Effects of text structures on interest and memory in expository texts

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Abstract: The purpose of the study was to examine the effects of expository-text structures on interest and memory. Three methods of structuring texts used in the study were detailing, contextualizing, and questioning strategies. Students in grades 6 and 7 participated in the study. Two experiments were conducted. In the experiment 1, a within-subject design was used to investigate differences in text interests among different forms of texts. In the experiment 2, a between-subject design was used to investigate the effects of the text-structuring strategies on text comprehension and memory as well as text interest. Results of the experiment 1 showed that students selected contextualized texts as the most interesting. The reason was that students felt contextualized texts practically relevant to their real lives. In addition, texts constructed by using the strategies showed significantly higher levels of interest than the base text where no strategies were applied. However, in the experiment 2, no significant differences in text interest were found among the different forms of texts. In addition, scores on the text comprehension and memory tests were significantly higher in the base and questioning-strategy texts than in the other two forms of texts. Especially, the lowest performance was found in the contextualized texts. The results of the study provide practical implications on how to structure expository texts commonly used in school to enhance motivation and learning outcomes. Specifically, the results suggested that it would be the most desirable to construct text contents so as to create cognitive conflicts to readers, when text interest, comprehension, and memory are all considered.
Keywords: text interest, expository text, text-structuring strategies

An individual's interest in text contents influences not only their motivation to read the text, but also how well they comprehend it (Hidi, 1990; Krapp, Hidi, & Renninger, 1992; Shiefele, 1992). Interest brings about active learning by encouraging learners to be highly engaged in learning. At the same time, it affects learning outcomes by making learning processes more meaningful. The purpose of the study was to examine the effects of methods used to structure expository texts on text interest and comprehension.

There have been two different approaches to investigating the roles of interest in learning (Hidi & Baird, 1988). One is to focus on individual interest, which is different among students. The individual interest is sometimes called personal preferences. The other is to focus on situational interest, which is elicited by learning materials or activities.

Although a number of studies reported that individual interest plays an important role in enhancing learning, it is difficult for teachers to utilize individual interest in actual classroom

learning. It is because every student has his or her own interest and because it is largely different across students (Hidi, 1990).

On the other hand, situational interest is relatively easy to utilize in educational settings. This is because interest elicited from text features or learning activities are less affected by individual differences, and because it is not hard to evoke students' interest by manipulating learning stimuli or activities. Text interest is part of situational interest and it can be triggered by text structures.

Factors affecting text-based interest were examined in previous studies. Kintch (1980) suggested that cognitive interest is determined by readers' background knowledge, uncertainty of the story, and postdictability. Anderson, Shirey, Wilson, & Fielding (1987) also suggested four text characteristics which increase the degree of text-based interest. They are novelty, character identification, life theme, and activity level of a text. According to the researchers, students tend to be more interested in novel or unusual content (novelty), characters they can easily identify with (character identification), what is important to them (life theme), and intense actions and feelings (activity level). Schraw, Bruning, and Svoboda (1995) also developed the multicomponent model of situational interest, and identified six text characteristics that included coherence, ease of comprehension, engagement, vividness, background knowledge, and emotiveness.

In conclusion, factors influencing text-based interest can be divided into two categories: Structure- and content-based factors. Structure-based factors include text coherence, uncertainty, and postdictability. Novelty, surprise, life theme, activity level, and universally interesting concepts are associated with content-based factors.

According to previous research, text-based interest has positive effects on text memory and comprehension. Increase in recall, especially of main content rather than the whole content, has been reported by several studies. Schraw (1997) found that situational interest was not connected with the recognition of main information, but with the overall interpretation of a text and elaborations. In summary, research suggested that text interest makes changes not in the quantity but in the quality of the memory on text contents (Hidi & Baird, 1988; Schraw, 1997).

In this study, the effects of different ways of structuring expository texts were examined on text interest and memory. Previous studies on situational interest, particularly those on text-based interest, have mostly focused on narrative stories, not expository texts. Considering that expository texts make up a large proportion of learning materials, research on the text-based interest of expository texts can be expected to provide important practical implications.

Based on the results from previous research, we designed three text-structuring strategies for an expository text, which are intended to evoke text interest and enhance students' memory and comprehension on text contents. Three strategies were detailing, contextualizing, and questioning strategies. In the study, we examined the effects of each strategy on text interest and comprehension.

Method
Experiment 1
<u>Participants</u>

Participants were 222 students in the 7th grade from two junior high schools located in a Metropolitan area. Male students were 115 (51.8%) and female students were 107 (48.2%). Participants were assigned to three groups and each group was provided four different types of the same texts. The four different types of the same text were constructed by applying the strategies developed for making the text more interesting in the study.

Materials

Four different types of a text for three topics were constructed in the study: Base, detailed, contextualized, and search-for-answer texts. The three topics included the following: "What make people flush after they drink," "why does forgetting occur," and "what happens if you jump in a falling elevator?"

Base texts for each topic were obtained from children's science-magazine articles and original texts were modified to have cohesive structures for clear explanation of each topic. Pilot tests were conducted to another group of the 7th graders to check readability and there were no difficulties with comprehending the base texts.

Three strategies were applied to the base texts: Detailing, contextualizing, and questioning strategies. By applying these strategies, three additional types of a text were constructed: Detailed, contextualized, and search-for-answer texts, respectively.

The detailing strategy was one inserting some supportive details into contents of the base texts. The strategy was expected to make the base passage more concrete and specific. For example, when the following sentence was presented in the flushing-face text, "when the alcohol is absorbed in our body, it moves to the liver where it gets dissolved," additional sentence having more concrete information was followed. In this instance, the following sentence was added to the base text: "The liver produces a chemical substance called ADH, which dissolves alcohol."

The contextualizing strategy was one making the texts began with an everyday life situation. For example, in the flushing-face text, a situation was introduced where a child got curious about the reason that wine made only his father flush during the family reunion at home.

Finally, the questioning strategy was one presenting a multiple-choice question at the beginning of the text in order to trigger readers' cognitive conflicts. For example, at the beginning of the flushing-face text, the following question was asked, "Why do you think some people get flushed after drinking?" Then the following four choices were provided for readers: (a) Because people were in a bad mood when they drink, (b) because alcoholic beverages promote blood circulation, (c) because the toxic substance in alcoholic beverages spreads over the body, and (d) because alcoholic beverages heat up our body and then our face, too.

Procedures and measures

After reading the four types of texts in one topic, students were asked to rank them in terms of their interest. Additionally, students were given a 6-point likert scale to rate their perceived interest in each type of the texts. Finally, students were asked to provide some explanations why they thought a certain type of the texts more interesting than the others.

Experimental design

The within-group research design was used to examine the differences in text interest among the four types of texts in the study. Each group of students was given the four types of texts. After reading each text in one topic, students were asked to rank them in terms of their interest. Additionally, students were given a 6-point likert scale to rate their perceived interest in each type of the texts. Finally, some explanations were asked why they thought a certain type of the texts more interesting than the others.

To control for the effect of text-presentation order, the counter-balanced design was used in the study. Students in each group were given the four different texts in counter-balanced orders.

Experiment 2

Participants

Participants were 151 students in grade 6 from a middle-class suburban elementary school located in a Metropolitan area. Among participants, male students were 79 (52.3%) and female students were 72 (47.7%). In experiment 2, a between-group research design was used and participants were randomly assigned to the four groups: Base-text, detailed-text, contextualized text, and search-for-answer text groups. The number of students assigned to each group was 33 for the base text, 30 for the detailed text, 25 for the contextualized text, and 24 for the search-for-answer text.

Materials

The same texts used in experiment 1 were used in Experiment 2. However, the participants in experiment 2 were one year younger than those in experiment 1 so that the texts were modified a little easier by replacing difficult words with easier ones.

Procedures and measures

One week before students read the texts, their prior knowledge and working memory span were assessed. The test of prior knowledge was composed of 6 true-false questions for each topic text. The questions assessed students' knowledge of the basic concepts of each text. The working memory test used in this study was developed for elementary students based on the reading span test by Daneman and Carpenter (1980).

A general interest in the text topics was also measured before they read the assigned texts of a topic. The participants were asked to rate how interesting the topic was before they read the story using 1 to 6 likert scale. Then participants were instructed to read the text carefully by informing that they would be asked to remember what they had read.

After reading the materials, students were asked to rate the degree of interest of each text: Base, detailed, contextualized, and search-for-answer texts. The test was composed of 9 items that were classified into three categories: Cognitive, emotional, and behavioral aspects of interest. There were 3 items included in each category.

After finishing the text interest test, the comprehension test of the texts they read was administered. The test was composed of 8 items, asking readers' literal and inferential understanding of the texts.

Finally, one week after reading the texts, the students took two memory tests of the texts they had read. In the free recall test, they were asked to write down all the concepts in the texts they could remember. Among the concepts they recalled, only important ones were

counted for later data analyses.

A maze test was also administered as a recognition test. In the maze, main sentences in the texts were provided with some blanks. Students were asked to select one of three choices that could fill in the blank. Ten selections had to be made during the maze test and the number of correct choices was scored.

Results
Experiment 1
<u>Analysis of differences in text interest</u>
Means and standard deviations for text interest in the experiment 1 were provided in Table 1. To examine the effects of each strategy on text interest and comprehension, we conducted a one-way ANOVA with repeated measures. The results were presented in Table 2. There was a statistically significant main effect of text-structuring strategies on text interest (F (3, 660) = 101.52, p < .01). For further analyses, three contrast conditions were constructed where reference group was the base text. Each of the three strategy-applied texts was significantly different from the base text in text interest (contrast 1: BT vs. DT, F (1, 220) = 90.30, p < .01; contrast 2: BT vs. CT, F (1, 220) = 298.40, p < .01; contrast 3: BT vs. ST, F (1, 220) = 154.91, p < .01).

Table 1: *Means and Standard Deviations of Text interest in within subject design*

	BT		DT		CT		ST		
	M	SD	M	SD	M	SD	M	SD	N
Interest	2.68	1.21	3.75	1.42	4.62	1.07	4.16	1.33	221

<u>Note.</u> BT=Base text; DT=Detailed text; CT=Contextualized text; ST=Searching-for answer text.

Table 2: *Analysis of Variance with repeated measurements in Text Interest*

Variable	SS	df	MS	F	p
Strategy (A)	453.80	3	151.27	101.52	.00
Subject (S)	105.58	220	0.48		
A X S	983.46	660	1.49		
Total	1542.84	883	1.75		

Experiment 2

Analysis of text interest

Means and standard deviations for text interest in the experiment 1 were presented in Table 3. To examine the effects of the strategies on text interest, one-way ANOVA was conducted. In contrary to the results in the experiment 1, results showed that the differences in the text interest among the strategies were not statistically significant ($\underline{F}$ (3, 108) = 0.35, $\underline{p}$ > .05).

Table 3: *Means and Standard Deviations of Text interest in the between subject design*

	BT		DT		CT		ST	
	M	SD	M	SD	M	SD	M	SD
Interest	33.20	7.59	31.81	6.98	31.31	6.54	32.14	7.32

Note. BT=Base text, $\underline{n}$=33; DT=Detailed text, $\underline{n}$=30; CT=Contextualized text, $\underline{n}$=25; ST=Searching-for answer text, $\underline{n}$=24.

Analysis of text comprehension

Means and standard deviations for text comprehension in the experiment 2 were provided in Table 4. To examine the effects of the different text-structuring strategies on text comprehension, MANOVA was conducted. The results of analysis were presented in Table 5. They showed that the text-structuring strategies were found to have significant effects on text comprehension (Wilks' λ= .70, $\underline{p}$ < .01). The results of univariate tests were followed. Significant differences among the strategies were found in the measures of comprehension ($\underline{F}$ (3, 108) = 5.81, $\underline{p}$ < 0.01, with an eta^2 of 0.139), recognition ($\underline{F}$ (3, 108) = 5.21, $\underline{p}$ < 0.01, with an eta^2 of 0.126), and recall ($\underline{F}$ (3, 108) = 7.77, $\underline{p}$ < 0.01, with an eta^2 of 0.177). To identify the effects of each strategy on text comprehension, planned comparisons were conducted with the base text as a reference group. The detailed text group showed significantly a higher mean than the base text group in the comprehension measure ($\underline{t}$ (108) = 3.11, $\underline{p}$ < .01); however, there were no significant differences in the recognition and recall measures ($\underline{t}$ (108) = 1.91, $\underline{p}$ > .05 and $\underline{t}$ (108) = 1.935, $\underline{p}$ > .05, respectively). The contextualized text group showed significantly higher outcomes in all three measures than the base text group (for comprehension, $\underline{t}$ (108) = 2.69, $\underline{p}$ < .01; for recognition, $\underline{t}$ (108) = 3.64, $\underline{p}$ < .01; for recall, $\underline{t}$ (108) = 3.77, $\underline{p}$ < .01). Finally, the search-for-answer text did not show any significant differences in all dependent measures from the base text group (for comprehension, $\underline{t}$ (108) = -.30, $\underline{p}$ > .05; for recognition, $\underline{t}$ (108) = .33, $\underline{p}$ > .05; for recall, $\underline{t}$ (108) = -.90, $\underline{p}$ > .05).

Table 4: *Means and Standard Deviations of Text Comprehension*

	BT		DT		CT		ST		
	M	SD	M	SD	M	SD	M	SD	N
Comprehension	14.12	4.77	10.47	5.00	10.80	5.18	14.5	3.30	14.5
Recognition	25.82	2.98	24.33	3.12	22.84	3.91	25.54	2.02	25.54
Recall	1.28	0.21	1.14	0.30	1.00	0.31	1.20	0.30	1.20

Note. BT=Base text, n=33; DT=Detailed text, n=30; CT=Contextualized text, n=25; ST=Searching-for answer text, n=24.

Table 5: *Multivariate Analysis of Variance in Text Comprehension*

Variable	Wilks' Λ	Univariate F	df	p	eta^2
Comprehension		5.81	3, 108	.001	.14
Recognition	.70**	5.21	3, 108	.002	.13
Recall		7.77	3, 108	.000	.18

**p < .01

Discussion

The effects of different text structures on text interest and comprehension were examined with within- and between-subject research designs in the study. First, regarding text interest, different results were obtained in the study. In the experiment 1, the base-text condition was ranked significantly lower in interest than the other three text conditions where the strategies were applied; however, the differences were not found in the experiment 2.

The seemingly conflicting results are likely to come from using different research designs in the experiments 1 and 2. In the experiment 1, students read the four different types of a text with the same content, whereas students read the three texts of different topics to which one of the text-structuring strategies was applied consistently in the experiment 2. Therefore, characteristics of the texts to which the strategies were applied were more likely to stand out to students than the base texts in the experiment 1. In contrast, students read the same strategy-applied texts in the experiment 2; therefore, text features intended with the strategies were not distinct to students. This same phenomenon was reported in the studies on the effects of imagery on memory (McDaniel & Einstein, 1986).

Second, regarding text comprehension, the results in the study were opposite to what were expected. The base-text condition showed significantly higher outcomes in the measures of comprehension and recall, but not in the recognition measure, than the other text conditions, except for the search-for-answer text condition. These results suggested that although text-structuring strategies were effective in increasing readers' interest in texts, the increased interest was not linked to increased comprehension and memory on text contents.

The results might be related to the length of the texts used in the study and the effect of seductive details on text comprehension and memory. The texts were relatively short with less than 200 words on average, and they explained phenomena in a cohesive way. Therefore, the base text was likely to make readers focus on contents of the texts, leading to higher performances in the comprehension and memory tasks. In contrast, the detailed text that was intended to provide more elaborated contents to readers might distract readers from constructing a cohesive representation of text contents. The contextualized text showed the

worst performances in the study. The contextualized text was expected to provide readers with familiar situations so that readers would process text contents more concrete and relevant to themselves, leading to better outcomes in comprehension and memory of text contents. In contrast to the expectations, the contexts provided seemed to function as seductive details while readers processed text contents, as was found in previous studies on text comprehension (Harp & Mayer, 1997; Wade, Schraw, Buxton, & Hayes, 1993).

One interesting finding in the study was that the search-for-answer texts did not deteriorate readers' comprehension and memory of text contents as compared with the base texts. It would be due to the fact that questions provided before reading texts, at least, did not destruct cohesive processing of given text contents. In addition, the questions seemed to bring about cognitive conflicts to readers so that readers felt more interested in the search-for-answer texts than in the base texts.

In summary, the detailing and contextualizing strategies looked not secure in terms of comprehension and memory of text contents, even though they increased levels of interest in text contents. The questioning strategy seemed to have some potential for making reading materials more interesting and processed in more cohesive ways.

Finally, a further study is necessary on the effects of the strategies used in the study on text interest, comprehension, and memory with longer passages. As the length of texts is increased, there may be a tendency that readers feel bored of and their attention is distracted from reading tightly-structured, abstract texts. Students usually read long expository texts; therefore, the effects of text-structuring strategies on interest, comprehension, and memory of text contents would appear to be different from the results of the study.

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Appendix

There are people whose face flushed red when they drink. Once we start drinking, the alcohol in the drink gets absorbed into our body. The alcohol that is absorbed in our body moves to the liver and gets dissolved. At this time, while some people's livers dissolve alcohol well, others' have troubles in dissolving alcohol. If the body cannot dissolve alcohol well, the undissolved alcohol will be accumulated in our body. The alcohol that hasn't been dissolved and still exists in our body turns into toxin. This toxin spreads throughout our body through blood vessels, and makes our face turn red. After all, flushed face after drinking can be a dangerous sign that toxin has spread throughout our body.

Figure 1: *Example of base text on "What make people flush after they drink?"*

There are people who flushed red when they drink. Once we start drinking, the alcohol in the drink gets absorbed into our body. When we drink, about 30% of the drink is absorbed into the stomach and the rest is absorbed into the small intestines of our body. The alcohol that is absorbed in our body moves to the liver and gets dissolved. The liver produces a chemical called ADH, which dissolves alcohol. At these times, while some people's livers dissolve alcohol well, others' have troubles in dissolving alcohol. If the body cannot dissolve alcohol well, the undissolved alcohol will be accumulated in our body. The alcohol that hasn't been dissolved and still in our body turns into toxin. According to several experiments, the toxin which is called Acetaldehyde is strong enough to cause cancer. This toxin spreads throughout our body through blood vessels, and makes our face turn red. That is, the blood vessels of our faces get expanded by the toxin, which is shown by our flushed face. After all, flushed face after drinking can be a sign of danger that indicates toxin spreads throughout our body. People who easily get flushed when they drink are reported to be more likely to get cancer than those who don't.

Figure 2: *Example of detailed text on "What make people flush after they drink?"*

One day when my father's friends visited our house, my father started drinking with his friends after having dinner. After eating cookies in the room with my brother, I went out to the living room, and noticed that only my father's face turned red. When I asked my father if he drank the most, he insisted that he drank just a little. I wonder why his face turns red when he drinks and why some people do not at all.

There are people whose face flushed red when they drink. Once we start drinking, the alcohol in the drink gets absorbed into our body. The alcohol that is absorbed in our body moves to the liver and gets dissolved. At this time, while some people's livers dissolve alcohol well, others' have troubles in dissolving alcohol. If the body cannot dissolve alcohol well, the undissolved alcohol will be accumulated in our body. The alcohol that hasn't been dissolved and still exists in our body turns into toxin. This toxin spreads throughout our body through blood vessels, and makes our face turn red. After all, flushed face after drinking can be a dangerous sign that toxin has spread throughout our body.

Figure 3: *Example of contextualized text on "What make people flush after they drink?"*

Why do you think some people get flushed after drinking?
(a) because people were in a bad mood at the time when they drank
(b) because alcoholic beverages promote blood circulation
(c) because the toxic substance in alcoholic beverages spreads over the body
(d) because alcoholic beverages heat up our body and then our face, too
Have you chosen your answer? Then shall we find out the right answer?

There are people whose face flushed red when they drink. Once we start drinking, the alcohol in the drink gets absorbed into our body. The alcohol that is absorbed in our body moves to the liver and gets dissolved. At this time, while some people's livers dissolve alcohol well, others' have troubles in dissolving alcohol. If the body cannot dissolve alcohol well, the undissolved alcohol will be accumulated in our body. The alcohol that hasn't been dissolved and still exists in our body turns into toxin. This toxin spreads throughout our body through blood vessels, and makes our face turn red. After all, flushed face after drinking can be a dangerous sign that toxin has spread throughout our body.

Figure 4: *Example of search-for-answer text on "What make people flush after they drink?"*