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The Influence of Topic Knowledge, External Strategy Use, and College Experience on Students'

Comprehension of Controversial Texts

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Abstract

This study examined the influence of three personal factors, namely, prior knowledge about the text topic, external strategy use during reading, and experience in college, on students' comprehension of the relations among controversial texts. Eighty-six one-year and 80 three-year undergraduate students answered a questionnaire assessing topic knowledge. One week later, they read two controversial texts and then completed two tasks assessing their comprehension of intertextual relations and recall of intratextual arguments respectively. The results indicated that topic knowledge influenced the comprehension of intertextual relations through enhancing the processing of intratextual arguments. The production of summary notes during reading had indirect and direct positive effects. Longer experience in college led to a better understanding of intertextual relations.

The Influence of Topic Knowledge, External Strategy Use, and College Experience on Students' Comprehension of Controversial Texts

Controversial texts, two or more written texts that give different views on an issue, are familiar to people in democratic society. They are a major mode of legal, political, social, and scientific discourse. For example, a controversy over policy is often developed through newspapers, magazines, books, and websites. Those who intend to follow or participate in the controversy must be able to deal with multiple texts that argue for or against the policy. Proficiency in reading controversial texts is necessary for becoming active citizens, let alone experts in each discourse (Chall, 1996; Westby, 2004; Wineburg, 1991).

This article concerns the influence of personal factors on students' comprehension of controversial texts. In particular, I concentrated on their comprehension of the relations among the texts. It involves detecting discrepancies among the texts and identifying what the writers agree or disagree about and their positions toward the issue (Perfetti, Rouet, & Georgi, 1999; Rouet, Britt, Mason, & Perfetti, 1996). It is important for readers of controversial texts to understand the intertextual relations precisely; otherwise they may miss the points in dispute, accept even contradictory statements as true, and bias their judgments on the issue. Unsurprisingly, there is evidence that students differ from each other in the comprehension of intertextual relations: the detection of discrepancies among texts (Perfetti, Britt, & Georgi, 1995) and the synthesis of arguments across texts (Stahl, Hynd, Britton, McNish, & Bosquet, 1996; Wolfe & Goldman, 2005). Provided that these differences are systematic, examining the sources of variance can shed some light on what is crucial to students' success in comprehension. Little research attention, however, has been given to personal factors except for discipline expertise. Consequently, our knowledge is quite limited about what factors account for the differences

among students, that is, novices in academic disciplines. The present study takes the first step toward addressing this question.

Theoretically, successful reading of controversial texts requires the processing of information within and across individual texts (Rouet, 2006). The model proposed by Stahl et al. (1996), for example, posits that readers of controversial texts understand what is said in each text first, and then integrate information across the texts. This is also true of the comprehension of intertextual relations. Without a proper understanding of each one of the controversial texts, readers may find difficulty in identifying what are points in dispute. On the other hand, they must go beyond individual texts in order to relate the texts with one another. Given these requirements, personal factors can affect students' comprehension of intertextual relations in two ways. One way is to influence intratextual processing (e.g., elaborating on information within individual texts), thereby promoting or hindering their comprehension of intertextual relations indirectly. Another way is to exert a direct influence on intertextual processing, that is, comparing, connecting, and integrating information across individual texts. A mental representation of intertextual relations is the immediate product of intertextual processing.

As potential personal factors that may influence intratextual processing, I focused on topic knowledge and external strategy use. Topic knowledge refers to prior knowledge of the text topic. Although prior research effort has been confined to reading of a single text, there is much evidence, consistent with constructivist theory (Anderson & Pearson, 1984; Kintsch, 1994; Pressley & Afflerbach, 1995), that topic knowledge provides a base for remembering the text and understanding it (e.g., Alexander, Kulikowich, & Schulze, 1994; Spilich, Vesonder, Chiesi, & Voss, 1979; Wiley, 2005). External strategies are cognitive operations (e.g., paraphrasing, summarizing, organizing, explaining, evaluating) with the concurrent production of external

representations, such as notes, annotations, and underlines (Kobayashi, 2007). Previous studies have shown that at least some types of external strategy, such as paraphrasing and summarizing, stimulate deeper processing of information from a single text as measured by comprehension test (Bretzing & Kulhavy, 1979), essay-type test (Lahtinen, Lonka, & Lindblom-Ylänne, 1997), and recognition test (Wittrock & Alesandrini, 1990), to name a few (see Caverly, Orlando, & Mullen, 2000, for a review). Provided that the nature of intratextual processing is common to reading of a single text and controversial texts, topic knowledge and external strategy use would affect the comprehension of intertextual relations via the relationships with intratextual processing.

Evidence suggests that external strategy use may also influence intertextual processing. Britt and Sommer (2004, Experiment 1) found that when reading two controversial texts, students who were told to summarize the first text before reading the second text outperformed those who were not in between-text integration. In a study by Kobayashi (in press), students' use of external strategies facilitated intertextual processing when they were given a purpose of finding intertextual relations, but not when given a purpose of forming one's opinion. He attributed this pattern of results to the different use of external strategies. That is, students with a purpose of relation-finding produced brief summaries of individual texts and intertextual notes more than did students with a purpose of opinion-forming. Although these studies did not treat external strategy use as a personal factor, it is likely that individual differences in the use of external strategies directly contribute to the comprehension of intertextual relations.

College experience is another potential factor that may influence intertextual processing. Rouet et al. (1996) argues that it plays an important role in improving students' ability to process information across controversial texts because college is the first place where they are

substantially required to learn from controversies and multiple texts. Indeed, there is evidence that through college experience, students acquire thinking skills and epistemological beliefs relevant to intertextual processing (see Pascarella & Terenzini, 2005, for a review). The present study compared one-year and three-year Japanese college students, who read texts in Japanese, on the comprehension of intertextual relations. Generally speaking, Japanese school education provides students with few opportunities to use and learn from controversial texts until they enter college. If college experience is a crucial factor, three-year students would outperform one-year students in the comprehension of intertextual relations, regardless of topic knowledge or external strategy use.

In the present study, it was predicted that (a) topic knowledge would affect the comprehension of intertextual relations via intratextual processing; (b) external strategy use would have direct and indirect effects; and (c) college experience would directly affect the comprehension of intertextual relations. From the literature review, however, I could not predict whether topic knowledge and college experience would have direct and indirect effects respectively. The present study also addresses this problem.

Method

Participants

Participants were 86 one-year students (29 males and 57 females; ages $M = 18.91$ years, $SD = .68$) and 80 three-year students (31 males and 49 females; ages $M = 20.79$ years, $SD = .54$) from two teacher-training courses at the Shizuoka University, a national university in the Tokai region of Japan. All of them were Japanese and majoring subject education. Participants received extra course credit for their participation.

Procedure

The experiment was conducted in two sessions. In the first session, participants' topic knowledge was assessed. This session took about 20 min. The second session was held a week later. The tasks and procedure used in this session were similar to those used in Kobayashi (in press). Participants were presented two texts together and told to read the texts in any order. Each text was typed in separate sheets of paper. The experimenter gave no explicit reading orientation but informed them that they would be asked some questions afterward. Participants were also provided a sheet of white paper for notes and told that they might underline and take notes on the white paper and in the margin of the text paper, if necessary. They were given 25 min to read the two texts. Following that, the texts and notes were removed. Intertextual-relation task and intratextual-argument task were then administered in that order. To complete these tasks, participants were given 25 min and 20 min respectively.

Materials

Two articles appeared in a morning edition of a Japanese newspaper, *the Asahi Shimbun* (August 27, 2004), were used. One is written by Nakajima (1,314 letters long in Japanese, 35 sentences), and the other is written by Ohtsu (1,361 letters long in Japanese, 32 sentences). The texts give conflicting views about the introduction of English education as a required subject into public elementary schools in Japan. Table 1 shows brief summaries of each writer's major arguments. An independent sample of 30 undergraduate students rated the ease of understanding of each text on a 5-point scale ranging from *easy to understand* (1) to *difficult to understand* (5). The mean ratings were 3.37 ($SD = .61$) for the text by Nakajima and 3.87 ($SD = .76$) for the text by Ohtsu.

Measures

Topic knowledge. Topic knowledge was assessed using paper and pen. Participants

received the following instructions: “There is now a controversy on the introduction of English education as a regular subject into public elementary schools in Japan. Write down everything you know about it.” Their answers were scored as one point if they included one valid statement that corresponds to information in the texts. The total score for each participant was regarded as his or her topic knowledge. Although this scoring system is somewhat stringent, I adopted it to exclude correct but irrelevant knowledge because a controversy on the introduction of earlier English education covers a wide range of topics beyond the text topic. A coder who was blind to the experiment was asked to score about 20% of the participants’ answers. The percentage of agreement with the author was 87.5%. Disagreements were resolved by discussion.

Comprehension of intertextual relations. Intertextual-relation task was used to assess participants’ comprehension of the relations among arguments across texts. They were told to “describe how the two writers’ arguments were interrelated with each other on the introduction of English education as a regular subject into public elementary schools in Japan,” using paper and pen. Their answers were segmented into statements describing intertextual relations. A statement was determined as a description of an intertextual relation if it included two components: (a) agreement or disagreement between the two writers about an issue and (b) each writer’s opinion about the issue. The statements varied from a sentence to several sentences. Credit was given for production of a valid statement of an intertextual relation if the statement was consistent with each writer’s arguments. Examples of valid statement are shown in Table 2. Total scores ranged from 0 to 5. Interrater agreement assessed for about 20% of the participants’ answers was 88.5%. Disagreements were resolved by discussion.

Recall of intratextual arguments. Intratextual-argument task was used as an off-line measure of intratextual processing. Participants received the following instructions: “I would

like you to recall reasons and responses to possible counterarguments each writer gives for supporting his own claim on the controversial issue. Write down as much as you can remember separately for each of the two texts.” Their answers were scored by tallying the number of arguments (i.e., reasons and responses to possible counterarguments) that were recalled correctly. Credit was given for recall of an argument if the recall answer included the gist meaning of the original paragraph(s) describing it without omitting, confusing, and distorting the points. The maximum score for each participant was 8. Interrater agreement assessed for about 20% of the participants’ recall answers was 87.5%. Disagreements were resolved by discussion.

External strategy use. To assess participants’ use of external strategies, external representations that they produced during reading were analyzed. Their sheets of text and notes paper were coded as present or absent separately for five categories of external representation: highlightings, explanatory notes, personal ideas, summary notes, and intertextual notes.

Highlightings refer to underlines, brackets, marks, or boxes that highlight a text portion (e.g., a word, a sentence, a paragraph). *Explanatory notes* are analytic or interpretative comments on a text portion. *Personal ideas* are evaluative comments on a text portion, one’s opinions about the controversial issue, or information from one’s prior knowledge. *Summary notes* refer to summaries of each writer’s arguments. *Intertextual notes* are comments on the relation between the two writers’ arguments, lines connecting the two writers’ arguments noted, or spatial arrangement of text information showing a contrast between the two writers’ arguments. In the following analyses, each category of external representation was treated as dummy variable: absent = 1 and present = 2. Interrater agreement for about 20% of the participants’ sheets of text and note paper was 98.2%. Disagreements were resolved by discussion.

Results

Table 3 displays the descriptive statistics and correlations among variables. To test direct and indirect effects on the comprehension of intertextual relations, a path analysis was conducted using the AMOS 7.0 (Arbuckle, 2006). Although the intertextual-relation task preceded the intratextual-argument task, the recall of intratextual arguments was specified as a cause of the comprehension of intertextual relations in the model. This was because I used the recall of intratextual arguments as an indicator of how participants were engaged in the processing of intratextual arguments while reading. Nonsignificant paths were trimmed. Standardized path coefficients ($p < .05$) are shown in Figure 1. College experience and summary notes were directly associated with the comprehension of intertextual relations. In addition, there were indirect paths from topic knowledge and summary notes to the comprehension of intertextual relations via the recall of intratextual arguments. This model fit the data quite well, $\chi^2(5, N = 166) = 4.73, p = .45$, goodness-of-fit index (GFI) = .99, adjusted goodness-of-fit index (AGFI) = .97, comparative fit index (CFI) = 1.00, and root-mean-square error of approximation (RMSEA) = .00.

To examine the possibility that topic knowledge and college experience had direct and indirect effects respectively, I also constructed a modified model with two paths, that is, a path from topic knowledge to comprehension and a path from college experience to recall. Although this model fit the data well, $\chi^2(3, N = 166) = 4.12, p = .25$, GFI = .99, AGFI = .95, CFI = .97, and RMSEA = .05, the standardized coefficients for the two paths were not significantly different from zero: -.04 for the path from topic knowledge to comprehension and -.05 for the path from college experience to recall. This result favors the original model.

Discussion

The present study examined the influence of topic knowledge, external strategy use, and

college experience on students' comprehension of the relations among controversial texts. I hypothesized that topic knowledge and external strategy use would affect the comprehension of intertextual relations via intratextual processing. It was also hypothesized that external strategy use and college experience would have direct effects on the comprehension of intertextual relations. The results of path analysis confirmed this model at least within the variables included.

As expected, topic knowledge enhanced the recall of arguments in each text. This result is in line with prior findings that topic knowledge was positively associated with memory and understanding of a single text (Alexander, Kulikowich, & Schulze, 1994; Spilich, Vesonder, Chiesi, & Voss, 1979; Wiley, 2005). It also extends the applicability of constructivist theory (Anderson & Pearson, 1984; Kintsch, 1994; Pressley & Afflerbach, 1995), which stresses the role of topic knowledge in the processing of a single text, to the processing of controversial texts.

The effects of external strategy use differed according to what types of external strategy students employed. Of the five categories of external representation, only summary notes significantly predicted the recall of intratextual arguments and the comprehension of intertextual relations. Students who produced summary notes gained a better score in the recall of intratextual arguments. This result is in accordance with prior findings that summarizing facilitated single-text processing, thereby promoting later recall (Bretzing & Kulhavy, 1979; Lahtinen et al., 1997; Wittrock & Alesandrini, 1990). The production of summary notes also had a direct positive influence on the comprehension of intertextual relations. One possible explanation for this effect is that summaries written in a sheet of note paper, or simplified and concurrently-visible external representations of individual texts, may make it easier for readers

to review arguments across the texts and to find the intertextual relations (Kobayashi, in press; O'Hara, Taylor, Newman, & Sellen, 2002).

Regardless of topic knowledge and external strategy use, college experience directly affected students' comprehension of intertextual relations. Three-year students outperformed one-year students in the comprehension performance. This result gives support to Rouet's et al. (1996) view that college experience fosters students' ability to process information across controversial texts.

Limitations

The model proposed in the present study accounted for only 15% of the variance in comprehension, suggesting that other personal factors not included in the model may have had a greater impact. First of all, readers will note that the present study did not take account of cognitive and motivational factors such as students' general reading ability, topic interest, and working memory capacity, which may have played a central role in intratextual processing (e.g., Daneman & Carpenter, 1980; RAND Reading Study Group, 2002; Rouet, 2006; Schiefele, 1992). In addition, it should be noted that previous studies have emphasized the role of document-level reading skills (Britt & Aglinskias, 2002) and epistemological beliefs (Bråten & Strømsø, 2006; Wineburg, 1991) in the processing of controversial texts. Although I presumed that these factors covary with college experience, the independent effects remain unexamined. Future research should address these issues.

It is also important to note several limitations inherent to measures used in the present study. First, I assessed students' comprehension of the relations among controversial texts using intertextual-relation task. This measure, however, was not devised to separate failure in understanding intertextual relations from failure in remembering them. Second, open-ended test

might have underestimated topic knowledge students actually had because it depended considerably on their efforts to recall and write answers. Third, the variability in these measures was quite limited. Other measures of comprehension and topic knowledge should be developed in future studies.

Finally, it is not clear from the present study what experience in college improved students' comprehension performance. The effect of college experience might reflect the difference in the experience of exposure to controversial texts or in the broader learning experience in college. Additional research is needed to examine these possibilities.

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Table 1

Brief Summary of Two Writers' Major Arguments

Nakajima's argument

- English education should be introduced as a regular subject into public elementary schools right now. (Claim)
- English is necessary for survival in globalization of the economy and communication because it is an international language. (Reason)
- Earlier education is more effective in the acquisition of English. (Reason)
- Don't worry about who will teach English. Competent people for the work will be able to be found outside the school. (Response to possible counterargument)
- Some people may be concerned that earlier English education will have a negative impact on children's formation of identity as a Japanese. To prevent it, however, materials for teaching English can deal with Japanese culture and history. (Response to possible counterargument)
- At elementary school, an emphasis should be put on the acquisition of English as a communication tool. English education after elementary school should be unified and put stress on practical use. Furthermore, teaching in universities should be implemented according to proficiency levels. (Proposal)

Table 1 (*continued*)

Ohtsu's argument

- It is still early to decide to introduce English education as a regular subject into public elementary schools. (Claim)
 - It is questionable whether English teaching for several hours per week in elementary schools is effective in the acquisition of English. In addition, the benefits of English education at elementary school remain unexamined in Japan. (Reason)
 - Although early English education may be effective in the acquisition of correct pronunciation, it is useless for communication without learning grammar. (Response to possible counterargument)
 - The majority of primary teachers are not prepared to teach English. What is worse, under the present circumstances, it is difficult to give them in-service training and to reform teacher's training system. (Reason)
 - There is no room for introducing English education into the present class schedule without a negative influence on education of the other subjects. (Reason)
 - Consideration should be given to the question of how to improve a whole education system up to college education. First of all, more basic language education is needed. (Proposal)
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Table 2

Examples of Valid Statements of Intertextual Relations

Student 2	Mr. Nakajima approves “the introduction of English education as a required subject into public elementary schools in Japan,” whereas Mr. Ohtsu disapproves it.
Student 15	Mr. Nakajima says “Earlier education is more effective for learning a foreign language.” On the other hand, Mr. Ohtsu says “Earlier education is helpful only to children living in the environment where people usually speak English. It is unlikely that children in Japan will master English through learning only for several hours per week. That is a mere illusion.”
Student 70	An approver indicates a risk that the formation of one’s identity as a Japanese will be hindered, while a disapprover makes no mention of it.
Student 121	With regard to the problem of how to deal with a shortage of English teachers in elementary schools, a writer who favors the plan says that there must be talented people in each local community and we will be able to make good the shortage by giving a teacher’s license for English to people with experience of studying abroad. On the other hand, a writer who is against the plan indicates the following problems. Some teachers already have difficulty in teaching English now. A large majority of teachers, who do not have teacher’s licenses for English, will not teach English appropriately. What is worse, it is not easy to reeducate those teachers or to reform the teacher’s training system.

Table 3

Descriptive Statistics and Correlations among Variables

Variable	1	2	3	4	5	6	7	8	9
1. College experience ^a	-								
2. Topic knowledge	.10	-							
3. Highlightings ^b	.14	.01	-						
4. Explanatory notes ^b	-.06	.01	.25**	-					
5. Personal ideas ^b	.02	.06	.13	.03	-				
6. Summary notes ^b	.07	.11	.02	.07	-.23**	-			
7. Intertextual notes ^b	.14	-.00	.17*	.07	-.07	.24**	-		
8. Recall	-.01	.26**	-.05	-.00	-.10	.23**	.07	-	
9. Comprehension	.17*	.06	.10	.00	-.08	.30***	.21**	.27***	-
<i>M</i>	1.48	2.13	1.85	1.27	1.20	1.63	1.20	5.02	1.48
<i>SD</i>	.50	1.37	.36	.44	.40	.49	.40	1.26	1.12

Note. *N* = 166

^a 1 = one-year students, 2 = three-year students. ^b 1 = absent, 2 = present.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1. Path analysis of predictors of students' comprehension of intertextual relations. Standardized path coefficients are presented. $^* p < .05$. $^{**} p < .01$.