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The interplay of processing task, text type, and proficiency in L2 reading

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Abstract

This study was an investigation of how particular processing tasks influence L2 reading in relation to text type effects and L2 reading proficiency. Two groups of Japanese university EFL students (N = 103), varying in English reading proficiency, read a narrative passage and an expository passage in one of three task conditions: outlining, answering embedded questions, and reading only. All three groups produced written recalls immediately after reading as well as one week later. The results indicated no significant differences related to task types. However, a main effect for text type effect was shown only on the immediate recall of main ideas: More main ideas were recalled for the narrative text than for the expository text. Text type effects became more prominent in the delayed recalls. The content analysis of prototypical recalls suggested qualitative differences between task types and possible interactions between task types and text types.

Keywords: L2 reading, outlining, embedded questions, text types, recall analysis

Reading comprehension in a second language (L2) requires readers to be more actively involved with the text than when reading in the first language (L1). Unlike L1 reading, where many lower-level processes are automatized and sufficient cognitive resources can be allocated to higher-level processes, many L2 readers must deal with lower-level reading processes that are not highly automatized, thereby leaving insufficient resources for global processes such as inferencing, integrating textual information with schematic knowledge, and establishing an overall picture of the content. As a result, L2 readers can easily end up establishing an incoherent and fragmentary text representation.

In order to facilitate the establishment of a coherent and integrated text representation and enhance comprehension, various processing tasks or study adjuncts have been proposed in both L1 and L2. The effectiveness of various instructional interventions specially designed to facilitate active reading by L2 readers has been demonstrated, including note taking (Edge, 2006; Kobayashi, 2002), preview activities (Chen & Graves, 1995), and other product-based instructions such as summarization and outlining (Bean, Singer, Sorter, & Frazee, 1986; Iovino, 1993; Reynolds & Shirey, 1988), and making a graphic organizer (Jiang, 2007).

However, the effects of these processing tasks can vary depending on other factors, such as text type and individual differences. In particular, recent research developments have focused a great deal of attention on the effects of specific tasks based on the assumption that the cognitive demands imposed by particular tasks may enhance or inhibit cognitive processing (Robinson, 2001; Skehan, 1998). Some tasks may facilitate reading a particular text type; others may not be effective for L2 readers whose ability to construct local text meanings and assemble local information is not fluent enough. For those still preoccupied with lower-order processes such as L2 decoding and syntactic parsing, fluency training (Grabe, 2009) or linguistic aids such as glossing and textual manipulation (Leow, 2009) may be more beneficial in terms of ensuring a sufficiently coherent text base. If the lower-level processes are effectively automated, enough attention space in working-memory capacity can be allocated to global text features.

Although readers' attentional capabilities develop as they grow, the ability to use higher-level processes effectively requires instructional support. Students will not intuitively know how to engage in the requisite operations for those skills. For L2 learners who are sufficiently fluent and ready to engage in cognitively complex tasks, various types of learning interventions focusing on higher-order processes have been proposed for better-developed text representation, such as hierarchical summary training, the use of explicit text devices highlighting key information, and visualization of the relationship through the use of graphic aids such as flowcharts, conceptual networking, and conceptual mapping. These tasks are assumed to direct students' attention to text structure and differentiate key text concepts, identify their logical connections, and facilitate retention (Grabe, 2009; Koda, 2005).

Thus, practitioners and researchers have developed and experimented with a variety of activities. However, despite the attention focused on task-based reading instruction, few researchers have investigated how task factors affect reading comprehension performance in relation to the effects exerted by learner and text factors. Therefore, the primary purpose of the current study is to investigate the interactions among task factors, text factors, and learner factors in L2 reading.

Background

Task Demand and Elaborating Processes

A number of L1 studies have demonstrated that conditions that make reading more effortful can be beneficial to learning. MacNamara, Kintsch, Singer, and Kintsch (1996) found that less coherent texts improve readers' performance on inference tasks. Mannes and Kintsch (1987) demonstrated that readers perform better on a problem-solving task when an introductory outline does not match the text well. The authors concluded that perspective inconsistency creates a cognitively difficult reading condition that leads to better learning in terms of integrative processes. Such arguments concerning the facilitative effects of cognitively demanding tasks on reading comprehension are also supported by research into elaborative processing in educational psychology and cognitive psychology. For example, Battig (1979) discussed intra-task interference, in which more difficult processing tasks result in better performance.

L2 studies have also provided some evidence for the facilitative effects of cognitively demanding

tasks on reading comprehension. Horiba (2000) investigated differences in task demand effects, finding that readers who were instructed to elaborate the link between sentences generally had better memory of the content than those who memorized them. This finding may have resulted from the deep processing caused by the relatively high cognitive demands of the reading tasks. The effects of task differences on L2 reading can also be seen qualitatively. Horiba examined differences in task effects between a read-for-coherence condition and a reading freely condition on native and non-native readers' reading processes in terms of inference use. She found that nonnative readers' recall under the read-for-coherence condition was as good as that of native readers.

Given the conceptual overlap between theory and the task difficulty effect discussed herein, it can be hypothesized that clearly written texts may lead to apparent understanding with minimal processing, thereby reducing individuals' memory of the text. Therefore, the effectiveness of cognitively demanding tasks may be the result of the active processing that they engender.

Be that as it may, increasing processing difficulty beyond some optimal level will result in negative effects on memory (McDaniel & Einstein, 1989). McDaniel, Einstein, Dunay, and Cobb (1986) demonstrated that moderate levels of difficulty significantly improved recall whereas high levels of difficulty did not. Based on this result, McDaniel and Einstein (1989) speculated that retention can be enhanced if more automatic reading processes are disrupted so that some minimal amount of additional conscious processing is required. In L2 research, Horiba (2002), who investigated task effects (reading for surface forms, reading for meaning, and reading for critique) as well as language proficiency and L1 comprehension skill factors on the recall of L1 and L2 readers reading an expository text, also found that the task was a significant factor accounting for variance in the recall of L2 text, but not L1 text. She explained that the kind of processing demands imposed by a particular task may more strongly influence how well the content of the text is comprehended and encoded into memory in the L2 than when processing the same text in the L1. Notably, her finding that the recall of L2 text was negatively affected under a read-for-critique condition compared with recall in other task conditions indicates the negative effects of high cognitive demand imposed by a complicated task in addition to L2 linguistic constraints. Therefore, it is possible to assume that an optimal level of task difficulty exists and that it varies depending on linguistic factors such as text difficulty and L2 proficiency, especially for L2 readers who are heavily constrained by limited linguistic knowledge.

The Interaction between Processing Task and Other Variables

In order to identify the optimal level of a task effect, it is important to consider the interaction between tasks and such variables as text variables and learner variables.

Task effects vary depending on other variables, such as the text type or text features in both L1 and L2 reading. Kintsch and Young (1984) identified an interaction between task effects and text effects by showing that L1 readers were better able to use information for problem-solving tasks when they read difficult expository passages rather than simple narrative passages. Horiba (2000) compared L1 and L2 reading by investigating the effects of text and task types on reading processes and recalls. She found that in L1 reading, both task types and text types affected recall.

Meanwhile, in L2 reading, task types did not affect processes as much as recall although text types strongly affected both recall and processes. Horiba's findings suggest that task and text types have complex relations in L2 reading.

Facilitative task effects during reading might also differ based on learner variables, such as prior knowledge, reading ability, and language proficiency. Some L1 studies have reported on interaction between prior knowledge and task difficulty. McDaniel, Hines, and Gyunn (2002) showed that readers' ability can influence the effects of a particular processing task by comparing skilled readers' and less-skilled readers' reactions to generation tasks while reading a folktale (i.e., sentence-unscrambling). The sentence-unscrambling task was beneficial for less-skilled readers, but not for skilled readers as the task was redundant for them. However, the authors also found that readers with less skilled decoding skills do not benefit from the generation task because they tend to rely on higher-order information to compensate for their poor decoding skills. Thus, a possible reason why L2 readers do not always benefit from a particular task may also be individual differences, such as linguistic knowledge and comprehension skills, which interact with task factors. L2 learners are constrained by a lack of linguistic knowledge of the L2; thus, they do not always benefit from a particular task. Therefore, it is possible to hypothesize an interaction not only between task and text types, but also between task types and L2 proficiency.

Material Appropriate Difficulty (MAD) Framework

One perspective for understanding some of the inconsistent effects of reading adjuncts is the Material Appropriate Difficulty Framework (MAD) (McDaniel & Einstein, 1989, 2004), which assumes that memory for texts should improve when tasks of appropriate difficulty are performed.

The MAD framework focuses on three components of the reading situation: the type of processing induced by difficulty or effort, the type of processing invited by the stimulus materials, and the overlap between both of these sources.

The MAD framework assumes that at least two types of conceptual elaboration are important for text comprehension and retention. The first type of elaboration, called *individual-item processing*, reflects the extensive processing of individual components of an episode (e.g., attending to individual statement or event described in the text). Thus, the information elaborated in terms of an individual item refers to information specific to the individual concepts or proposition within the text. The other type of elaboration, called *relational processing* or organizational processing, relates the components of different episodes to one another. Therefore, relationally elaborated information represents integrated information of the individual propositions within the text (e.g., understanding relationships between ideas in the text).

The second fundamental idea of MAD is the assumption that particular text types invite particular types of processing. For instance, narrative texts invite the extraction of relationships (i.e., organizational structure) within a text more readily than expository texts possibly because the schemata available for processing narratives are better developed, better organized, more

familiar, and more regular than those used to process expository texts. On the other hand, expository passages invite processing that focuses on individual items or propositions. The types of relations that readers have to identify vary between narrative texts and expository texts as a result of the differences in familiarity with textual structure, content, and standards of coherence. Narrative texts possess a causal-temporal structure that is more familiar to readers than the logical structure of expository texts; the content of narrative texts often deals with topics familiar to readers such as human relationships or interpersonal problem solving while expository texts often deal with novel topics that are less familiar to readers; and readers have to attempt to establish primarily causal and referential coherence whereas different types of coherence are involved in processing expository texts (Graesser, McNamara, & Louwerse, 2003; van den Broek, Virtue, Everson, Tzeng, & Sung, 2002).

A final and key element of the framework assumes that processing difficulty effectively enhances recall only to the extent that the difficulty manipulation encourages processing that is complementary to the processing invited by the material itself (Einstein, McDaniel, Owen, & Coté, 1990; McDaniel, et al., 1986). For example, the comprehension of expository passages that require readers to integrate various pieces of information gained from the text can be facilitated by activities inducing relational processing (McDaniel & Einstein, 1989, 2004). In contrast, the comprehension of narrative passages can be facilitated by activities that induce individual item processing.

If the MAD framework is applied to activities that influence textual processing, it can be assumed that processing tasks that encourage relational or organizational processing (e.g., placing scrambled sentences in the correct order, writing arguments, and outlining) will have mnemonic benefits for expository passages whereas reading activities that focus attention on individual-item information (e.g., answering embedded questions, reading letter deleted texts, and finding particular expressions) will have mnemonic benefits for narrative passages.

Present Study

*Statement of the Problem and Research Question*s

The MAD framework raises an issue that has not been clarified in the L2 literature. L2 researchers have yet to illuminate the possible interactions between task variables and text variables. The instructional effects reported in some previous L2 studies (e.g., Horiba, 2000) may not be manifested in others where different text types are used. The results of previous L2 research on instructional task effects need to be interpreted with caution because most of those studies used only one type of text. In order to minimize this problem, the effect of the same task using two text types will be examined in the current study. As discussed in the previous section, the effects may also differ depending on the text type in L2 reading, regardless of how effective a particular task may be. In addition, it is important to investigate whether manipulating the cognitive demands of tasks may improve L2 reading performance if the task creates "desirable difficulty" as McDaniel and Einstein (1989, 2004) assumed, since little L2 data are available concerning the effects of different processing tasks in terms of differences in cognitive demand.

Given the identified gaps in the research, the present study will replicate McDaniel and Einstein's (1989) study by adding a specific learner factor—namely, L2 reading proficiency—so that the results of this study can be compared with the results of the L1 study. Therefore, the primary question that this study will attempt to answer is to what degree processing task effects, text type conditions, and L2 reading proficiency interact with each other and influence L2 reading comprehension. In order to answer this question, three sub-questions are posed:

1. Will there be interactions among processing tasks (outlining, embedded questions, and control), text types (narrative and expository), and L2 reading proficiency (high and low) on L2 reading comprehension in terms of performance in recall writing (total ideas and main ideas)?
2. To what degree will any effects among processing tasks, text types, and L2 reading proficiency persist after one week (delayed recall performance)?
3. What are the qualitative effects of processing tasks, text types, and language reading proficiency on immediate and delayed recall?

Embedded Questions and Outlining as Elaborating Tasks

The present study uses two different processing tasks—namely, embedded questions and outlining—that are assumed to differ from one another in terms of cognitive task demand. Both embedded questions and outlining have been widely used as educational reading adjuncts for enhancing text comprehension. However, as shown by Einstein et al. (1990) and McDaniel et al. (1986), who have provided evidence that these two tasks induce different types of processing, the tasks have different types of effects on reading comprehension. According to McDaniel and Einstein (1989), embedded questions test specific information stated explicitly in the text and require little macrostructure information to answer. As such, they are believed to facilitate primarily individual item processing and hence are assumed to be beneficial for processing narratives. This assumption was supported by demonstrating that questions inserted after a segment of text were particularly effective for recalling narrative texts as they were understood to enhance recall for the information directly questioned.

Outlining is also considered to be an effective instructional task for increasing free recall texts because it encourages readers to organize important text elements, thereby integrating textual information into a memorable representation (Reynolds & Shirey, 1988). Cook and Meyer (1983) also pointed out that outlining encourages relational processing as it invokes processing that draws attention to the text's macrostructure. Therefore, it is assumed that outlining is believed to facilitate text processing, especially in expository texts.

Narrative Text and Expository Text

Given that task effects vary according to specific text variables, the current study uses two text types: narrative and expository texts. Important differences exist in structure and content between narrative and expository texts; these differences induce different types of processing and problems for L2 readers. Narratives possess well-documented, familiar structures. From a content perspective, narratives typically deal with information about social or interpersonal relationships as well as everyday problem solving, information about which both adults and

children tend to know quite a bit (Coté, Goldman, & Saul, 1998). Horiba (2000) characterized narratives as having fairly consistent and predictable semantic causal structures based on intentional, goal-directed actions. Compared to narrative texts, expository texts generally create a stronger need for familiarity. Many expository texts are informational and present unfamiliar concepts and their relations. Therefore, successful comprehension depends in part on prior knowledge of the topic. In addition to the availability of prior knowledge, comprehension difficulties arise from a wide variety of rhetorical organizational patterns that are often indicated by organizational markers. L2 readers often engage in local information processing and develop comprehension problems at the local level.

Furthermore, Koda (2005) pointed out different roles of background knowledge in L2 reading between narratives and expository prose. According to Koda, content-relevant domain knowledge can compensate for L2 linguistic constraints in reading expository text, but it does not play as important a role in comprehending narratives because domain knowledge is activated to reconstruct the author's intention and is assimilated by new insights for restructuring existing knowledge bases. In addition, it does not substitute for the event-specific information necessary to link text elements despite the fact that it, to a certain degree, contributes to recognizing causal relationships among events (Koda, 2005). In sum, text type constitutes an independent influential variable that must be considered when investigating the effects of processing tasks on reading comprehension. As Koda pointed out, it is important to carry out in-depth analyses of genre-specific processing requirements induced both linguistically and conceptually during L2 reading as the results highlight intra-individual variations in comprehension across text genres.

Considering the L2 readers' sensitivity to differences in text types and task types, as previously discussed, it is predicted that there will be interactions between text types and task types as predicted by the MAD framework for L1 readers. However, this prediction can only be made under the condition that readers can establish sufficiently coherent text representation as L2 readers' competence is often heavily constrained. If readers' L2 lower-level skills are not sufficiently automatized, not enough attention resources remain to be allocated to higher-level processing, such as elaborating their text representation. As a result, a kind of floor effect prevents L2 readers from benefiting from instructional support focused on higher-order processes (i.e., optimal combination of learning interventions and text type conditions). It is further predicted that the effects among processing tasks, text types, and L2 proficiency will persist after one week, as long as L2 learners' proficiency is high enough to be influenced by the conceptual elaboration tasks used in this study, as the MAD framework assumes that memory for text should improve when tasks of appropriate difficulty are performed. However, if their lower-level processing is not proficient enough to benefit from the effects of learning interventions, the text is still difficult for comprehension and the long-term facilitative effects of task conditions cannot be expected. Finally, it is predicted that qualitative differences between different task types and text types will be shown and provide implications for interpreting the results of quantitative analyses.

Method

Participants

Participants comprised 103 students (86 female and 17 male) enrolled in a four-year university in western Japan. The immediate recall groups and the delayed recall group were formed from this same pool of participants. Participants for the immediate recall study were divided into two groups based on their scores on the reading section of the Michigan Placement Test. Participants who scored more than 55 points (maximum score = 80) formed the high reading proficiency group (n = 49); those who scored under 55 formed the low reading proficiency group (n = 51). An independent groups t-test (t = 12.40, df = 101) showed a statistically significant difference between the scores of the two groups ($p < .01$). Table 1 summarizes the sample size of each condition for both immediate and delayed recall.

Only 76 of the original pool of 103 participants returned to participate in the delayed recall writing. The same cut-off point (i.e., 55 points) was applied to form a high reading proficiency group (n = 47) and a low reading proficiency group (n = 29). An independent group t-test (t = 12.50, df = 81) showed a statistically significant difference between these two groups ($p < .01$).

Table 1. *Grouping of participants by task, group, and text type*

	Control		Embedded Q		Outlining	
	High	Low	High	Low	High	Low
Immediate Recall	14	19	16	19	19	16
Delayed Recall	13	13	15	9	19	7

Materials

The reading section of the Michigan Placement Test (Form C) was used to measure participants' general English reading ability. The K-R21 internal-consistency estimate of reliability for the reading section of the Michigan test was .90.

An expository text, *Cutting Down the Forest,* and a narrative text, *Big Change*, were used in the experiments (see Appendices A & B). Based on the findings of a preliminary study, linguistically appropriate passages in terms of vocabulary and content were carefully chosen. The think-aloud obtained from the participants confirmed the appropriateness of the passages. Both passages were selected from an ESL reading text, *More Reading Power* (Mikulecky & Jeffries, 1996), in which they were part of a series of rapid reading activities. The expository passage, which was about deforestation, was chosen because the topic is familiar enough to Japanese students to permit them to activate their prior knowledge and relate it to the content of the text. This passage contained 488 words, 40 sentences, and 185 propositions and had a Flesch-Kincaid Readability Index of 6.4 and a Flesch Reading Ease rating of 71.2. Meanwhile, the narrative passage discusses the main events in the life of Maria Montessori, the founder of the Montessori school. This passage contained 505 words, 37 sentences, and 205 propositions and had a Flesch-Kincaid Readability Index of 8.3 and a Flesch Reading Ease rating of 59.3.

Three sets of reading materials were prepared. The set prepared for the control condition (i.e., the read-only group) included two passages printed on separate pages and a sheet for recall after

each of the two passages. For the group of participants who answered embedded questions during the reading, the entire reading passage and all questions for both texts were printed on the same page (see Appendix A). Five embedded questions were created by a Japanese English instructor who regularly teaches English reading classes to Japanese university students, meeting the following criteria established by McDaniel and Einstein (1989): They were designed to test specific information stated explicitly in the preceding paragraph, and they required little macro-structure information to answer. All questions were checked by a second trained-rater in order to ensure that the conditions described in McDaniel and Einstein's study were met. For the outlining condition, the entire reading passage, instructions, and examples of outlining were printed on the same page (see Appendix B).

Procedures

After general instructions for the experiment were orally provided to the participants in Japanese, they received a reading packet containing the Michigan Placement Test (Form C) and two reading passages with task instructions. Participants were randomly assigned to one of the three task conditions—namely, reading only, answering embedded questions, and outlining. Participants read and recalled both the narrative and expository text. In order to reduce the risk of a practice effect, the order of the passages was counterbalanced across participants: One half of the participants read the narrative followed by the expository text while the other half read in the opposite order. After taking the Michigan Placement Reading Test (for 50 minutes), participants were asked to read the two passages and follow the instructions for their assigned task. They were informed that they would be tested for their comprehension. The control group was instructed to read as they usually do, the embedded questions group was instructed to answer the questions embedded in the text while reading, and the participants in the outlining condition were instructed to produce an outline of the passage. They were allowed to respond in any language because their responses to the embedded questions and outlining task were not evaluated.

Participants spent 20 minutes reading each passage. The participants were also told not to skip pages or to go back to any previous page. Both the embedded question and outline groups were instructed to complete the tasks while reading and to finish reading rather than completing the tasks if they did not have enough time to complete the assigned tasks.

Immediately after reading, they were given 20 minutes to recall and write down the contents of the passage. They were instructed to write down whatever information they remember and complete the recall of sentences in Japanese, their native language, instead of English as Lee (1986) demonstrated that L2 readers may not be able to express the ideas that they actually comprehend in the target language due to constraints on their L2 writing skills. Participants were also asked to produce written recall about the two passages a week after the reading session.

Analyses

Recall analyses. Before analyzing the recall data, the two passages were analyzed in two ways. First, they were propositionally analyzed according to the procedure proposed by Bovair and Kieras (1985) and divided into propositions by two trained raters. Using this definition, a list of

propositions was created for each text through discussions between two Japanese speakers of English, one of whom was a Japanese English language instructor and the other a fluent Japanese speaker of English. Inter-rater reliability, which was calculated by dividing the number of propositions for which both raters agreed by the total number of propositions in the text, was estimated to be .93. Disagreements were resolved through discussion. According to this analysis, the expository text was made up of 185 propositions and the narrative passage was made up of 205 propositions. This list was used to score the amount of information contained in the participants' recall products. Thus, the maximum score of the total recall was 185 points for the expository text and 205 points for the narrative passage.

In addition to the propositional analysis of the texts, the passages were analyzed for main ideas in order to evaluate the participants' ability to retain important ideas reflected in their recall and distinguish those participants who include many important ideas from those who recall many details. Clauses reflecting the main ideas were chosen by the same two trained raters: Clauses expressing superordinate ideas (i.e., topic sentences stating a problem, clauses for main causes of the problem, clauses for details of each cause and effects of the problem) were selected for the expository text whereas main events (main actions or situations about the protagonist and responses to them) were selected for the narrative text. Inter-rater reliability indices were calculated by dividing the number of clauses both raters chose by the average of the total number of sentences chosen as the main idea of each passage. The inter-rater reliability was .90 for the expository text and .84 for the narrative text. Discrepancies between the two raters were discussed. An agreed-upon version of the list of the main idea clauses was created and used as a template for scoring the participants' understanding of main ideas. According to these templates, the narrative text had 13 main idea clauses while the expository text had 10 main idea clauses. Unlike the analyses of the total ideas recalled, a looser scoring criterion was used due to the holistic nature of main idea comprehension: Possible slight distortions or additions in meaning as well as close paraphrases of the original statements and verbatim recalls were considered to be adequate.

Ultimately, each participant's recall protocol was analyzed in terms of the total number of recalled idea units as well as the number of main ideas. Two trained raters scored 25% of the data, and inter-rater reliabilities were calculated by dividing the number of propositions both raters agreed upon by the total number of propositions in the passage. The reliability estimates ranged from .90 to .95. All disagreements were resolved by discussion and another round of scoring by the two raters. After determining that the inter-rater reliability was sufficiently high, the remaining data were analyzed by one rater. Group means were obtained for the total proportion of recalled propositions (the total number of recalled propositions was divided by the total number of propositions for each passage) and the proportion of clauses reflecting main ideas (the total scores were divided by the maximum score of each passage).

Analyses of variance. When multiple ANOVAs are performed, it is necessary to make a Bonferroni adjustment in order to avoid making a Type I error (Tabachnick & Fidell, 2001). Four three-way repeated-measures ANOVAs were conducted in this study; thus, a Bonferroni adjustment was made. The alpha level of .05 was divided by four and an adjusted alpha level of .0125 was employed. For this reason, p values are shown to three decimal places.

Results

Interactions Among Processing Tasks, Text Types, and L2 Reading Proficiency on Immediate Recalls

In order to examine the effect of different types of processing tasks, text types, and reading proficiency levels on the immediate passage recall, the mean proportion and standard deviations of the total ideas recalled and main ideas recalled were calculated. Tables 2 and 3 summarize the descriptive statistics for total ideas and main ideas recalled, respectively. The descriptive statistics for the total ideas recalled show a large gap between the high and low proficiency groups.

The effects of the different processing tasks, text types, and reading proficiency levels on the two dependent variables—namely, the mean proportion of the total ideas and main ideas recalled—were statistically examined with two three-way repeated-measures ANOVAs. The independent variables were a within-group factor of text type (narrative and expository) and two between-group variables of task type (reading only, outlining, and answering embedded questions) and reading proficiency levels (high and low).

Table 2. *Mean proportion (SD) of the immediate recall of total ideas by task condition, reading proficiency, and text type*

	High			Low		
	Control	Embedded	Outline	Control	Embedded	Outline
Narrative	31.01	28.69	30.73	18.28	13.76	13.08
	(10.00)	(11.94)	(11.81)	(8.49)	(9.25)	(10.43)
Expository	33.32	30.07	30.24	19.46	13.86	15.05
	(14.49)	(10.21)	(13.1)	(8.62)	(10.5)	(9.88)
n	14	16	19	19	19	16

Table 3. *Mean Proportion (SD) of the immediate recall of main ideas by task condition, reading proficiency, and text type*

	High			Low		
	Control	Embedded	Outline	Control	Embedded	Outline
Narrative	63.33	57.50	64.56	38.95	29.82	35.83
	(21.52)	(19.91)	(16.49)	(21.23)	(19.16)	(24.69)
Expository	46.43	47.40	50.44	31.58	23.24	28.65
	(23.28)	(12.44)	(16.07)	(15.36)	(15.36)	(18.75)
n	14	16	19	19	19	16

The results, which are shown in Tables 4 and 5, reveal a significant difference only for reading proficiency levels, thereby indicating that the high-proficiency participants performed better than the low-proficiency participants in all task conditions. A statistically significant difference was also found for text type for main ideas recalled. Participants recalled more main ideas for the narrative text than for the expository text. No statistically significant effects for task were shown

for either total ideas recalled or main ideas recalled. No difference for total ideas recalled was found between the two text types.

Although no significant interaction occurred between reading proficiency and text type on the main ideas recalled, the descriptive statistics suggest that the high-proficiency group outperformed the low-proficiency group on main ideas recalled, albeit to a lesser degree, on the expository text than on the narrative text.

Table 4. *Repeated-measures ANOVA for the immediate recall of total ideas by task condition, reading proficiency, and text type*

Source	*SS*	*df*	*MS*	*F*	*p*	eta^2
Between subjects						
Proficiency (P)	11323.56	1	11323.56	61.04	.00	.326
Task (T)	557.00	2	278.50	1.50	.23	.016
P×T	67.24	2	33.62	.18	.84	.001
Error	17994.92	97	185.52			.518
Within subjects						
Text type (TT)	78.11	1	78.11	1.65	.20	.002
TT×P	1.53	1	1.53	.03	.86	.000
TT×T	8.51	2	4.26	.09	.91	.000
TT×P×T	62.37	2	31.19	.66	.52	.001
Error	4588.85	97	47.31			.013

Table 5. *Repeated-measures ANOVA for the immediate recall of main ideas by task condition, reading proficiency, and text type*

Source	*SS*	*df*	*MS*	*F*	*p*	eta^2
Between subjects						
Proficiency (P)	28287.08	1	28287.08	55.83	.000	.269
Task (T)	1373.21	2	686.67	1.36	.263	.013
P×T	394.01	2	198.01	.39	.678	.003
Error	49148.04	97	506.68			.468
Within subjects						
Text type (TT)	5471.13	1	5471.13	27.41	.000	.052
TT×P	564.29	1	564.29	2.83	.095	.005
TT×T	123.14	2	61.57	.31	.735	.001
TT×P×T	76.29	2	38.15	.19	.826	.000
Error	19361.73	97	199.61			.184

Interactions Among Processing Tasks, Text Types, and L2 Reading Proficiency on Delayed Recalls

Following the same procedures used in the immediate recall analysis, the effects of processing

tasks, text types, and reading proficiency levels on the delayed total recall and delayed main idea recall were examined. Although 27 participants were missing from the original pool of 103 participants for the delayed recall session and the sample size differed between the two proficiency groups, the gaps in *n*-sizes between cells for ANOVAs were within the acceptable ratio of four to one for carrying out the repeated-measures ANOVA (Tabachnick & Fidell, 2001).

In order to investigate the effects of different processing tasks, text types, and reading proficiency levels on passage recall a week after the reading session, the mean proportion and standard deviations of the total ideas and main ideas recalled were calculated. Tables 6 and 7 show the descriptive statistics for total and main ideas on the delayed recall, respectively.

Table 6. *Mean proportion (SD) of the delayed recall of total ideas by task condition, reading proficiency, and text type*

	High			Low		
	Control	Embedded	Outline	Control	Embedded	Outline
Narrative	18.39	16.07	17.56	9.49	10.24	10.59
	(11.25)	(8.02)	(7.55)	(6.69)	(6.98)	(7.66)
Expository	14.84	13.77	15.28	7.57	6.73	10.43
	(12.59)	(9.10)	(8.15)	(4.43)	(7.05)	(4.91)
n	13	15	19	13	9	7

Two three-way repeated-measures ANOVAs were carried out with three independent variables and two dependent variables for delayed recall. The dependent variables were the total number of ideas recalled and the number of main ideas recalled a week after the experiment session. The three independent variables were task (outlining, embedded questions, and read-only conditions) and L2 reading proficiency (high and low) as the between-subject variables as well as text type (narrative and expository) as the within-subject variable. The results are shown in Tables 8 and 9.

Table 7. *Mean proportion (SD) of the delayed recall of main ideas by task condition, reading proficiency, and text type*

	High			Low		
	Control	Embedded	Outline	Control	Embedded	Outline
Narrative	47.69	52.89	58.60	33.33	33.33	36.19
	(22.91)	(19.43)	(18.40)	(20.55)	(10.00)	(18.80)
Expository	30.13	27.22	36.84	19.23	14.82	30.95
	(15.79)	(17.10)	(18.49)	(10.96)	(14.29)	(18.46)
n	13	15	19	13	9	7

Table 8. *Repeated-measures ANOVA for the delayed recall of total ideas by task condition, reading proficiency, and text type*

Source	*SS*	*df*	*MS*	*F*	*p*	*eta*^{2}
Between subjects						
Proficiency (P)	1582.97	1	1582.97	13.70	.000	.135
Task (T)	66.69	2	33.34	.31	.735	.005
P×T	30.75	2	15.37	.14	.867	.002
Error	7538.84	70	107.70			.646
Within subjects						
Text type (TT)	178.97	1	178.97	5.69	.020	.015
TT×P	6.00	1	6.00	.19	.665	.000
TT×T	18.36	2	9.18	.29	.750	.001
TT×P×T	18.04	2	9.02	.29	.753	.001
Error	2217.87	70	31.68			.190

The results of the delayed recall analyses also revealed no statistically significant task effects; however, the reading proficiency effects were significant for both total ideas and main ideas recalled. In addition, a statistically significant difference for text type effect was identified, but only on the main ideas recalled. These results are consistent with the results of the immediate recall analysis.

Descriptive statistics indicated a meaningful difference in the delayed total ideas recalled between the two text types: Participants performed better on the narrative text than on the expository text. Unlike in the immediate recall, where a text type difference was found only for the main idea recall, total idea recall was affected by text type in the delayed recall.

Table 9. *Repeated-measures ANOVA for the delayed recall of main ideas by task condition, reading proficiency, and text type*

Source	*SS*	*df*	*MS*	*F*	*p*	*eta*^{2}
Between subjects						
Proficiency (P)	6936.69	1	6936.69	14.39	.00	.103
Task (T)	1987.47	2	993.74	2.06	.13	.029
P×T	67.82	2	33.91	.07	.93	.001
Error	33745.73	70	482.08			.504
Within subjects						
Text type (TT)	10032.92	1	10032.92	55.38	.00	.150
TT×P	697.97	1	697.97	3.85	.54	.010
TT×T	433.91	2	216.55	1.20	.31	.006
TT×P×T	251.99	2	126.00	.70	.50	.003
Error	12681.60	70	181.12			.189

Qualitative Analysis of Recall Performance

The quantitative results demonstrated no statistically significant differences in the amount of information recalled between task conditions. However, they did not indicate whether a difference existed in the quality of information represented in the participants' recall although a text type-based difference was evident for the number of main ideas recalled. Therefore, a qualitative analysis was used to examine what type of information was recalled from the two text types for each task in order to determine whether a qualitative difference existed between tasks as well as explain the lack of a difference between task conditions. To this end, a prototypical recall was constructed for each condition based on the task type, text type, and participants' reading proficiency, following the procedure used in Linderholm et al.'s (1979) work.

Prototypical recalls are a useful means of assessing the quality of information recalled from a text (Linderholm et al*.,* 2000). In the current study, the prototypical recall consisted of summaries of the information recalled by a majority of the participants. Prototypical recall was created for both versions of each text by identifying statements recalled by at least half the participants (see Appendix C). To standardize the unique way in which the participants paraphrased text statements, the prototypical recalls were constructed using the original text statements in their original order, following Linderholm et al. (2000).

Consistent with the results of the statistical analyses, the task type-based prototypical recalls showed no significant differences in the amount of information recalled between the three task conditions for both narrative and expository texts (see Appendix C-1 & 2). However, small qualitative differences were found in the content.

The prototypical recall of the narrative text showed that more than half of the participants who answered embedded questions recalled the parts asked by the questions (e.g., the profession of the man with whom Maria had a child) quite well (see Appendix C-1). More than half of the participants in the outline condition recalled the information that linked the main events and subordinate information for each main event. For example, they remembered "It was difficult … to understand why [Maria] left such a good position" as additional information to her leaving her job whereas participants in the other conditions did not. More than half of the participants in the control condition recalled the first four fifths of the passage better than the participants in other conditions, but they generally did not recall the last one fifth.

A slight difference in quality between the tasks was also evident in task type-based prototypical recall of the expository text, despite the lack of quantitative task-based differences (see Appendix C-2). Participants in the embedded question condition remembered the parts of the text related to the questions they were asked. However, they failed to remember more abstract information, such as the author's summary or speculation about the facts in the article that were not addressed by the embedded questions. On the other hand, participants in the control and outline conditions generally recalled the abstract ideas in addition to the facts asked by the embedded questions although their recall was not as detailed as the participants in the embedded question condition. Such results may stem from the fact that those in the control and outline conditions seem to have paid attention to whatever information they thought was important and freely made inferences, whereas those in the embedded questions group were forced to pay attention to particular ideas

in order to answer the questions. Therefore, the participants in the control condition and outline condition were similar in terms of the items they remembered. Meanwhile, recall for the participants in the control condition was slightly more detailed. For example, the majority of the participants in the control condition recalled that "landowners in Brazil and Central America keep many cattle to export" while those in the outline condition recalled that "landowners want to keep many cattle." The outline condition did not require the use of detailed information. Those in the control condition were not induced to attend to particular information and could focus on any of the sentences.

The low-proficiency group displayed patterns similar to those of the high-proficiency group on overall recall performance for both narrative and expository texts although the amount of information they recalled was much smaller than that in the high-proficiency group, which is consistent with the results of the quantitative analyses. For this reason, their prototypical recalls were not listed.

The prototypical recall of the delayed recall was also constructed (see Appendix C-3 & 4). However, unlike the prototypical recall for immediate recall, no significant task effects were evident in the prototypical recall for the delayed recall. The text type effect was shown even more clearly in the prototypical recall for the delayed recall: Participants recalled more ideas for the narrative text than for the expository text in terms of the number of total ideas as well as main ideas. Thus, the overall prototypical analyses generally support the results of the quantitative study while further highlighting the qualitative task-related effects. Differences in the results of the prototypical recall analysis between the immediate recalls and delayed recalls implied the influence of the retention of intervals on task effects.

Discussion

In order to answer the main research question (i.e., To what degree do processing task effects, text type conditions, and L2 reading proficiency interact with each other and influence L2 reading comprehension?), the findings for each analysis will be interpreted in this section to answer the three sub-questions.

Question 1. Will there be interactions among processing tasks (outlining, embedded questions, and control), text types (narrative and expository), and L2 reading proficiency (high and low) on L2 reading comprehension in terms of performance in recall writing (total ideas and main ideas)?

A main effect for the reading proficiency level was found for both immediate and delayed recall, but no significant main effects emerged for task types and no significant interactions occurred in participants' recall for either total ideas or main ideas (see Tables 4 & 5). A main effect for text type effect occurred only on the main idea recall on both the immediate and delayed tests. These findings do not fully support the assumptions of the MAD framework, which predicts an interaction between text and task types. However, the MAD framework was partially supported by the finding that no text type difference occurred on the total idea recall but did occur on the main idea recall. Thus, the type of information that participants remember differs between the two text types even though the total amount of recalled information is the same. This outcome

likely stems from the assertion that the main ideas of narrative texts are easier to remember than the main ideas of expository texts. A conclusion consistent with the MAD framework's assumption about *material appropriate processes*, which claims that different types of processes is invited by different text types and predicts that narrative texts invite relational processing whereas expository texts invite individual item processing. Narrative texts are assumed to include highly connected concepts that allow key propositions to be repeatedly rehearsed, and the specific nature of information in narrative texts makes it easier for readers to remember main concepts of narrative passages; meanwhile, expository texts are assumed to have less argument overlap—a feature that inhibits the strengthening of conceptual nodes—and the abstract nature of the information makes it more difficult for readers to extract main concepts.

A possible reason for the lack of task effects is that the processing tasks neither enhanced nor decreased the participants' reading comprehension, in part because of a mismatch between the task demands and the participants' linguistic proficiency level. The processing tasks may not have functioned beneficially for the participants in the present study because they were severely constrained by their limited L2 proficiency. According to McDaniel and Einstein (2004), readers can benefit from tasks that provide "desirable difficulty" only if the learner can complete the task; thus, it is possible to assume the existence of linguistic thresholds where L2 readers start benefiting from the effects of processing tasks. The two tasks used in the present study were designed to facilitate reading comprehension; outlining was assumed to encourage readers to distinguish superordinate ideas and supporting details and ignore trivial information whereas embedded questions were assumed to primarily engage readers' selective attention processes as they search for the information needed to answer the questions. However, most of the facilitative effects reported in the L1 literature assume that readers' language proficiency is high enough for them to make the most of the effects of the conceptual elaboration being promoted through the tasks.

As Koda (2005) pointed out, careful attention must be given to the linguistic knowledge presumed to have been acquired by native-speaking students in adopting L1 instructional approaches. She argued that L2 learners, especially those lacking well-developed L2 decoding competence, are sensitive to local linguistic elements but not to global text organization; consequently, sufficient attentional capacity for information integration beyond sentence levels cannot be expected. L1 readers or fluent high-proficiency learners' low-level processes are sufficiently automatized to allocate enough attentional resources for engaging in information integration and conceptual manipulations whereas L2 learners still preoccupied with decoding are easily baffled by instruction interventions that require heavy attention to global text features. Readers' lower-level processes should be automatized enough to be able to benefit from tasks focusing on higher-level processes; otherwise, not enough attentional resources are left to engage higher-order processes.

Ultimately, L2 proficiency is a dominant force in determining which aspects of text-information processing L2 readers engage during comprehension at given points of their L2 development. Therefore, it can be speculated that only L2 readers whose proficiency level is above this threshold can benefit from processing tasks because they can develop a good enough—what Kintsch (1998) calls—"textbase" upon which they can further elaborate. Below this level, support to help establish an adequate textbase, such as glosses, textual manipulation, and

responses to pictures or images, might be more beneficial than conceptually supportive tasks. Close examination of individuals' performance on processing tasks is required to determine whether their L2 reading proficiency is high enough to respond to the tasks sufficiently and properly.

Question 2. To what extent will effects among processing tasks, text types, and L2 reading proficiency persist after one week (delayed recall performance)?

Similar to the analysis of immediate recall, no statistically significant task effects were found although a statistically significant proficiency effect was found on both total ideas and main ideas recalled. However, unlike the analysis of immediate recall, descriptive statistics indicated considerable text type differences in the total number of ideas recalled as well as the number of main ideas recalled (Tables 8 & 9), suggesting that the long-term retention of expository texts is more difficult than that of narrative texts for recalling both total ideas and main ideas.

These results are again not fully consistent with Einstein et al.'s (1990) L1 study, which indicated that the interaction between task and text types persisted beyond the one-week delay, namely, outlining activities improved the recall of expository texts while embedded questions improved the recall of narrative texts. Einstein et al. concluded that the benefits of complementary relations between text types and task types can persist at least one week. However, in the current study, no such interaction was observed. Instead, the text type effect on main ideas persisted beyond the one-week delay, and the text type effect on total ideas recalled became more prominent after the one-week delay. The finding concerning text type effects on delayed recall provides further evidence that expository texts are more difficult to recall than narrative texts, especially for L2 readers, possibly due to their lack of background knowledge, the large number of details that must be remembered, and unfamiliarity with the discourse organization of English expository text (e.g., Horiba, 2000).

Question 3. What are the qualitative effects of processing tasks, text types, and reading proficiency on immediate and delayed recalls?

The prototypical recall results supported the quantitative results, but provided important information regarding the quality of the participants' written recall. The type of information recalled often reflected the task they were assigned. In particular, the outline and embedded question conditions induced readers to pay attention to particular types of information whereas the control condition did not. The recall of those in the embedded question group confirmed that they recalled the information that they were asked to answer. The recall of the participants in the outline group tended to include main events whereas those in the control condition tended to remember details. However, this task type-based difference in recall was less prominent in the expository text, which may suggest a possible interaction between text type and task type.

Although the qualitative analyses suggested that it is possible to speculate that a qualitative task-based difference exists in recall products, it is necessary to carry out more in-depth qualitative studies on relations between text type and task type.

Conclusion

This study investigated how particular processing tasks influence L2 reading in relation to reading proficiency and text types. However, unlike previous findings for L1 reading, the current study did not show quantitative task type effects on both immediate and delayed L2 reading recall or on interactions between task effects and text types. Yet the findings concerning text type effects on immediate and delayed recalls are consistent with previous findings and assumptions about material appropriate processes, providing evidence about genre-specific processing requirements imposed on L2 readers during reading. The inconsistency between L1 studies (i.e., Einstein et al., 1990; McDaniel et al., 1986) and this study raises several issues to consider for future research and provides pedagogical implications.

First, it is possible that the facilitative effects of the potentially positive effects of the processing tasks used in this study were cancelled out by the mismatch between the task types and the participants' proficiency level. Linguistic constraints may have overridden the task effects. As a result, their poorly developed text representation might not have permitted them to benefit from the conceptual elaboration induced by the tasks. If we are to identify how particular processing tasks induce certain processing operations and thereby influence comprehension, we must carry out more careful analyses of L2 readers' proficiency variable, namely, investigating which particular tasks provide the desirable level of difficulty for them. Furthermore, careful attention is required to determine how to define a learner's ability. As McDaniel et al. (2002) suggested, the effect of a processing task can vary depending on what aspects of learners' reading skills are measured (e.g., decoding skills and comprehension skills).

The current study also suggested text type effects on participants' recall products in line with the MAD framework and other previous studies (Bensoussan, 1990; Dubravac & Dalle, 2002; Horiba, 2000; Koda, 2005). Although it is not possible to make generalizations about text type differences based on the present study, the effects of text type differences on L2 reading in terms of text representation were clear enough to suggest that text type-oriented processing is salient in L2 reading, as Horiba (2000) claimed. As only one narrative and one expository passage were used for each text type in the current study, future researchers should use multiple texts with different levels of linguistic difficulty and content familiarity for each text type.

Another way to view inconsistency between the L1 studies and this study concerns the complexity of the evaluation methods. The finding that the long-term retention of an expository text deteriorates if readers have not engaged in cognitively demanding tasks suggests that the effects of manipulating task difficulty will not appear unless the learning effects are assessed using a method that has a certain degree of cognitive complexity. Complex interactions between task types and text types may appear by creating a variety of comprehension questions or using multiple assessments. However, it is important to ensure that sufficient cognitive resources are available for executing tasks such as remembering important points or integrating information. Thus, researchers must strive to identify what McDaniel and Einstein (2004) called the "desirable difficulty" of cognitive effort for the facilitative use of processing tasks and the degree of complexity of the methods used to evaluate the effects of the cognitive effort.

The prototypical analyses of the delayed recall hinted at the need to conduct further qualitative

investigation into interactions among task factors, text type factors, and proficiency factors. Unlike McDaniel and Einstein's (1989, 2004) assumption about L1 reading, the present study did not clearly show facilitative complementary relations between the processes invited by a particular text type and the processes induced by a particular task type with L2 learners, but rather hinted at the possibility that task type, text type, and learner's variables interact with one another. It is necessary to carry out in-depth analyses into the processes influenced by the text types and task types using online methodologies (e.g., think-aloud) so that interactive relations between task and text types may be better demonstrated.

Finally, a pedagogical implication from this study concerns the importance of considering the interplay of task type factors, text type factors, and learners' factors when L2 instructors select or design reading materials and tasks. Unlike L1 reading, it is difficult to predict the degree of difficulty or instructional effects of a particular task simply by judging from task types and text types. The influences of text types or task types as well as interactions between the two are not straightforward in L2 reading. Koda (2005) emphasized the importance of timely implementation of interventions focusing on higher-level operations, cautioning that premature implementation can have negative impacts on L2 learners; indeed, introducing idea linkage across sentences to learners still struggling with word-meaning extraction also may induce frustration and confusion. Therefore, other tasks such as note-taking, questions for authors (Anderson, 2009), or graphic organizers (Grabe, 2009) may be more helpful in compensating for the lack of linguistics knowledge for low-proficiency learners.

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Appendix A

Narrative Text (Big Change) and Embedded Questions

1. What kind of problem did one of Maria's female students have?
2. What is Maria's new kind of question?
3. What kind of occupation does Dr. Montesano have?
4. Whom did Dr. Montesano marry?
5. What happened to Maria's son?

While she was the director of the Orthophrenic School Maria worked closely with the children. At night she studied her notes and designed new materials for particular problems. There was one young girl, for example, who seemed unable to learn how to sew. Maria invented a weaving exercise so that her hands could practice the in-and-out movement of sewing. When the girl next tried sewing she was far more successful.

Maria found that the children generally learned much more easily if they were prepared first with exercises. This seemed to be true for reading and writing as well. The regular Italian schools had always used repetition as a teaching method. Many children-both normal and with developmental problems-had learned little that way.

The new methods of Maria's school, however, gave quite different results. Some of the children even managed to pass the regular state elementary school examinations. This seemed like a miracle to many people. For Maria, however, this success brought new questions. She wondered if her methods would work as well as in teaching normal children.

At this point in her career, Maria made a decision that surprised everyone. In 1900, she left the Orthophrenic School and went back to the university as a student of education. No one could imagine why she would want to leave her position at the school where she was well-respected. At the time, she simply said that she felt she must learn more about education. But this explanation was probably only part of the truth.

This period in Maria's life is surrounded by mystery but one thing is sure. She had a romance with one of the fellow doctors, Dr. Giuseppe Montesano. He had worked in hospitals with Maria and then had become co-director of the Orthophrenic School. Maria and Giuseppe were together day after day, and eventually their relationship became more than professional. They were both young, after all, and Maria was a beautiful, lively woman.

Soon Maria was expecting a baby. It is hard to imagine how she hid her changing shape during this busy period. But somehow she did and her son Mario was born in 1898. For some reason she did not marry Montesano. They may have made an agreement never to get married to anyone. Dr. Montesano, however did marry someone else in 1900. This may have been the real reason for Maria's decision to leave the school.

With Maria's love of children, it may seem surprising that she gave her son to another family to bring up. However, in those days it was shameful for an unmarried woman to have a child. Maria may not have cared about scandal, but her mother probably did. And if the public had known about her son, Maria's career would probably have ended. The fact that Maria did not bring up her son may have influenced her later life and work. Having missed the experience of caring for her son, she may have cared even more about helping other children.

Appendix B

Expository Text (Cutting Down the Forest) and Instruction for Outlining

While reading the text, please make an outline of the passage either in English or Japanese, following these directions: First, identify several main points. Second, list supporting ideas for each point. Please note that there is not necessarily one main point for each paragraph.

Example

I. Japan as an aging society
    A. Decrease in the number of children
    B. The rapid rate of aging
II. The shortage of taxpayers as a future problem
    A. Decrease in the labor force population
III. Government measures against the aging society
    A. Raising the age at which pension benefits become available
    B. Designing an income-based medical cost system

There is nothing new about people cutting down trees. In ancient times, Greece, Italy, and Great Britain were covered with forests. Over the centuries those forests were gradually cut back, until now almost nothing is left.

Today, however, trees are being cut down far more rapidly. Each year, about 42 million acres of forest are cut down. That is more than equal to the area of the whole of Great Britain. While there are important reasons for cutting down trees, there are also dangerous consequences for life on earth.

A major cause of the present destruction is the worldwide demand for wood. In industrialized countries, people are using more and more wood for paper, furniture and houses. There is not enough wood in these countries to satisfy the demand. Wood companies, therefore, have begun taking wood form the forests of Asia, Africa, South America, and even Siberia.

Wood is also in great demand as firewood in developing countries. In many areas, people depend on wood to cook their food. As the population grows, the need for wood grows, too. But when too many trees are cut at once, forests are destroyed. A future source of wood is destroyed as well. When some trees in a forest are left standing, the forest can grow back. But only if it is not cut again for at least 100 years. In reality, it usually has no chance to grow back. Small formers who are desperate for land move in. they cut down the rest of the trees and burn them. In this way, many millions of acres of forest are destroyed every year. Unfortunately, the forest soil is not good for growing food. Thus, these poor farmers remain as poor and desperate as before. They have also lost the resources of the forest.

However, the desperate and poor people are not the only ones to cut and burn forests. In Brazil and Central America, large landowners want to raise lots of cattle for export. They put too many cattle on too little land. When that land has been ruined, they burn parts of the forests. Then they move the cattle into the forest land. This way both land and forest are destroyed.

The destruction of forests affects first the people who used to live there. However, it also has other effects far away. For example, on the mountainsides, trees help to absorb heavy rains. When the trees are cut down, the rain pours all at once into the rivers and there are terrible floods downstream. This has happened to the Ganges, the Mekong, and other major rivers in Asia. But finally, the loss of forests may have an effect on the climate of our planet. Together with increasing pollution, it could cause temperatures to rise and the climate to change around the world. No one knows exactly what effects this would have on our lives. For many people, however, the effects would probably be destructive.

Appendix C

Prototypical Recall Results

1. Immediate Recalls for the Narrative Text

Control condition

Maria worked closely with children as a school director.
At night she studied and designed new materials.
There was a girl who could not sew.
After having her practice in-and-out movements, she was able to sew.
Maria realized that children can learn better if she prepares them with exercises.
Italian schools used a particular teaching method.
In Maria's school, some students could pass the entrance exam.
It was like a miracle.
She wondered if this teaching method was really effective or not.
The fact that she left school and went back to the university to study surprised everyone.
She said she would like to learn more about education, but this was only part of the truth.
She had a romance with a doctor.
The worked together and gradually developed a close relationship.
She became pregnant.
But they did not get married.
They promised not to marry anybody
But, he married somebody else.
This may be the real reason why she left her job.
She gave her son to another family to raise.
Her mother cared about unmarried women having children.

Embedded question condition

Maria was a director of a school.
There was a girl who could not sew.
Maria invented a practice method for her.
The girl improved in sewing.
Maria realized that children learned better when she prepared them with the first preparation.
She wondered if her method of teaching would be effective for normal children too.
She left her school and went back to the university.
Everybody was surprised by her decision.
She said she wanted to learn more about education.
She had a romance with a doctor with whom she worked at a hospital.
She gave a birth to a son.
She and the doctor did not marry each other.
They promised not to marry anybody.
However, the doctor married somebody else.
She gave her son to another family to raise.
It was shameful for an unmarried woman to have children.
Although Maria did not care about it, her mother did.
Her career would have ended if the public had known about her son.
Missing the experience of raising her son, she may have even cared more about her students.

Outline condition

Maria was working closely with children at a school.
There was a girl who could not sew.
After practicing, she developed the ability to sew.
Maria realized that students could learn better if she prepared them with exercises.
The results of her school students' exam surprised everyone.
She wondered if this method of teaching was also effective for normal children.
She left the school and went back to the university as a student.
It was difficult for people to understand why she left such a good position.
She wanted to learn more about education.
She had a romance with a doctor.
They were working together.
She became pregnant.
They did not marry each other.
They promised not to marry anyone.
However, the doctor married somebody else.
This is the real reason why Maria left her job.
She gave her son to another family to raise.
Her mother was afraid that it would be shameful for a unmarried woman to have children.
Maria did not care about it.
She missed the experience of raising her child.
She may have even cared about her students.

2. Immediate Recalls for Expository Text

Control

Cutting trees is not something new.
In ancient times, countries like Greece, England, and Italy were covered with trees. The forests have since been cut down. Almost nothing is left now.
Now trees are being cut down more rapidly.
Every year 42 million acres of forests are cut down, which is more than the area of England.
One of the biggest causes for this is the big demand for trees from industrial countries.
Trees are used for paper, furniture, and houses in industrial countries.
However, there are no resources to satisfy such demands in their own countries.
Wood companies started taking wood from Asia, Africa, South America, and Siberia.
Trees are also used as materials to make fire for cooking in developing countries.
As the population grows, the demand for trees increases.
If many trees are cut down at once, forests are destroyed; if forests are not disturbed for 100 years, trees can grow back.
Small farmers cut and burn trees and then move to another place.
However, the land is not good for growing food.
Landowners in Brazil and Central America keep many cattle to export.
They put too many cattle in a small area and destroy forests.
On the mountainsides, trees help absorb heavy rains.
When trees are cut down, there are terrible floods.
This has happened in the Mekong and Ganges rivers.
Deforestation changes the earth's climate and causes temperatures to rise, leading to destructive results.

Embedded Question

There is nothing new about cutting down forests.
In ancient times, Greece, Italy, and England were covered with wooded areas.
Trees have been cut down, and almost nothing is left now.
Today, 42 million acres of forests are being cut down every year, which is equal to the size of Great Britain.
Trees are used for paper, furniture, and houses in industrial countries.
There is not enough wood in these countries to satisfy the demand.
Wood companies have been taking wood from the forests of Asia, Africa, and Siberia.
Some countries use trees for cooking.
If some trees are left without being cut down for 100 years, forests can grow back.
The landowners in Brazil and Central America keep many cattle to export.
They burn forests for more space.
Trees help absorb heavy rains.
When too many trees are cut down, there are floods in the rivers.
Deforestation also causes climate changes on earth and raises temperatures.

Outline

Cutting down trees is nothing new.
Greece, Italy, and England were covered with forests in ancient times.
Trees have been cut down over centuries, and almost none are left.
Trees have been cut down rapidly.
Every year, 42 million acres of forests have been cut down, which is equal to the size of Great Britain.
A major cause of deforestation is the great demand for wood.
Trees are used for paper, furniture, and houses in industrial countries.
There is not enough wood to satisfy their demand.
Wood companies have taken trees from Asia, Africa, and Siberia.
Trees are used as firewood for cooking in developing countries.
As the population increases, more trees are cut down.
When too many trees are cut down at once, forests are destroyed.
If some trees are left standing, forests can grow back, but only if they are not cut again at least for 100 years.
Landowners want to keep many cattle.
They put cattle in a small space.
They burn forests and destroy lands.
They destroy the land.
Trees help absorb heavy rains.
If trees are cut down, there are floods in rivers like the Ganges.
Deforestation causes temperature increases and climate changes.

3. Delayed Recalls for the Narrative Text

Control (high proficiency)
Maria was working for a school.
There was one young girl unable to sew.
After Maria had the girl practice, she was able to sew.
Maria left the school and went back to the university.
This was surprising to everyone.
She said she felt she must to learn more about education.
This explanation was part of the truth.
She had a romance with a doctor.
They had a baby. They did not marry.
They made an agreement never to get married to anyone, but he married someone else.
This is the real reason why Maria left the school.
She gave her son to another family to raise.
In those days, it was shameful for an unmarried woman to have a child.
Maria may not have cared about having a baby as a single mother, but her mother probably did.
Having missed the experience of caring for her son, Maria may have cared even more about helping other children.

Control (low Proficiency)
Maria was working for a school.
There was one young girl unable to sew.
Maria left the school and went back to the university.
She found that the children generally learned much better if they were prepared first with exercises.
She had a romance with a doctor.
She became pregnant.
They made an agreement never to get married to anyone, but he married someone else.
In those days, it was shameful for an unmarried woman to have a child.

Embedded Question (high proficiency)
There was one young girl unable to sew.
Maria left the school and went back to the university.
She had a romance with a doctor.
They had a baby.
They made an agreement never to get married to anyone.
He married someone else.
Maria gave her son to another family to raise.
In those days, it was shameful for an unmarried woman to have a child.

Embedded Question (low Proficiency)
Maria was a teacher.
She had a romance with a doctor.
She became pregnant.
They made an agreement never to get married to anyone.
He married someone else.

Outline (high proficiency)
Maria was working for a school as a teacher.
There was one young girl unable to sew.
Maria left the school and went back to the university.
She had a romance with a doctor.
She became pregnant.
They made an agreement never to get married to anyone.
He married someone else.
Maria gave her son to another family to bring up.
In those days, it was shameful for an unmarried woman to have a child.

Outline (low proficiency)
Maria left the school and went back to the university.
She had a romance with a doctor.
She became pregnant.
They made an agreement never to get married to anyone.
He married someone else.
Maria gave her son to another family to raise.

4. Delayed Recalls for the Expository Text

Control (high proficiency)
England, Italy, and Greece were covered with forests in ancient times.
Trees are used for paper, furniture, and houses.
Industries have taken wood from Africa, Siberia, and Asia.
Trees are also used for cooking.
If some trees are left standing for a long time, forests can grow back.
Trees help absorb rain.
If trees are cut down, there will be floods in the rivers.
Trees cause the temperature to rise.

Control (low proficiency)

Trees have been cut down.
Trees are used for paper and houses.
Trees have been imported from countries in Asia and Africa.

Embedded Question (high proficiency)
England, Italy, and Greece were covered with forests in ancient times.
Trees are used for paper and houses.
Trees have been imported from countries in Asia and Africa.
Trees help absorb rain.
If trees are cut down, there will be floods in the rivers.

Embedded Question (low proficiency)

Trees have been cut down.
Trees have been imported from countries in Asia and Africa.
If trees are cut down, there will be floods in the rivers.

Outline (high proficiency)
Trees have been cut down.
Every year, an area of trees that equals all of Great Britain is cut down.
Trees are used for paper and houses.
Trees are also used for cooking.
If trees are cut down, there will be floods in the rivers.

Outline (low proficiency)

European countries were covered with forests.
Trees have been imported from countries in Asia and Africa.
If trees are cut down, there will be floods in the rivers.
Cutting down trees causes temperatures to rise.

About the Author

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