N-12 The Requisites for Academic Reading Support System based on activating non-prose Information

Yukari Kato and Toshio Okamoto

The University of Electro-Communications

Chofugaoka 1-5-1 Chofu, Tokyo 182-8585 Japan

{kathy, okamoto}@ai.is.uec.ac.jp

Abstract: The purpose of this paper is to propose the framework of relevant leaning system for second language education based on both theoretical literature and the experimental data. Based on the experimental and theoretical data, non-prose information is used as relevant information for nonnative readers because it is more easily used than prose information. Our system is designed to provide nonnative students with necessary knowledge and practice that are relevant to understanding. Therefore it includes not only the partial supports for words and phrases, but also the total supports for readers' mental process of academic comprehension. In other words it intends to functionally integrate local/peripheral process that poses linguistic and graphical features and rule, and global/central process that activates readers' background knowledge. This integration of two teaching tactics could the integration of prose and non-prose information for effective reading comprehension for nonnative readers.

Keyword: Relevance Theory, Japanese for Specific Purpose, Non-prose information, Academic Reading

1. Introduction

1.1 Shifting Interest to Japanese for Academic Purposes

In recently years, in Japan, there has been rapid increase of foreign students studying at graduate schools of science and technology, who have already completed some academic courses in their major fields, but do not have sufficient language ability for academic life. A possible solution, for the difficulties above mentioned, is to base the new language learning systems development on empirical studies of the learners' problems, difficulties and needs, which includes two different functions to support both language and specialized learning.

This paper is organized as follows. Section 2 describes related studies, which helps us to provide preliminary data for designing adequate curriculum and systems for Japanese for Specific Purpose (JSP). In Section 3, we illustrate the experiment that was conducted to investigate the influence of background knowledge and language proficiency on the use of visual and textual information in academic articles.

2. Activating Visual Information as Reading Strategy

In the field of cognitive and developmental psychology, it has drawn attention away from the text itself and focused it upon another factor such as pictures and illustrations [18]-[23].

Increasing attention has been paid to internal mental process of readers in terms of their background and world knowledge. Thus Reid and Beveridge [24] attempted to investigate more precisely the relationship between pictures facilitation and learners' abilities in text processing. Their result indicated that picture appeared to enhance the learning of superior ability group but to retard to the learning of the inferior ability group.

Kato et al. [25] tried to investigate how nonnative reader could make up for the lack of comprehension by reference to the pictures in academic articles. Our study suggested that illustration embedded in the articles appeared to retard to comprehension of the less experienced group although it enhanced the comprehension of superior ability group. This result reinforced previous findings [24] that less able pupils could not make up for the lack of comprehension by reference to the pictures if they find text difficult to comprehend.

3. Experiment

This experiment attempted to investigate precisely the relationship between pictures facilitation and learners' background knowledge and language proficiency in text processing. What we are concerned here in this experiment is how nonnative reader can synthesize related prose and non-prose information in academic reading comprehension.

3.1 Research Questions

Our goal with this research is to propose the prototype lessons of reading support system for nonnative readers.

1. *How dose learners' background knowledge influence the use of visual and textual information?*
2. *How does learners' language proficiency influence the use of visual and textual information?*

3.2 Method
3.2.1 Subjects

The subjects were 41 foreign students studying at the business department of a private university in Japan. The subjects who participated in this experiment were 19 freshmen and 22 sophomores who were intermediate and advanced learners of Japanese

3.2.2 Materials and Procedure

We selected two passages from the journal of information processing and economics. Based on the previous study [24], the comprehension tests items were prepared to examine understanding corresponding to three different types of information source: (1) questions testing understanding information presented in the picture form, (2) questions for the understanding of information only available in the text, and (3) further questions for the understanding of information which was presented both in picture from and in the text. Forty-one undergraduates in business department participated in this study for course credit. Each participant was tested on two different reading passages and comprehension tests.

3.3. Result

We separately examined the comprehension tests of the two different domains in order to investigate the effects of the background knowledge on understanding the textual and visual information.

.3.1. Result of Non-Specialized Domain

To examine the three different conditions, we conducted an ιNOVA on the data in Table 2, with Japanese language proficiency freshman vs. sophomore) as between-subject factor and information ources (picture, text, and both picture and text) as within-subject ιctor. The major focus of the analysis reveled that interaction etween grade and information source variables reached significance, ' $(2,117) = 5.49$, $p < .01$, $MSE = 0.54$.

Compared with the simple effects on two variables, the results ιere displayed in Table 3. Fisher's least significant difference (LSD) rocedure presented that sophomore performed significantly better ιan freshman on the use of textual information $(MSE = 0.54, 5\%$ ιvel).

There was no significant simple effect on sophomore's erformance, confirming the expectation that students with high ιpanese proficiency effectively used three kinds of information ource. On the other hand, freshman's performance was significantly ιfferent between information sources, which indicated that textual ιformation was more difficult than visual information, likewise, both ιcture and text.

Table 2: Correct Answers in Comprehension Test

	Picture	Text	Both
Freshman	2.53	1.84	2.89
(N=19)	(0.84)	(0.96)	(0.32)
Sophomore	2.86	2.68	2.77
(N=22)	(0.35)	(0.72)	(0.53)

Table 3: ANOVA Results of Non-Specialized Domain Test

Factor	SS	df	MS	F
Grade	3.78	1	3.78	8.08**
Picture	1.16	1	1.16	2.70
Text	7.19	1	7.19	16.72**
Both	0.15	1	0.15	<1
Info.Source	7.26	2	3.63	8.44**
Freshman	11.64	2	5.82	13.53**
Sophomore	0.34	2	0.17	<1
Grade × Info.	4.72	2	2.36	5.49**
Error	50.28	117	0.43	
Total	66.04	122		

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

ι.3.2. Result of Specialized Domain

Analysis on non-specialized domain indicated that there was ιgnificant interaction between grade and information source ιariables. Table 4 showed the means of correct answers on ιomprehension tests. As a result, there was no significant interaction ιetween grade and information source, $F (2,117) = 1.91$, $n.s.$, ιSE=0.35, as shown in Table 5. However, Fisher's least significant ιifference (LSD) procedure presented that textual information was ιgnificantly less used than the other source $(MSE = 0.35, 5\% level)$.

Table 4: Correct Answers in Comprehension Test

	Picture	Text	Both
Freshman	2.89	2.37	2.47
(N=19)	(0.32)	(0.76)	(0.70)
Sophomore	2.95	2.32	2.91
(N=22)	(0.21)	(0.84)	(0.43)

Table 5: ANOVA Results of Specialized Domain Test

Factor	SS	df	MS	F
Grade	0.67	1	0.67	1.94
Information Source	6.98	2	3.49	10.09**
Grade × Info.	1.32	2	0.66	1.91
Error	40.49	117	0.35	
Total	49.46	122		

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

3.4. Discussion

The present study investigated the effects of learners' domain knowledge on the use of prose and non-prose information and attempted to identify the relationship between language proficiency and information processing in academic reading comprehension.

Concerning the first research question, the difference of language ability between freshman and sophomore were significantly larger in the non-specialized field than in the specialized field. This result suggested that the background knowledge could compensate the gap of language ability by using prose and non-prose information. However, in case that learner should not have the adequate background knowledge, it would be hard tasks for both freshman and sophomore to comprehend the ideas only based on textual information. It implied that background knowledge would take the important role to activate the visual information and synthesize related ideas

Concerning the second research question, it indicated that the difference between freshman and sophomore was larger in the use of textual information rather than of visual information. This seemed due to fact that textual information was closely related grammatical usage and vocabulary, which required more time to master than visual facilitation.

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