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Effects of Comic Strips on L2 Learners' Reading Comprehension

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This article reports the results of an experiment investigating the role of comic strips on ESL learners' reading comprehension. The students' proficiency levels were estimated, and students were organized into a low intermediate-level proficiency group (low-level students) and a high intermediate-level proficiency group (high-level students). Students in each group were presented with either a high-level text or a low-level text, and the text was presented with or without a comic strip. Two-way and three-way ANOVAs run on data from 107 immediate recall protocols reveal that the low-level students receiving the high-level text with the comic strip scored significantly higher than their counterparts receiving the high-level text only. They also show that providing a comic strip with the high-level text did not enhance the high-level students' recall. In addition to offering pedagogical suggestions, I discuss results in light of the dual coding theory and refer to other cognitive theories such as mental model, noticing, and the repetition hypothesis.

EFL and ESL teachers often give students reading materials accompanied by visuals such as pictures, cartoons, or comic strips to make reading more enjoyable and comprehensible. Likewise, ESL and EFL textbook designers and materials developers often use visuals to provide context, which helps engage students in reading. Along with practice-oriented questions, L2 reading specialists and researchers have investigated whether using visuals or not makes a difference in L2 learners' reading comprehension, and what types of visuals work better for learners at different proficiency levels. This study helps to resolve theoretical and practical issues in L2 reading by investigating to what extent including comics as visual support for ESL texts increases reading comprehension.

THE EFFECT OF VISUALS

Many reading comprehension studies consider the extent to which visuals, that is, any graphic display that portrays all or some of the accompanying text's content, help readers to comprehend factual information. These studies usually compare how well readers remember a text with visuals and how well they remember a text without visuals, and they generally find that visuals in text facilitate readers' comprehension and memory.

Researchers (e.g., Levie & Lentz, 1982; Levin, Anglin, & Carney, 1987) have outlined five major functions of visuals in reading.

- Representation: Visuals repeat the text's content or substantially overlap with the text.
- Organization: Visuals enhance the text's coherence.
- Interpretation: Visuals provide the reader with more concrete information.
- Transformation: Visuals target critical information in the text and recode it in a more memorable form.
- Decoration: Visuals are used for their aesthetic properties or to spark readers' interest in the text.

In a meta-analysis of the effects of visuals, Levin et al. (1987) found that all but the decorative function facilitate memory. These functions are, in order of importance, transformation, interpretation, organization, and representation. According to Gyselinck and Tardieu (1999), however, the representational function overlaps the other three (i.e., transformation, interpretation, and organization) because visuals always repeat part of the text's content, either the details or the relationships between the details.

DUAL CODING THEORY

Researchers have used numerous theoretical frameworks to describe, explain, and predict the effects of visuals on cognition in general and on reading comprehension in particular, among them the mental model theory (Marcus, Cooper, & Sweller, 1996), the repetition hypothesis (Gyselinck & Tardieu, 1999), and the dual coding theory (Paivio, 1971, 1986; Sadoski & Paivio, 2001). The dual coding theory (DCT), which concerns the nature of language and imagery, can perhaps provide a framework to unify these disparate theories.

The inclusion of nonverbal aspects of cognition such as mental imagery is "the most novel facet of this approach in a modern context,

but it provides a comprehensive account of the verbal, linguistic aspects of cognition as well” (Sadoski & Paivio, 2001, p. 2). In DCT, the linguistic coding system can be called the *verbal system*, and the nonverbal coding system can be called the *imagery system*. These two systems enable the analysis of external scenes and the generation of internal mental images. However, unlike schemata theory, DCT assumes that the verbal system is organized sequentially and the nonverbal system is organized non-sequentially, resulting in different constraints in processing. According to Sadoski and Paivio (2001), “the structuring and processing of these mental representations, or encodings, is the basis of all cognition in this theory” (p. 43).

In reading, DCT accounts for hypothesized bottom-up and top-down processes. Regarding bottom-up processes, DCT assumes that language units derived from natural language are organized and mentally represented in various sensory modalities. Based on familiarity and the effects of context, the reader may use these representations to perceive grapheme-phoneme correspondences, and the visual, auditory, and/or articulatory configurations of letters, words, or word sequences. Regarding top-down processes, DCT provides a broader and more specific account of meaning, coherence, and inference effects. Activating both verbal and nonverbal mental representations of text helps readers create alternative, interconnected contexts for generating inferences and integrating text, which enables them to alter their accessing strategies along a continuum from feature perception to inferential text modeling.

L1 Reading Research

DCT has been used as a theoretical framework for studying L1 reading comprehension. Researchers have found that pictures duplicating information in the text improve reading comprehension and memory. To examine how high school students used illustrations to comprehend technical materials, for example, Purnell and Solman (1991) conducted five experiments: Some students received text alone, some received a visual illustrating the same content alone, and others received both the text and the visuals. In accordance with DCT, they found that the text and illustration presented together produced better results than either did alone, even when students were repeatedly exposed to either the text or the illustration. These results are consistent with other research conducted by Kulhavy, Lee, and Caterino (1985), who found that fifth graders better understood and retained information in maps and prose directions when it was presented in both spatial and elaborated verbal forms rather than either form alone. Their conjoint retention hypothesis is acknowledged as a rendition of DCT.

Along with exposure to both pictures and text, Gambrell and Jawitz (1993) investigated the relative effectiveness of induced mental imagery, attention to story illustrations, and both together. They found that students who had attended to both text and illustrations and who had formed their own mental images performed better on several measures of comprehension than students who had studied both text and illustrations, and who in turn performed better than students who had studied text alone. More recently, Mayer (1999) investigated educational multimedia explanations including science text and illustrations. Mayer found that words and pictures together produced better recall and transfer than either did alone, and that individual differences in ability were a factor. In every experimental test in his research program, the multimedia group outperformed the single representation group. Both Mayer's and Gambrell and Jawitz's studies are consistent with DCT principles.

L2 Reading Research

DCT is also a useful theoretical framework for studying the effects of visuals on L2 reading comprehension. To investigate the reading comprehension of a group of seventh-grade ESL students, Tang (1992) asked one group of students to read academic texts with the help of graphic classification trees reflecting the organization of the text, and the other group to read without the graphic trees. The results revealed that the students who had the graphic trees performed significantly better on recall protocols. The visuals may have helped improve comprehension because they provided "additional contextual information" (Hadley, 2001, p. 150), which is consistent with DCT.

Researchers have also investigated the effects of different types of visuals on reading comprehension. In her study of English-speaking college students reading a story in French under six pictorial context conditions, Omaggio (1977, 1979) found that using several pictures together is not necessarily better than using just one. In their study comparing the effects of video segments and still pictures on the foreign-language reading comprehension of a group of English-speaking fifth graders studying French, Hanley, Herron, and Cole (1995) found that students who watched video segments that presented the narratives (the Video Condition Group, $n = 31$) performed better on follow-up, short-answer comprehension tests than those who listened to the teacher read the narratives aloud while following along in the text and studying four still pictures that illustrated the narrative's meaning (the Picture plus Teacher Narrative Condition Group, $n = 31$).

Hudson (1982) investigated the effects of visuals on adult ESL learners at beginning, intermediate, and advanced proficiency levels. He

assessed the subjects' reading comprehension on three passages under each of the three conditions: (a) Subjects saw pictures related to the passage, received focus questions, and wrote down predictions before reading; (b) subjects received vocabulary lists and discussed definitions before reading; and (c) subjects read the passage, took a test on it, reread the passage, then took a test on it again. His study found that at lower proficiency levels, procedure (a), pictures plus questions and predictions, was more effective, but at more advanced levels, procedures (b), vocabulary lists and definitions, and (c), read, test, reread, retest, were more effective than procedure (a). Based on his finding, Hudson concluded that visual imagery via picture cues can overcome deficits of lower proficiency readers and that more advanced readers bring more nonvisual information to the reading comprehension process. Although Hudson did not directly associate this result with DCT, the salient finding that using visuals helped low-proficiency level students merits further investigation from that perspective.

CARTOONS AS VISUALS

A comic strip is defined in this study as a series of pictures inside boxes that tell a story. Among visual genres, comic strips catch many researchers' attention because they are communicative, popular, accessible, and readable, and they combine aesthetic perception with intellectual pursuit (Harvey, 1994; Inge, 1990; O'Sullivan, 1971; Swain, 1978; Waller, 1991). Comic strips communicate using two major media—words and images—a somewhat arbitrary separation because comic strips' expressive potential lies in skillfully employing words and images together.

During the past decade, numerous journal articles have introduced techniques for using comic strips in education and particularly in language classrooms. Harrison (1998), for instance, discussed how comic strips can be employed in journalism history classes to illuminate the subject and impart a number of relevant lessons. Wright and Sherman (1994) discussed the attributes of daily comic strips that make them an ideal medium for reading and English courses. After analyzing the readability of various comic strips readily available to students and teachers, they argued that comic strips can be used effectively to build reading skills. In a subsequent article, Sherman and Wright (1996) introduced a teaching strategy using newspaper comic strips to promote higher level thinking in elementary and secondary students. They explained and demonstrated two functions of questioning (centering and expansion) using a Peanuts comic strip. In a more recent article, Wright and Sherman (1999) argued that teachers can promote literacy, higher level thinking, and writing skills by encouraging students to

combine words and pictures to create comic strips. They further asserted that if teachers want students to become literate, critical, and creative thinkers, then they must align curricula, teaching strategies, and instructional resources. In the area of reading and writing, the task is to stimulate students' thinking about explicit and implicit meanings conveyed by textual material. Wright and Sherman concluded that teachers can accomplish this task by using comic strips as both a method and medium of instruction.

Comic strips have also been used to teach second or foreign languages. Ousselin (1997) argued that teaching business culture and terminology requires a variety of pedagogical resources. He suggested that comic strips, because they are versatile, easy to use, and culturally relevant, can complement textbooks and activities commonly used in business French courses. Williams (1995) investigated how comic books can be used as instructional materials for ESL students with low intermediate-level English language skills, and with limited discourse and interactive competence. Williams found that using comic strips in second language classrooms can guide students to hypothesize about the cartoons' language, raise awareness of pragmatics, and emphasize language's underlying regularity.

THE STUDY

Research within the DCT framework has shown that verbal and nonverbal coding systems work better together for both L1 and L2 reading comprehension than either one of them works alone. But in the L2 context it is not clear which types of visual organizers help which kinds of learners (e.g., at different proficiency levels, and with different learning styles). It is unclear to what extent a certain type of visual element can help learners' reading comprehension or when a certain type of visual element should be presented to facilitate text comprehension. Above all, it is unclear what cognitive processes use visuals to bring about beneficial effects. Hadley (2001) raises a number of issues regarding the role of visual elements in L2 reading comprehension. She asks whether pictures, drawings, or other visual elements can actually enhance students' comprehension of L2 texts and calls for research to demonstrate the differential effects of certain types and numbers of visuals on students at various proficiency levels (2001, p. 149). This study employs one type of visuals—comic strips—to test whether presenting the text with or without the comic strip generates different results among L2 learners at different proficiency levels. The specific research questions are

- What effect does presenting text with comic strips have on L2 students' reading comprehension?
- Does using comic strips with a text geared toward the student's proficiency level improve the student's reading comprehension more than using comic strips with a text that is either above or below the student's proficiency level?

It is hypothesized that for a student at a low intermediate proficiency level reading a high-level text, the comic strip will improve the student's recall, and for a student at a high intermediate proficiency level reading a low-level text, the comic strip will not improve the student's recall.

METHODS

This study employed a 2 (English proficiency level: high, low) \times 2 (text difficulty: difficult, easy) \times 2 (visual support: with, without comic strips) factorial design, using volunteers from ESL classes at a university in the United States.

Participants

This study's target population is adult ESL learners required to take ESL courses before or after enrolling in either undergraduate or graduate programs in U.S. universities. The sample was taken from those who registered for various ESL courses in an ESL center at a large southwestern university during a recent summer language program. When they enroll, all the students are required to take a placement test, and based on their test results, their core proficiency level is estimated on a scale from 10 to 70.

All students take an essay writing test (30 minutes). A committee grades the essays holistically. The placements are used to determine whether a student should be in a writing class at a proficiency level different from his or her core level. Students then take the STRUCTURE (SA) portion of the CELT (45 minutes) followed by the LISTENING (LA) portion of the CELT (approximately 30 minutes). The results from the two CELT tests are entered into the computer, which converts the raw scores to percentages. A perfect composite score would be 200%. Students are placed in a regular 8-week program according to the following scale:

- Level 70 for those who score 126 or higher
- Level 60 for those who score 105–125

- Level 50 for those who score 95–104
- Level 40 for those who score 77–94
- Level 30 for those who score 65–76

Students whose essays contain only a few words or nothing and students who score 30% or below on the STRUCTURE section (raw score < 24) go directly to 10s-20s-30s testing. In this testing procedure, students take the writing test as a group then take the oral interview individually. The committee, which consists of experienced teachers, then compiles the scores and places students at the appropriate proficiency level.

Classroom instructors distributed a consent letter to about 135 CESL students representing 46 countries (the majority of the students are Hispanics, Arabs, Japanese, Chinese, and Korean) enrolled in 2-hour reading classes, and the majority of the students ($N = 107$) signed the consent letter. After consulting with the program coordinator and instructors, all 107 participants were clustered into either the low intermediate proficiency group (Levels 10–30) or the high intermediate proficiency group (Levels 40–70). As it turned out, the number of students was almost evenly divided between the two clusters, with 53 in the low intermediate proficiency group and 54 in the high intermediate proficiency group.

Instrumentation

The instruments for the study were two texts, one high level and one low level (see Appendix A), and one comic strip (see Appendix C). The comic strip was selected from a textbook (Ashkenas, 1985) and modified to ensure overall comprehensibility, the absence of cultural bias, and minimal written scripts. Each text was constructed for students at one of two proficiency levels. Text 1 was created for ESL students at the low intermediate level; it was relatively short (250 words), with a more limited vocabulary, simple syntax, and controlled use of slang and idioms. Text 2 was created for ESL students at the high intermediate level; it was longer than Text 1 (300 words) and had more complicated syntax, a larger vocabulary, and used slang and idioms. Although the texts' linguistic difficulty levels were different, both texts conveyed about the same information as the comic strip. The researcher, a nonnative-English-speaking professional, created the texts, then two native English speakers trained in applied linguistics modified them. Once the texts were developed, a linguist evaluated the comic strip's relevance to the texts' content and each text's vocabulary, syntax, discourse, and idiomatic language. The instruments were field-tested among five ESL learners in a local intensive language program (two high-level students and three

low-level students), and the instrument was modified one last time before it was used in the study.

Data Collection

The researcher collected data with the help of language program coordinators and instructors. Students in each cluster were randomly divided into four treatment groups, with 13 or 14 students in each group. The four treatments were

- T1, low-level text only
- T2, low-level text with comic strips
- T3, high-level text only
- T4, high-level text with comic strips

To differentiate treatments and to ease data collection, different colored papers were used for different treatment groups (e.g., white for T1, yellow for T2, pink for T3, and green for T4).

Data were collected within a 2-week span. The instructors gave the student participants a specific task corresponding to their treatment. Depending on the instructors' and the students' preferences, some treatments were given during class time and others were given after class. Students were told to read the text as many times as they would like (the time each student needed to finish the reading ranged from 10 to 20 minutes). When the students had finished reading, they surrendered the text and the comic strips and began writing down everything from the reading that they understood. Because the aim of this study is comprehension, not production, students were allowed to write in English, in their L1s, or both. Student writing in languages other than English was translated before it was evaluated by the scorers. It is surprising that only a few students chose to write in their native languages.

Immediate Recall Protocols

Data collected in this study were immediate recall protocols (IRP)—a postreading task designed to test students' abilities to understand texts without the help of outside materials. Research in second and foreign language reading favors IRP (over multiple choice and true-false formats, among others) as a valid means of assessing reading comprehension for foreign language students (e.g., Bernhardt, 1986, 1991). Johnston (1983) claims that the IRP is the most straightforward assessment of the interaction between reader and text. Bernhardt (1986) asserts that this method offers insight into the method of reconstruction that the reader

employs to encode information in a text. Bernhardt (1991) also maintains that the immediate recall protocol avoids many of the pitfalls commonly found in other assessment measures. In sum, the IRP demands that the reader comprehend the text well enough to recall it coherently and logically, and it allows misunderstandings or gaps in comprehension to surface—a feature that other methods of evaluation cannot offer.

Data Analysis

The participants' written IRPs were scored by three language specialists (the researcher and the two research assistants) using the simple propositional analysis system based on pausal units or breath groups (Johnson, 1970). I opted not to use idea units for scoring so that I could capture different levels of recall based on the four-value system designed for the study. Each recall protocol was first divided into acceptable pausal units (each unit refers to a pause during normally paced oral reading) that are then ranked from 1 to 4 points depending on their salience to the message of the text. Four points are given to the units having the greatest semantic significance and one point to the least. The three raters first worked independently determining the pausal units of each recall, and then calibrated their results before they each rated the recalls according to the normed numerical value for each pausal unit. The interrater reliability was high (.95).

Interpretations of numerical values are Value 4 (information essential to the story, and telegraphic account of the story); Value 3 (important but not necessarily essential information); Value 2 (additional or redundant information that helped to reveal the story's completeness); and Value 1 (trivial or subordinate information, which least affects the story line). See Appendix C for an example.

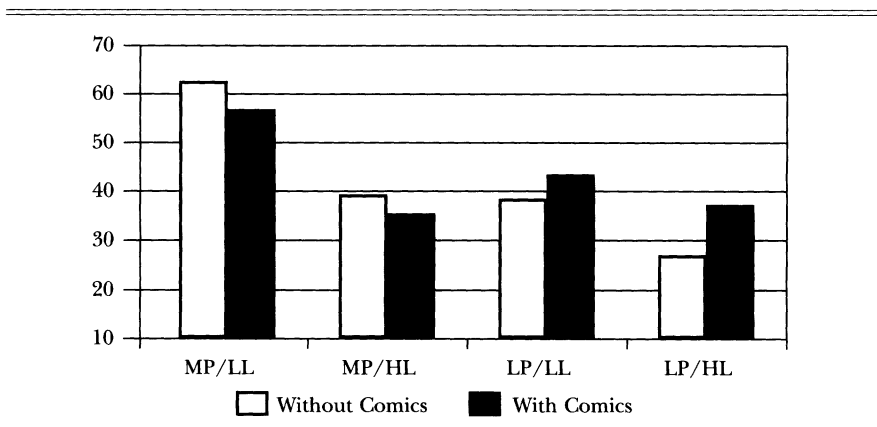
Because the number of pausal units in the high-level text ($n = 78$) is greater than in the low-level text ($n = 68$), and because the numerical values assigned to the pausal units over four values in the high-level text (total points = 188) is different from those in the low-level text (total points = 170), the numerical values were converted to percentages. For instance, if a student reading the low-text with or without a comic strip received 100 points out of 170, then this student's points were converted to 58.8%. Likewise, if a student reading the high-level text with or without a comic strip received 100 points out of 188, then this student's points were converted to 53.2%.

RESULTS

The results indicated that the comic strips accompanying a written text do not have a uniform effect across proficiency levels. Instead, as shown in Figure 1, the low-level students receiving the high-level text with the comic strip scored significantly higher than the low-level students receiving the high-level text only. Adding comic strips to the high-level text for the more proficient learners, however, does not enhance this group's recalls.

A three-way ANOVA was carried out to test for statistical significance of the observed differences (see Table 1). The high proficiency level students tended to score significantly higher overall than the low proficiency level students, thus confirming their different proficiency levels, $F(1, 105) = 19.23, p = .00$. All participants scored significantly higher on easy texts than on difficult ones, $F(1, 105) = 33.17, p = .00$. Comics use had no significant effect on the performance of these participants as a group, $F(1, 105) = 1.18, p = .28$. However, comics use did interact significantly with participants' proficiency level, $F(1, 105) = 8.16, p = .005$. This interaction suggests that comics use had a differential effect on the two groups. It had a significant effect on the low proficiency group but not on the high proficiency group. No other significant interaction was found. In sum, the analyses show that using comic strips significantly enhanced the performance of low-level students but had little impact on the performance of high-level participants.

FIGURE 1
Participants' Mean Percentages of Correct Recalls



Note. MP/LL = more proficient, low-level text; MP/HL = more proficient, high-level text; LP/LL = low proficient, low-level text; LP/HL = low proficient, high-level text.

TABLE 1
Three-way ANOVA of Participants' Performance

Source	<i>df</i>	Sum of squares	Mean square	F	Sig.
Model	7	16911.24	2415.89	9.80	.00
S	1	4696.69	4696.69	19.20	.00
T	1	8098.88	8098.88	33.10	.00
C	1	287.96	287.96	1.10	.28
S * T	1	439.45	439.45	1.80	.18
S * C	1	1992.81	1992.81	8.10	.01
T * C	1	429.50	429.50	1.70	.19
S * T * C	1	292.66	292.66	1.10	.28
Error	99	24175.97	244.20		
Total	106	41087.20			

Note. S = student level; T = text difficulty; C = comics use.

DISCUSSION

When low-level students have difficulties comprehending the high-level text, their recall is poor (19.41%). That means the students in this group comprehended about one-fifth of the information in the text, although it does not necessarily mean that they did not comprehend the text because problems recalling information could result from problems in encoding, storing, or retrieving the information. The linguistic input (text) might not be transferred to output because of poor intake (Gass, 1988).

However, students at the same level had significantly higher scores (38.70%) in their recall protocols when the text was presented together with the comic strip. Students might have shifted their attention from the text to the accompanying comic strip when they realized that they did not fully comprehend the L2 input (text). In return, the comic strip, which they did comprehend, might lead students to notice the text's linguistic input and thus enable them to comprehend the text through matching and mapping among factors such as word recognition, phonographemic features, syntax, intertextual perceptions, and background knowledge (Bernhardt, 1991). The interaction between the text and the comic strip thus facilitated the students' comprehension and output (recall protocols).

Overall, the pattern of results in the study is consistent with DCT. The low-level students apparently did not need the pictures to support the simpler text, and the higher proficiency group likewise did not need the pictures to support either the simpler or the more difficult text versions.

However, the lower proficiency group did significantly better with the more difficult text when it was supported with pictures because presenting the text with pictures enabled them to read the text using two sources of information instead of just one.

According to DCT, the process of reading involves at least two coding systems: a verbal system and a nonverbal system. These two systems are interconnected but independent. DCT holds that pictures are stored only in the nonverbal code and language is stored only in the verbal code, but referential connections may be forged between them. The pictures in this study could not be stored in the verbal code because they are not verbal, but they could be stored in the nonverbal code and associated with their respective text descriptions in the verbal code. DCT helps to explain why the comic strip reiterating information from the text facilitated comprehension of the text, but DCT does not explain why the high-level students did not benefit from the comic strip presented with the high-level text.

The mental model theory proposed by Marcus, Cooper, and Sweller (1996), however, seems to offer a plausible explanation. These researchers argue that graphics or illustrations can reduce the cognitive load associated with complex reasoning tasks because they can present essential information more concisely than equivalent textual statements. Illustrations are easier to process than text because they show spatial relations, whereas text requires the reader to construct a mental representation of the relations. In other words, visuals facilitate mental model building. According to Glenberg, Kruley, and Langston (1994), "the entities in the encoded picture would serve as referent for the words in the text, and the encoded picture would become a mental model" (p. 616). In this scenario, visuals act as a transitory step in the process of transforming text into mental images that eventually become a mental model.

But when the comic strips do not reflect the high-level text's linguistic complexities, the simpler comics tend to interfere with readers' ability to construct a mental model as complex as the text. According to this logic, to construct an accurate mental model of the text, readers need visuals that closely mirror the text's structure and complexity. The compatibility of the comic strips with the low-level text supports this logic. They greatly facilitated the comprehension of the low intermediate-level students in the study.

The comic strip's noneffect on high-level students' comprehension of high-level texts can be further explained by "noticing" (Schmidt, 1990). During the process of reading comprehension, readers consciously analyze and compare what they have noticed while reading. When the reader has difficulty comprehending the text's linguistic input because it is too difficult, the comic strip can call the reader's attention to the

linguistic input. This explains why low-level students reading the high-level text with the comic have a better recall than their counterparts who read only the high-level text without the comic. But comic strips can also distract the reader from the text's linguistic complexities, especially when they do not reflect the information embedded in the text. The high-level students do not benefit from the comic strip accompanying the high-level text because the comic strip provides simplified input that shifts their attention away from the complexities of linguistic structure and the details of the story that the comic strip does not reveal. The differential effects of comic strips on the reading comprehension of learners at different levels challenges the commonly held assumption that comic strips accompanying texts can improve students' reading comprehension, thus calling into question Sadoski and Paivio's (2001) claim that the DCT is universal.

The results of this study suggest that the effects of comic strips on L2 learners' reading comprehension are constrained by a number of factors, such as the students' comprehension level of the written text, their individual strategies for processing the text, and the way their reading comprehension is measured (e.g., multiple choice vs. recall protocols). Unlike multiple choice tests that are "often not passage-dependent" (Bernhardt, 1991, p. 198), recall protocols require the reader to retrieve information that reflects his or her level of reading comprehension. Because we asked the students in the study to do recall protocols after they had finished reading, they used what we had given them (i.e., low-level or high-level text, and with or without the comic strip) to process the information and perform the task (recall protocols).

The study's results also imply that the advantage of providing comic strips with reading text diminishes when the student has difficulty comprehending the text. On the contrary, when the comic strip does not reflect the text's linguistic complexities, it does not enhance students' recalls. The effect of comic strips on reading comprehension largely depends on the quality of the repetition effect. When the information from the text and from the illustration are well integrated, they "[act] as if the information was presented twice, thus enhancing performance" (Gyselinck & Tardieu, 1999, p. 211).

This study suggests that the reading comprehension of the low-level students was greatly facilitated when the comic strip repeated the information presented in the text. Comic strips accompanying high-level texts, however, often do not reflect the text's linguistic complexity and tend to suggest only the basic information or the story line. Using comic strips with the high-level text might have prevented the high-level students from exploring the text's complexities as indicated in the recall protocols. Therefore, visuals that do not reflect the text's linguistic

complexity can hinder reading comprehension when the reader assumes that the visual and the text carry the same information.

IMPLICATIONS

The results of this study suggest that materials developers designing textbooks for ESL and EFL learners should choose the visuals cautiously. Whether they be pictures, cartoons, or comic strips, visuals should reflect the text's linguistic complexity and help the reader process the linguistic input and retrieve the necessary information for output. Although striving to maximize comprehension by choosing visuals that are compatible with the text, they should also consider the readers' language proficiency levels. L2 reading teachers should use pictures and visual aids with caution, regardless of learners' ages or stage of language development, because overloading them with images might not challenge them cognitively. Teachers should also consider which types of visuals work better for learners at different proficiency levels. While this study tests only the effects of comic strips on adult L2 learners, there are many other visual forms (e.g., cartoons, illustrations, photos, maps, tables, and charts) that might have different effects on second and foreign language learners' reading comprehension. For instance, language learners might find political cartoons, with their implicit meaning, more cognitively challenging.

Future research should consider the effects of these other genres on reading comprehension so that textbook designers and materials developers can make informed decisions when selecting visual aids for language textbooks. Although this study suggests that comic strips have an effect on L2 learners' reading comprehension, it did not test comic strips' effect on learners' L2 retention, which is another subject for future research. Furthermore, using recall protocols as scoring measurement is too time-consuming for practitioners to use in real classrooms. Researchers might use other testing measures in similar studies to find a more efficient and effective way to measure reading comprehension that second and foreign language teachers can use in their classrooms.

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APPENDIX A

Texts

The Low-Level Text

Mr. Thompson was a very strict third-grade English teacher. He often challenged his students with hard questions. One morning, he walked into the classroom and said energetically, “Boys and girls, today we are going to learn about a very important punctuation mark: the hyphen.” The students did not know what a hyphen was. Mr. Thompson continued to explain: “Hyphens are used within a word or between two words.” Then Mr. Thompson asked: “Can anyone give an example of how we use hyphens?” No one could answer the question. Suddenly, Bob Fits, who always had an answer, raised his hand. Looking through his thick glasses, Bob said, “Not all fast-food servers are *fast* food servers, and not all high-school students are *high*.” The rest of the class disliked Bob and looked at him angrily. Mr. Thompson, however, praised him and said, “That’s a very good example, as usual, Bob! Let’s write it out.” The students were all mad at Bob.

Mr. Thompson turned to write on the board. As he did, a ball of paper hit Mr. Thompson’s

shining bald head. Surprised and then angry, Mr. Thompson turned around and shouted, “Who did that?” Mr. Thompson looked at the class angrily and waited for an answer. Together, the students pointed their fingers at Bob. Bob’s eyes were wide with fear as Mr. Thompson stared at him and asked, “Robert Fits, what do you have to say for yourself?” And for once, Bob did not have an answer to Mr. Thompson’s question. (250 words)

The High-Level Text

Mr. Thompson, a third-grade language arts teacher, was constantly challenging his students with rather difficult questions. Entering the classroom one morning, he energetically announced: “Boys and girls, today we are going to learn about an extremely important punctuation mark: the hyphen.” Perplexity filled the students’ eyes as they looked at one another, completely clueless. “Hyphens,” Mr. Thompson continued, “are odd little sideways marks that elbow into the language, both written and spoken.” A foreboding atmosphere began to envelop the classroom, and the sense of fear mounted as Mr. Thompson posed one of his infamous questions: “Can anyone give an example of how we use hyphens?” Out of the dead silence brought on by the question, the hand of the teacher’s pet, Bob Fits, shot up. Peering through his thick lenses, Bob offered, “Not all *fast-food* servers are *fast* food servers, and not all *high-school* students are *high*.” Over the low groan that Bob’s pun generated from the rest of the class, Mr. Thompson praised him, “Excellent example, as usual, Bob! Let’s write it out, and I’ll provide you with some rules about using the hyphen.” As the class sneered in Bob’s direction, and Mr. Thompson turned toward the board, a well-aimed ball of paper hit its intended target, which was Mr. Thompson’s shining bald head. Surprised and then furious, Mr. Thompson whirled around and, shaking his fists, shouted, “Who did that?” Angrily staring at the now innocent faces of his class, Mr. Thompson waited, determined to find the culprit. In unison, the students grinned and pointed accusingly at Bob. Bob’s eyes were now the ones filled with bewilderment and fear as Mr. Thompson glowered at him, asking, “Robert Michael Fits, what do you have to say for yourself?” For once, Bob did not have an answer to Mr. Thompson’s question. (300 words)

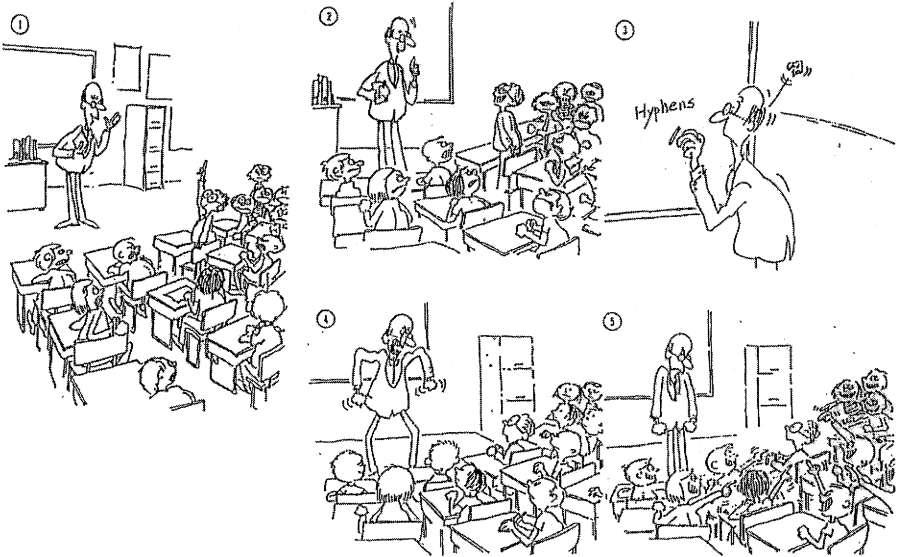
APPENDIX B

Example of Pausal Units and Value Assignments

Pausal unit	Value assignment
Mr. Thompson was a very strict	4
third-grade English teacher	4
He often challenged his students	3
with hard questions	2
One morning,	1
he walked into his classroom	2
and said energetically,	3
“Boys and girls,	1
today	1
we are going to learn	4
about a very important punctuation mark:	3
The hyphen.”	4

APPENDIX C

The Comic Strip



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