewed. As little time was invested and/or remained for the learner-constructed groups in this study to review the notes, its comparable performance to the expert-constructed groups does not seem unexpected.

The final research question was related to whether learners' multiple intelligences predicted their performance on different types of textual presentation. Results revealed that from among the intelligence types under study, interpersonal and intrapersonal intelligences significantly predicted the text-only groups' performance, while visual, verbal, and intrapersonal intelligences were significant predictors of the learner-constructed groups' reading scores. The former can be accounted for on several grounds: Interpersonal intelligence, as defined by Nicholson-Nelson (1998), refers to the ability to work effectively with other people and to understand them and recognize their goals, motivations, and intentions. Students who exhibit a high endowment of this intelligence have strong leadership skills and are skilled at organizing, communicating, mediating, and negotiating. According to Gardner (1983), an individual who is high in interpersonal intelligence understands the intentions, motivations, needs, and desires of others better, and is capable of working effectively with them. Therefore, it may be inferred that a reader who inherently has a higher level of interpersonal intelligence can make sense of the text and deduce the author's intention more readily and successfully. Similarly, intrapersonal intelligence has been described as the ability to understand oneself, to assess one's strengths and weaknesses, and to act effectively using this knowledge source (Gardner, 1983). Students gifted in intrapersonal ability have a strong sense of self, are confident, and can enjoy working alone. They naturally notice and acknowledge their potentials and identify ways of circumventing challenges more efficiently. This reasoning might explain why intrapersonally intelligent students turned out to be more successful in doing text-only assignments, which are by their nature more demanding and reader-unfriendlier than the competing ones. It must be noted that, in order of difficulty, the text-only condition followed by the learner-constructed mode demanded more attention and commitment on the part of the learners. In the expert-constructed condition, however, the tasks were ready-made and scaffolded and, therefore, put little burden of responsibility on the readers' shoulders.

The next MI-related finding was the mediating role of visual, verbal, and intrapersonal intelligences in relation to the learner-constructed groups' text performance. Visual (or spatial) intelligence (intelligence of pictures and images) is defined by Nicholson-Nelson (1998) as the ability to create spatial representations of the world and to transfer them mentally or concretely. Students who are endowed with a high level of spatial intelligence tend to understand new information more productively if it is accompanied by a mental or physical picture; they do well with maps, charts, and diagrams, favor mazes and puzzles over plain texts, and are skilled at drawing, designing, and creating things. Accordingly, a student with high visual/spatial intelligence benefits more than the competing peers from COs like outlines, which simplify the flow of information, logical arguments, explanations, and examples present in a typical expository text. Another predictor of learner-constructed groups' performance was verbal intelligence. Gardner (1983) has described verbal (or linguistic) intelligence as one's sensitivity to spoken and written language, ability to use language to accomplish goals, as well as ability to learn new languages. Based on this definition, students who exhibit verbal/linguistic intelligence have a preference for writing, reading, telling stories, and solving puzzles. Accordingly, they learn best through hearing and seeing words, speaking, writing, and reading. Learner-constructed outline mode matches these students' writing and note-taking abilities, which in turn will result in a better test performance.

7. Conclusion and implications

To recap, three plausible conclusions are drawn on the basis of the findings: (a) learner- and expert-constructed outlines are more effective than text-only condition for L2 text comprehension; (b) students with higher verbal and visual competencies are more successful in taking systematic notes and organizing them into outlines, a task which calls for both language and spatial competencies; (c) those with a high emotional intelligence[1] (i.e., intrapersonal and interpersonal)

[1] Emotional intelligence (EI) refers to the capacity to recognize one's and others' emotions and to manage one's relationships and interactions with others. According to Goleman (1998), EI actually encompasses *intrapersonal* and *interpersonal* components of multiple intelligences.

competency are more active and self-regulated learners when assigned demanding and intricate tasks to accomplish. Based on the above observations, the following implications for practice are suggested:

1. The study gives credence to the role of *input enhancement techniques*, supporting the idea that with these instructional interventions the amount of time spent on reading a text and the amount of cognitive capacity allotted to its processing are considerably lessened. Educators and materials developers are encouraged to incorporate outlines to help readers, particularly L2 learners, learn more inter-concept relations and text structure and to improve text comprehension and recall. Outlines can be utilized for both learning and assessment purposes. They can be incorporated as warm-up, brainstorming, preview, and review activities.
2. It is recommended that teachers instruct students on different forms of note-taking (conventional and systematic) practices. By training students to construct outlines while reading, they will not only learn the target materials but also *learn how to learn*. However, students must be given time to review their self-designed notes or outlines for more effective results.
3. Outline practices are better viewed as a developmental and graded activity. That is to say, practicing and interpreting expert-constructed outlines are more suitable for novice readers since they typically help maximize feelings of encouragement and motivation. On the other hand, outline construction is more suitable for later stages to foster learner autonomy and self-regulation.
4. The predictive power of multiple intelligence in relation to input modalities of text presentation offers insights for teachers and educators to take cognitive and affective styles of the learners into account. As Leyu (2001) and Ghahari and Sedaghat (2018) contend, the number of instructional decisions in education will be markedly increased by taking learners' individual differences and preferences into account. Hence, the role of the teachers as the most influential agents that can promote the *one-method-does-not-fit-all approach* is highlighted. It is recommended that teachers *triangulate* a variety of strategies and techniques to address both the educational and psychological needs of L2 readers.

Other research avenues also exist. First, from among the textual enhancement techniques, only outlines (learner- and expert-constructed modes) were studied here. Thus, one area for further investigation is comparing outlines with other COs (e.g., graphic organizers, underlining, and mnemonics). Second, this study was limited to expository texts and cross-sectional data collection. Future studies could investigate the long-term retention effect of outlines, apply a longer treatment, incorporate follow-up review assignments, and examine their effectiveness for other text genres (e.g., narrative and argumentative). Finally, a larger sample size could be included in future studies in order to maximize the generalizability of the findings.

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