

Effects of Contextual Visuals as Advance Organizers on L2 Reading Comprehension

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This research compares student comprehension and retention of information in a foreign language reading passage in four advance organizer conditions. The participants were 120 Japanese-speaking adult studying English at an elementary level. The following four pictorial contexts were used as advance organizers: (1) no visual context; (2) pre-thematic context; (3) thematic context; and (4) post-thematic context. All participants read the same passage under one of the four conditions. The participants of the experimental groups were shown an illustration that related in context to the content of the reading passage prior to reading, while the control group was instructed to read the passage with no picture. Immediately after reading the passage, the participants answered a 20-item discrete point test for comprehension. Results of the study showed that reading comprehension for the new material by L2 learners was facilitated by the presentation of visuals before the reading task, and that the visual organizer in the pre-thematic condition significantly improved comprehension of the story. The results of the study are interpreted through a schema-based approach to L2 reading.

Key Words: advance organizers, visuals, multimedia, schema, L2 reading comprehension

1. INTRODUCTION

Multimedia seems to have had its heyday since the mid-1980s. Numerous teachers and designers have created multimedia applications, CD-based, LAN-based, or stand-alone programs, to help learners understand the language of the target culture. Suggestions for

using multimedia applications in language learning can be found in the L2 language acquisition research (Miyamoto, 2001; Hoven, 2006; Taylor, 2006; Strangman, Meyer, Hall, and Proctor, 2005). Herron, York, Corrie, and Cole (2006) write even though the production of multimedia packages is very costly and demands considerable amounts of time and creativity, the results for student learning appear to make it a worthwhile endeavor. Different types of images are used in these materials to help promote understanding of the language. The findings of empirical studies in L1 and L2 language acquisition (Bransford & Johnson, 1972; Hudson, 1982; Levie & Lentz, 1982; Mueller, 1980; Omaggio, 1979) that still pictures can act as effective advance organizers and improve student comprehension and retention of material support the use of visuals (e.g., still and dynamic images) in those multimedia applications. When creating multimedia applications, it is essential for teachers and designers to determine the type of images to be incorporated in accordance with the objectives of teaching. In order to do so, the effects of images should be empirically investigated.

A large body of research supports the effectiveness of presenting pictures to aid L2 learners' reading comprehension, especially if the learners are at lower levels of proficiency (Omaggio, 1979; Hudson, 1982; Taglieber, Johnson, & Yarbrough, 1988; Hanley, Herron & Cole, 1995a; 1995b; Ikeda, 1999; Cundale, 1999). These studies indicate that presenting pictures contextually related to the content of a story prior to reading not only provides the reader with background information, which serves as an advance organizer (Ausubel, 1960; 2000), but also activates an organizational schema for the passage as a whole by facilitating top-down processing and therefore, enhances comprehension of the story. Omaggio (1979) found that among the pictures she presented to the participants, the best visual context was the one depicting a scene from the beginning of the story. Ikeda (1999) found that in terms of story understanding, presenting important still images selected from the story development is more effective than dynamic pictures. According to Cundale (1999), if news pictures in the newspaper show images that are familiar to the students, they have the added advantage of activating schemata, and thus students can draw upon their knowledge of the subject whilst engaging in discourse.

So far, there appears to be a consensus that visual materials aid comprehension. However, there are two issues to be addressed with regard to the learning effects of contextual visuals. First, few empirical studies have shown what types of help the pictures provide, and what kinds of pictures might be best to use. As a result, we still do not know much about the learning effects of pictures, and how students benefit from them. Thus more re-

search is needed on how reading comprehension of L2 texts can be enhanced by certain kinds of contextual visuals.

Second, previous research has not always shown consistent results on the issue of whether or not presenting a picture before the reading task is more effective than after the reading task. Baggett (1984) reports that reproduction of the text is facilitated when visual images are presented in synchrony with or prior to the text. According to Brody & Legenza (1980), however, usually, subjects who view a picture after reading a passage score higher in multiple-choice questions than those who view before reading. Hojo (1991c) found that on factual questions, presenting pictures after a passage was more effective than presenting them to students before the passage. These studies, however, do not elaborate on the reasons why they achieved such results. Theories and assumptions for the effects of location on learning must be tested to ascertain the relationships between the location and its effects.

The current study was designed to continue and expand upon Omaggio's (1979) initial research on the effects of contextual visuals on L2 reading comprehension; with focus on examining what types of help pictures provide, and what kinds of pictures might be best to use for elementary-level Japanese adult learners of English. Due to the additional contextual information the illustrations provide, and the findings of Omaggio (1979), the researcher hypothesized that student reading comprehension of a foreign language reading passage would be facilitated by prior presentations of contextual visuals. The first research question was then: using an immediate test as a measurement of comprehension and retention of the targeted reading passage, would the scores for the experimental groups (pictorial contexts) be significantly higher than the scores for the control group (no picture)? The researcher further hypothesized that the picture which depicts a scene from the beginning of the story would be most helpful for the comprehension and retention of the reading passage. The hypothesis was based on the speculation that a picture depicting a scene from the opening paragraphs would provide a very clear contextualization for what follows. The second research question was: using the immediate test as a measurement of comprehension and retention of the targeted reading passage, would the scores for the participants of the experimental group, who were presented an illustration depicting a scene from the beginning of the story, be significantly higher than the scores for the control group (no picture) and the two other experimental groups (thematic and post-thematic conditions)?

Although we can find practical research about verifying the usefulness and effective-

ness of visuals, which are used in multimedia applications, we seldom find basic research about how what types of help pictures provide, and what kinds of pictures might be best to use. Given the fact that different types of visuals have been integrated into new media, it is essential to conduct basic research to investigate the various effects visuals may have on language learning (Hojo, 1991c).

2. EXPERIMENT

2.1. Objective

The objective of this experiment is to investigate (1) whether contextual visuals enhance reading comprehension of L2 learners, and (2) if they do, what kinds of pictures would be most effective in enhancing comprehension and what types of help would those pictures provide.

2.2. Participants

The participants of this experiment consisted in total of 120 adult learners of English. All participants were elementary-level learners who had scored below 470 or below on TOEIC (Test of English for International Communication) The 470 mark is regarded as elementary based upon the proficiency scale issued by the TOEIC Steering Committee; 470 or below ranks as D level, which says “capable of the minimum communication in ordinary communication.” The participants took the TOEIC test in October 2004, three months prior to the experiment. To facilitate the experiment, the participants were divided into four groups, and then the following treatment was randomly assigned to the four groups previously mentioned. Control Group read a passage without a picture. Experimental group A was provided an illustration depicting a scene from the beginning of the story before reading. In Experimental group B, reading was preceded by the provision of an illustration depicting a scene from the climax of the story. Experimental group C was presented an illustration depicting a scene from the end of the story prior to reading. Table 1 shows the number of participants in each group (n.), the means of their scores on the TOEIC (M.), and their standard deviations (S.D.). The analysis of variance based on this result was $F(3, 116) = 1.667$ and there was no significant difference among the four groups (Table 2). Therefore, it was clarified that the four groups were homogeneous. To

ensure that the four groups were homogeneous in terms of their English ability and knowledge of a targeted reading passage (a fable in the form of a picture book), prior to the onset of the current experiment, all the participants were requested to submit their TOEIC score. The researcher confirmed in informal conversations with the participants that all the participants had no knowledge of the passage. As for visual literacy of the participants, no previous research has shown a standard definition of the term, and no measurement has been devised to judge one's visual literacy. Therefore, no consideration was given to the participants' visual literacy in the current study.

Table 1. Group Means of the TOEIC

	n.	M.	S.D.
Control group	30	440	21.173
Experimental group A	30	436	21.189
Experimental group B	30	439	21.025
Experimental group C	30	428	22.194

Table 2. One-way ANOVA for the TOEIC

Source of Variance	SS	df	MS	F
Between groups	2290.625	3	763.542	1.667
Within groups	53124.167	116	457.967	(NS)
Total	55414.792	119		

(NS), No significant difference.

2.3. Materials

The text used in the experiment was a 1,138-words story (fable) in the form of a picture book, titled "Taro and the Amazing Bamboo Shoot," in English and is a translation of the Japanese picture book entitled "Fushigina-takenoko." The text was judged (based on a pilot study) to be suitable for the level of the participants in the current study. However, the title was not provided to the participants in the experiment to avoid possible confounding effects due to the fact that the title may serve as an advance organizer and thereby enhance reading comprehension scores.

The researcher used a picture book as a targeted reading passage because the story development tends to be relatively patterned; which makes it easier to divide the whole passages into "beginning," "climax," and "ending" parts, and decide on the best three illustrations, which depict each passage. In this way, the researcher was able to obtain three contextual visuals depicting each part of the story in order to compare the effects of such visuals on the comprehension of the narrative text. Also, by using a translation of a Japa-

nese picture book, cultural bias was eliminated. This precaution was taken because L2 readers' misunderstandings of the text may be caused by the activation of wrong script or schema due to the lack of knowledge of cultural differences between L1 and the target language (Omaggio, 1979).

The contextual visuals used as advance organizers in this study were three illustrations adapted from the picture book: (1) an illustration depicting a scene from the beginning of the story, (2) an illustration depicting the climax of the story, and (3) an illustration depicting a scene from the end of the story. (See Appendix 1). In order to examine the effectiveness of the contextual visuals, it must be proved that such visuals best depicts a scene from the beginning, climax and ending of the story. With regard to this problem, Ikuta et al. (1996) had participants choose, among several still images that were picked out of a particular scene, only one image which they believed best described the scene. However, according to previous research on story analysis, there seems to be no general agreement on a standard definition of the beginning, climax, and ending of the story. Consequently, to ensure that each illustration best depicts the three parts of the story, the best illustrations were selected by three native speakers of English, all of whom are English teachers at private high schools. They were asked by the researcher to read the whole passage (27 pages in all) and then divide it into three parts; beginning, climax and ending. They were then asked to choose three illustrations out of 18 illustrations which best depict a scene from the beginning of the story, a scene from the climax of the story, and a scene from the end of the story. As a result of consultation among the three native speakers, a consensus was reached on the pages of the three parts and best illustrations as shown in Table 3.

Table 3. Pages of beginning, climax, and ending of the story, and the best illustrations

Beginning Best Illustration	Climax Best Illustration	Ending Best Illustration
pp. 2-13	pp.14-21	pp.22-27
pp. 8-9	pp.18-19	pp.24-25

3. PROCEDURES

In the pictorial context conditions, the researcher engaged the participants in their respective advance organizer activity. Experimental group A (pre-thematic context) viewed a *PowerPoint*® slide of an illustration depicting a scene from the beginning of the story.

Experimental group B (thematic context) viewed a *PowerPoint*® slide of an illustration depicting a scene from the climax of the story, and Experimental group C (post-thematic context) viewed a *PowerPoint*® slide of an illustration depicting a scene from the end of the story. The presentation of the slide lasted one minute. The researcher decided, based on a pilot study, that one minute was enough for the reader to understand the illustrations. Upon completion of the advance organizer activity, each group received a copy of the same reading passage, and was given 15 minutes to read it. The researcher confirmed in a pilot study that 15 minutes should be enough for the participants to read the passage from beginning to end. The researcher collected the reading passage before the participants took the test which was administered immediately after the reading passage was collected. Participants were given 10 minutes to complete the 20-item discrete-point test. Test items were selected so that participants could only answer correctly based on information found in the reading material, not from the advance organizer. Each test item was worth 0, or 1 points. Zero was given for an incorrect answer and 1 point was given for a correct answer. (See Appendix 2 for samples of test items) The control group followed the same procedures except that no picture was presented to participants prior to reading.

In order to prevent the rival explanation that test items are biased to put one particular group at an advantage, the researcher and his English native-speaker assistant prepared 20 test items in the following manner; test items from No. 1 through 7 could be answered from information found in the beginning part of the story, No. 8 through 14 could be answered from information found in the climax of the story, and No. 15 through 20 could be answered from information found in the ending part of the story.

4. RESULTS

Table 4 shows the average score and standard deviation of the 20-item discrete point tests for each group. As a result of one way variance of analysis of the deviation based on the results in Table 4, as shown in Table 5, the effects of among the four conditions were significant ($F(3,116) = 27.82, p < 0.01$). Furthermore, according to Tukey's HSD test, there was a significant difference between experimental group A (pre-thematic context) and the control group (no picture), between experimental group A and experimental group B (climax context), and between experimental group A (pre-thematic context) and experimental group C (post-thematic context). However, the difference was not significant between experimental group B (climax context) and the control group (no picture),

between experimental group C (post-thematic context) and the control group (no picture), and between experimental group B (climax context) and experimental group C (post-thematic context). Therefore, the use of still pictures, as an advance organizer, particularly an illustration which depicts a scene from the beginning of the story, has a significant positive effect on comprehension of the passage. (See table 6)

Table 4 Group Means of the Reading Comprehension Test

	n.	M.	S.D.
Control group	30	9.5	1.67
Experimental Group A	30	13.9	1.97
Experimental Group B	30	10.6	1.97
Experimental Group C	30	10.7	2.21

Table 5. One way ANOVA for the Reading Comprehension Test

Source of Variance	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>
Between groups	323.625	3	107.875	27.826*
Within groups	449.7	116	3.877	
Total	773.325	119		

* $p < .01$; significant

Table 6. Multiple comparisons using Tukey's HSD Test

Left vs. right item	Experimental group		
	A	B	C
Control group = 9.5	4.4*	1.1	1.2
Experimental group A = 13.9		3.3*	3.2*
Experimental group B = 10.6			0.1
Experimental group C = 10.7			

* $p < .05$; significant

5. DISCUSSION

The overall findings of the present research indicate that reading comprehension for new material by L2 learners is enhanced by the presentation of visual materials in advance of the reading task, and that presenting an illustration which depicts a scene from the beginning of the story has a significant positive effect on their comprehension. The first hypothesis was partially supported by the fact that the average scores for the experimental conditions were significantly higher than the score of the control group. However, according to Tukey's HSD test, no statistically significant difference was observed between the control group and the experimental group B, between the control group and the

experimental group C, or between the experimental group B and the experimental group C. The findings support the contention of Omaggio (1979, 2000, p.150) that not all pictures are equally effective at enhancing comprehension. The results support the second hypothesis: the score for the pre-thematic condition (experimental group A) was significantly higher than the scores for the control condition and the other two experimental conditions.

5.1. Why was the pre-thematic picture most helpful?

It is possible that the still image depicting a scene from the beginning of the story was most helpful for one or more of the following reasons:

- 1) The illustration was easy-to-understand, thus encouraged the learners to employ top-down processing of the passage, thereby facilitating comprehension of the outline of the main events of the story (Miyamoto, 2001, pp. 125-147).
- 2) The provision of the illustration made the reading comprehension task easier by providing an organizational schema for the passage as a whole (Omaggio, 2000, p.150).
- 3) The illustration provided learners with implications for the story development, helping learners to avoid making wrong guesses or hypotheses about the events occurring in the passage (Omaggio, 1979; Mueller, 1980).

We need to consider when and how the illustration provided an organizational schema, and which facilitated the top-down processing of the text. When considering this problem, the researcher paid attention to the fact that the English translation for the beginning of the story does not really correspond to the Japanese original. A closer look at the difference between the descriptions of the beginning of the story reveals that the English version provides the reader with information that 1) a boy named Taro is the leading character, 2) he, his family, and villagers lived in a small village deep in the mountains, and 3) no one in the village had ever seen the sea for a hundred years.

On the other hand, the literal translation of the opening paragraph of the Japanese original is similar to this: "This is a story about what happened a long, long time ago in a village deep in the mountains. 'Taro, go and get some bamboo shoots. We're going to have special dishes for dinner tonight to celebrate your birthday.'" While such information is not sufficient for the reader to predict the story development, the descriptions of the beginning of the story in English is informative enough to help the reader make a fair

guess about the story development, if not the conclusion. In other words, the pre-thematic illustration, which was deeply connected in context to the content of the opening paragraph, was informative enough to contribute cues for comprehending and recalling the passage as a whole without confusing the reader.

The results also revealed that not all pictures were equally effective in enhancing story understanding in L2. The only illustration that had a significant positive effect on comprehension of the text was the one which depicts a scene from the beginning of the story.

5.2. Why was the thematic picture relatively ineffective?

Perhaps the illustration depicting a scene from the climax of the story was ineffective for one or more of the following reasons:

- 1) The illustration depicting the climax was a concrete, colored picture, thereby perhaps arousing the interests of learners (Nakano, 1988). However, as the picture was not deeply connected to the content of the passage as a whole, perhaps it was not informative enough to contribute to the understanding of the outline of the main events of the story.
- 2) The concrete picture had too much detailed information for the reader to absorb, and failed to present overall, general meaning of the passage (Omaggio, 1979).
- 3) The picture had too much redundant, irrelevant information, which makes it difficult to comprehend because the redundant information puts an overwhelming load on the learners' cognitive processing and working memory (Nakano, 1981)

5.3. Why was the post-thematic picture relatively ineffective?

Perhaps the illustration depicting a scene from the end of the story was ineffective for one or more of the following reasons:

- 1) The picture provided cues to events occurring later in the story and might therefore have failed to suggest an effective organizational schema to aid comprehension of the opening paragraphs (Omaggio, 1979).
- 2) The illustration worked as a synthesizer, which leads learners to a general backward or review process (Ogasawara, 1996). It may have helped the reader to reinforce his knowledge of the passage, rather than provide an organizational framework in order to comprehend the whole story.

The present study supports Omaggio's (1979) contention that a general picture depicting a scene from the beginning of a story may be the best visual context because it provides cues to the nature of the reading passage as a whole, thereby promoting understanding of the story.

6. FUTURE TOPICS

Future investigations of the role of contextual visuals in second language reading comprehension might be designed to address the three issues not well addressed by this study. First, future studies should be undertaken to see how various individuals perceive visual materials. The findings of the current research show that the best visual context was the pre-thematic context, but the conclusions were drawn only from the scores of the reading comprehension test. One can only speculate whether or not the participants in the experimental conditions tried to 'read' the pictures, but there is no ruling out a possibility that, after all, some learners didn't pay much attention to the pictures and yet scored well. Future researchers might want to obtain on-line data by using an eye-tracking camera so that they can observe and analyze how viewers process variable information in visual materials, and interact with such materials. In an attempt to collect on-line data on how images are actually watched by individuals, the researcher in the current study has begun to address the issue by using EMR-AT VOXER; one of the most sophisticated eye-tracking cameras currently available for research purposes. In a recent pilot study in which the same three contextual visuals and the reading passage as the ones in the current study were used, the researcher kept track of the eye movement of one student (who didn't participate in the current experiment), and then gave him an interview to elicit some statements regarding the visual organizers, and how he benefited from the organizers. One of the findings is that his eye-movement was dispersed most when viewing the thematic picture, which appeared to have too much detailed information to absorb. During the interview, he stated that he felt the picture was not so helpful as the pre-thematic one because he had difficulty identifying what the most valuable information might be for comprehension of the reading passage. He also stated that in connection with the post-thematic picture, he was so focused on peripheral information that he ended up making wrong guesses about the story development. These insightful statements show that we need to continue our research on how visual materials are viewed by individuals. With the use of an eye-tracking camera, the researcher is hoping to gain some under-

standing of visual behavior to address the fundamental issues of how humans will respond to all external stimuli.

Second, studies relating to the effect of the locus of the visual materials are needed. Some studies show that presenting certain kinds of pictures to language learners in advance of a reading task is more effective than after a reading task, and other studies show that this is not always the case. Further studies are needed to determine the effects of changing the locus of visuals, thereby clarifying the process of information processing, memory coding, and interaction between these processes (Nakajima, 1996, p.144).

Another consideration for future research concerns the additional effects of pictures in L2 reading comprehension. Are lots of pictures needed or does one visual aid suffice? How will the learning effects differ when presented one still image from when multiple images are provided? More studies are needed to investigate the quantitative aspects of visuals as advance organizers.

It could be argued that a limitation of this study was that the discrete-point test may have been a limited measure of participants' overall comprehension. Further empirical studies are needed not only to find out what kinds of pictures are most helpful in improving overall comprehension, but to examine the roles the pre-thematic picture, the thematic picture, and the post-thematic picture might play in comprehension. Second, due to scheduling limitations, the study precluded measuring the long-term effect of the respective contextual visuals on students' storing of information. Therefore, we do not know the long-term effects of visuals on L2 reading comprehension. Nevertheless, the findings obtained through this experiment indicate that the choice of visuals is important when incorporating images into multimedia applications, and can serve as an important index in the choice of visuals for use in multimedia teaching materials as well as in foreign language instruction.

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Appendix 1

Best illustration for the beginning part of the story

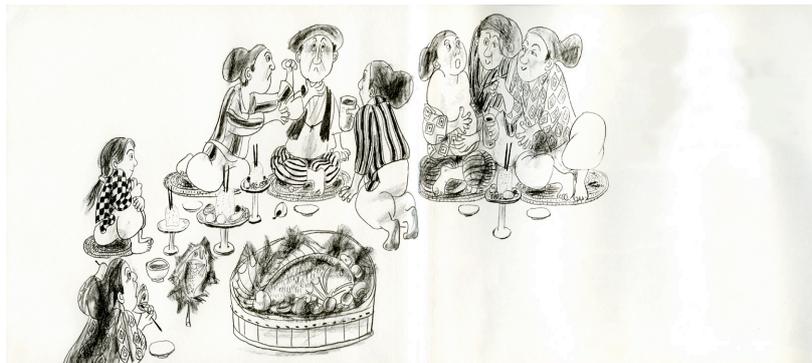


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Best illustration for the climax of the story



Best illustration for the ending of the story



Appendix 2

Post-test questions and model answers about Taro and the Amazing Bamboo shoot

- 1: Where did Taro live?
A: In a small village deep in the mountains in Japan.
- 2: What was special about this village?
A: Nobody had seen the sea for a hundred years.
- 3: What did Taro's mother send him out to find?
A: A tender new bamboo shoot to cook for his birthday dinner.
- 4: What did Taro's mother do when he didn't come home?
A: She went out to look for him.
- 5: What did she find on the ground?
A: His sandals and his hoe.
- 6: When did Taro's father decide to cut down the giant bamboo shoot?
A: When it stopped growing.
- 7: How long did it take for the bamboo shoot to fall?
A: All day and all night.
- 8: What did the villagers do when the bamboo shoot finished falling?
A: They followed it to find Taro.
- 9: Where did they find Taro?
A: On a large stretch of white sand next to a giant "pond" (a beach next to the sea).
- 10: How did they wake Taro up?
A: They splashed water from the "pond" onto his face.
- 11: What was strange about the water?
A: The water was salty.
- 12: What did they realize when they tasted the salty water?
A: That the "pond" was actually the sea.
- 13: What did Taro's mother remember hearing from her great-great-grandmother?
A: That "beyond the high mountains and low mountains lies the sea."
- 14: What did Taro's father remember hearing from his great-great-grandfather?
A: That "in the sea there are fishes and seaweed and shell fish."
- 15: What did they decide to do?
A: Catch some fish and find out if they could eat them.
- 16: What did the villagers do after they caught some fish?
A: They went back to the village.

17: Why didn't they get lost?

A: Because they could follow the giant bamboo shoot to their home.

18: What did they do on the next night?

A: They celebrated Taro's birthday.

19: What did they eat at his birthday party?

A: Fish, shellfish, seaweed, and bamboo shoots.

20: What happened to the village after that?

A: It became prosperous because the people could follow the bamboo shoot to the sea.