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Terakreditasi, November 2002

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DAFTAR ISI

PICTURES IN FOREIGN LANGUAGE PREPOSITION LEARNING

Y.G. Harto Pramono

ABSTRACT

This article explores the effects of design features on support given by illustrations to English preposition learning. Primary school students in Surabaya learning English completed a set of simple sentences in English from each of which the preposition had been omitted. Each written sentence was accompanied by a static illustration to represent the missing preposition. Analyses of subjects' responses suggested that two major sources of error were (a) subjects' first-language interference, and (b) "misinterpretation" of accompanying illustrations. In the latter case, the majority of problems occurred with sentences describing a change in a situation rather than those specifying an on-going state. Locational, directional, and temporal aspects were identified as design features of an illustration necessary to specify the motion (change-related) prepositions. In illustrations where such components are lacking, learners' success in selecting the appropriate preposition for a dynamic situation seemed to be related in part to their background knowledge.

Keywords: static illustrations, design features, motion prepositions, verbal visual processing, mental models

1.   INTRODUCTION

Pictures are widely used as part of foreign and second language teaching as a complement to texts (written and verbal information). Introductory language teaching materials, ranging from traditional textbooks to electronic resources, all make extensive use of pictures to support the learning processes. Further, language teachers often use additional pictures to complement these resources in their teaching with the aim of making the meaning of words and expressions clearer to the learners. This reliance on pictures reflects an implicit assumption by practitioners that these visual representations are intrinsically effective in supporting language learning. However, the question arises as to how useful these pictures really are. Is it possible that they could sometimes be redundant or even confusing for the learners? The extent to which the content, form, and presentation mode of a picture complements the text it accompanies is likely to be of crucial importance in determining the instructional effectiveness of such a combination. Educators need a principled basis for allowing them to distinguish between effective and ineffective pictures.

Children learning English as a foreign or second language in many parts of the world have found prepositions to be a particularly problematic area (Brala, 2003; Jabbour-Lagocki, 1990; Pramono, 2002a; Skrzypczynska, 1998; South, 1996; Vriend, 1988; Zughoul, 1979). While some of these difficulties are related to specific language knowledge deficiencies, others are related to more general background knowledge.

English teaching materials frequently accompany the short sentences used to introduce or test understanding and use of prepositions with illustrations intended to

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depict the relevant prepositional relationships. These illustrations typically include a number of entities that have been arranged in a manner consistent with the preposition concerned. A common application of these depictions involves the presentation of a sentence in which the preposition has been blanked out and the student is required to choose or produce the correct preposition on the basis of information given in the illustration. This type of exercise relies on the fact that a number of prepositions could be used to complete the sentence in a semantically and syntactically acceptable manner. Such incomplete sentences are intrinsically ambiguous until an appropriate preposition is added. The intended function of the illustration in such cases is to remove the ambiguity and direct the student's choice towards a particular preposition.

A previous study by the author (Pramono, 2002b) dealt with such materials in which elementary school students in Indonesia learning English completed a set of simple sentences in English from each of which the preposition had been omitted. Each written sentence was accompanied by a static illustration of the type commonly included in textbooks to represent the missing preposition. Subjects were required to identify the missing prepositions on the basis of information given in the illustration via both multiple choice and completion questions. Analyses of subjects' responses suggested that two major sources of error were (a) subjects' first-language interference, and (b) "misinterpretation" of accompanying illustrations.

In the latter case, the examination of the illustrations concerned indicated that they could be ambiguous for Indonesian students because the scope of legitimate meanings they allowed for these students was too broad. It was therefore too easy to "misinterpret" the picture. The majority of such problems occurred with sentences describing a change in situation rather than those specifying an on-going state. The study concluded that locational, temporal, and directional cues would be necessary for illustrations to specify motion prepositions sufficiently for there to be no problematic ambiguity in the depiction. Locational cues concern the relative positioning of target objects in relation to reference objects, whereas temporal and directional cues involve the addition of external symbols showing temporal and directional information of target objects. Temporal information indicates that the entity changes position over time. It disambiguates with respect to the temporal aspect, whereas directional information disambiguates in terms of the direction in which the depicted object moves. The study presented in this article, then, aimed to explore the effects of these design features in determining learners' capacity to choose motion (change-related) prepositions that are most appropriate for use in ambiguous incomplete text expressions. Its particular focus was upon the interplay between content depiction and the disambiguation of prepositions in sentences.

2. PICTURE AND TEXT COMPLEMENTARITY

Pictures in illustrated text are thought to facilitate the construction of mental models (Hegarty and Just, 1989; Mayer and Gallini, 1990; Schnotz, Böckheler, and Grzondziel, 1999). One explanation of this facilitation rests on the assumption that verbal and pictorial explanations are processed in different cognitive subsystems which provide different support for the construction of mental models (Mayer, 1997). Another explanation of the effects of pictures within explanatory texts on comprehension has been given by Wolfgang Schnotz, Justus Böckheler, and Harriet Grzondziel (1999). They combine elements of both dual-coding theory and mental model theory. Their

model offers a more detailed account than Mayer's model of the interplay between texts and pictures in knowledge acquisition and is used as the framework for this study reported below.

The model of text and picture comprehension developed by Schnotz and his colleagues (1999) sets out a series of processes and sub-processes by which people are assumed to develop an understanding of verbal and pictorial information. The basic structure of this model is shown in figure 1. The model consists of descriptive (left side) and depictive (right side) representational branches. The descriptive branch comprises the text, the mental representation of the text surface structure (syntax), and the propositional representation of the semantic content (meaning). The interaction between these representations is based on symbol processing. The depictive branch comprises the picture or diagram, the visual perception or image of the graphic display, and the internal mental model of the depicted subject matter. The interaction between these representations is based on processes of analog structure mapping.
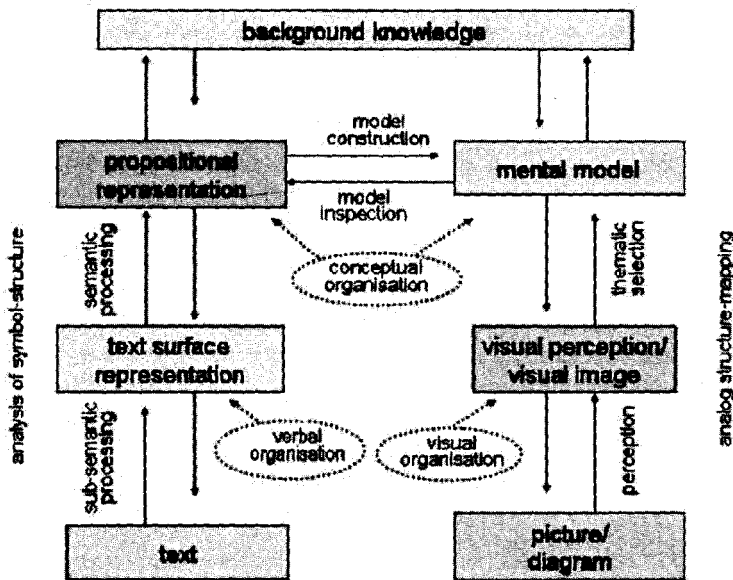
Figure 1. Schnotz, Bockheler and Grznziel Model Knowledge Acquisition from Texts and Pictures (1999).

During the process of comprehending a text, the reader constructs a mental representation of the text surface structure, generates a propositional representation of the semantic content and constructs from the so-called text basis a mental model of the described subject matter. The construction of a mental model during text comprehension implies a transition from a descriptive to a depictive representation. This transition is based on different, but *complementary*, principles of representation. In comprehension of pictures, the observer creates a visual mental representation or visual image

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of the graphic display with the help of preattentive perceptual processes as well as a mental model and a propositional representation of the depicted subject matter. The propositional representations and mental models interact continuously both in comprehension of texts and in comprehension of pictures via an interplay of model construction and model inspection.

The model suggests that pictures can function to remove potential ambiguity in the verbal (textual) presentation of subject matter by providing additional information. However, the pictorial information needs to be *complementary* to the textual information in order to disambiguate the verbal presentation. "Complementarity" refers to the condition where both sources of information (text and picture) must be employed in order to reveal the entire meaning of the text-picture/diagram combination. That is, textual information has gaps, which have to be filled by the information contained in the picture, and vice versa (Moliroe, Ballstaedt, and Mandl, 1989). According to Schnotz and his colleagues' model, text comprehension and picture comprehension provide different routes for mental model construction (supported by background knowledge) which implies that one route can replace the other to some extent (Schnotz, 2001). This model provides a framework with which to explain individual differences in multimedia learning. Various studies have shown that learners with high background knowledge do not profit very much from pictures in texts, whereas learners with low background knowledge benefit more. Obviously the high background knowledge allows mental model construction from the text also without pictorial support, whereas such external support is required for learners with low background knowledge.

In using prepositions for sentence completion, such as "The box is floating _____ the beach," learners may find it difficult to decide which preposition is the most suitable one because a number of prepositions could be used to complete the sentence in a semantically and syntactically acceptable manner. In that situation, a picture that is complementary to the text information may constrain possible interpretations and direct the learner's choice towards a particular preposition. However, this relies upon the picture sufficiently disambiguating the sentence in order to provide this direction. In the context of this study, it is assumed that properly designed features of pictures are likely to disambiguate.

3. THE STUDY: EFFECTS OF DESIGN FEATURES ON LEARNERS CHOICE OF PREPOSITIONS

3.1 Method

The study presented here explored effects of design features on support given by static illustrations to removing the ambiguity and so directing students' choice towards a particular preposition. There were 136 subjects from 5 primary schools in Surabaya who completed 3 separate tests in sequence: first, a test of motion prepositions; second, a test of background knowledge of the depicted contents; and third, a test of proficiency in general English prepositions. There was one week time interval between the tests. Schools were selected on the basis of: having "average to above average" students with a good command of English, especially prepositions, because the research was about the role of pictures, and required the language aspect to be a non-problematic variable; students who were from a mixed range of socio-economic groups; and convenience, depending on schools that were available to participate in the research. Only data from 124 students who passed a test of proficiency in general

English prepositions were included in the analysis.

Apart from the picture designs of the illustration itself, there are several other variables likely to influence effective learning with pictures. These include students' background knowledge of the depicted contents, the intensity with which they process the picture, and their general visual literacy. For this study, the role of student's background knowledge of the depicted contents is likely to be a particularly important influence on the direction of student's choice of prepositions. A most relevant aspect of background knowledge for this study is the students' familiarity with the depicted content in terms of its common possible movement directions. Thereby, the test of background knowledge of the depicted contents was intended to identify whether or not the subjects were familiar with the direction or directions to which the depicted content (for example, crab) usually moves. One example can be seen in figure 2.
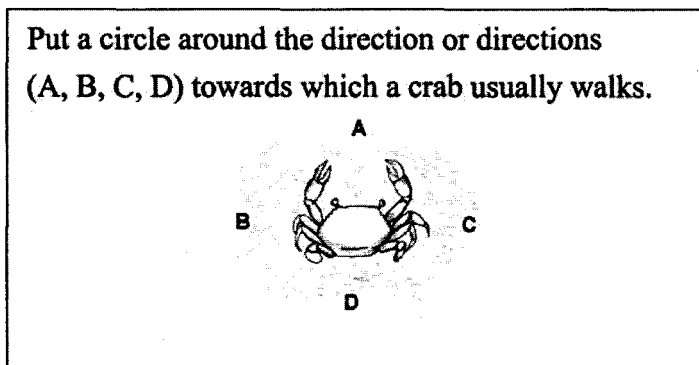

Figure 2. An Example from The Test of Background Knowledge

The test of general proficiency in English prepositions assessed the subjects' mastery of the target prepositions for the purpose of isolating the effect of design variables. The materials used for this purpose covered all the prepositions used in the test of motion prepositions - both the target prepositions (dynamic) and the distracters (static and dynamic) - but the context for each item and types of options were different. The two tests had different purposes, which determined the use of different supporting media. The test of general proficiency in English prepositions utilised three-dimensional objects to represent the missing preposition in each expression instead of static illustrations.

The test of motion prepositions was used to explore the effect of design features on how static illustrations remove ambiguity and, thus, direct students' choice towards a particular preposition. The test contained twenty multiple-choice items with each one consisting of a simple sentence in English from which the motion preposition had been omitted.

Each written sentence was accompanied by a static illustration to represent the missing motion preposition. Four alternative answers were provided and the subjects were required to choose the intended preposition on the basis of information given in the illustration. These alternative answers were of the following types: "positive" (intended); "negative" (the opposite of the intended answer); "positive or negative"; and

"neutral" answer (an alternative, other than "positive" or "negative" but also grammatical).

The static illustration that accompanied each sentence was specifically designed to systematically vary the portrayal of the target preposition's locational, temporal, and directional aspects. The depicted contents used in this test featured two geometrically dissimilar classes of objects: asymmetrical and symmetrical. This was appropriate in a practical sense because in real-world experience, learners encounter both types of objects. However, such a distinction is also important in a theoretical sense because it is assumed that these two different types of objects, by their nature, provide learners with different directional cues. In order to provide a representative cross-section of the broad types of contents learners encounter in instructional illustrations, the pictorial materials used in this study included both animate and inanimate objects. Animate objects comprised two categories: animals and human beings.

Each content (object) in the test was depicted in five different versions (*see* figure 3):
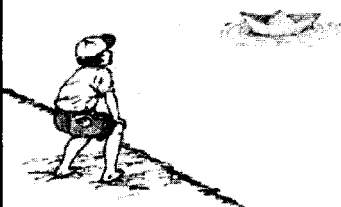
- *Implicit 1* contained locational information in which no external cues (symbols) were added to represent explicitly a change in the depicted situation. The depicted object was placed far from the reference object/destination.
- *Implicit 2* contained the same information as that in *Implicit 1*. However, the location of the depicted object was changed to be *close* to the reference object/destination.
- *Partly explicit 1* contained temporal information in which a dotted image was added to the depicted object as an external cue to represent a change in situation, that is, to indicate that the entity changes position over time.
- *Partly explicit 2* contained directional information in which an arrow was added to the depicted object as an external cue to represent a change in situation.
- *Explicit* contained both directional and temporal information, that is, both an arrow and a dotted image were added as external cues to represent a change in situation.

To avoid the possibility of sequence effects, the order of the questions, picture versions, and alternative answers were randomised.
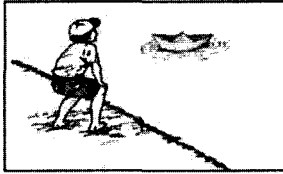
IMPLICT 1
locational only—no additional symbol added
(location far from reference object/point)

	The paper boat floats _____ the boy.	Option type *(randomised order)*
	a. towards or away from	_____ *pos or neg (+/-)*
	b. away from	_____ *positive (+)*
	c. towards	_____ *negative (-)*
	d. near	_____ *neutral (o)*

IMPLICT 2
locational only—no additional symbol added
(location close to reference object/point)

The paper boat floats _____
the boy.
   a. near — (o)
   b. towards or away from — (+/-)
   c. towards — (-)
   d. away from — (+)
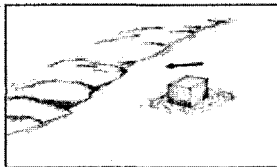
PARTLY EXPLICIT 1
temporal only—dotted image added

The box floats _____ **the beach.**
   a. away from — (-)
   b. towards or away from — (o)
   c. near — (+)
   d. towards — (+/-)

PARTLY EXPLICIT 2
directional only—arrow added

The box floats _____ **the beach.**
   a. near — (o)
   b. towards — (+)
   c. towards or away from — (+/-)
   d. away from — (-)

EXPLICIT
directional & temporal — arrow & dotted image added
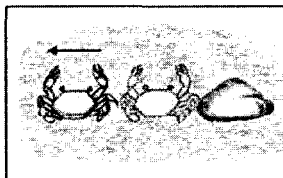
The crab walks _____ **the stone.**
   a. towards or away from — (+/-)
   b. near — (o)
   c. away from — (+)
   d. towards — (-)

Figure 3. An Example Set of Test Items

3.2 Results

The overall proportions of responses for each design feature across all subjects are shown in figure 4. Without added symbols, the rate at which intended ("positive") answers were chosen was considerably (37%) higher than either the "negative" or "neutral" answers (10.2% and 22.8% respectively), but marginally lower than for the alternative that included both the intended answer and its opposite (46.5%). However, with added symbols, the 71% overall response rate for intended answers was almost double that achieved for the versions without added symbols. In addition, the "intended plus opposite" alternative was chosen at only one third the rate (15.5%). Comparison of results for the three added symbol versions shows that the proportion of subjects who chose the intended answer in the temporal version was considerably less than for the directional or directional/temporal versions.
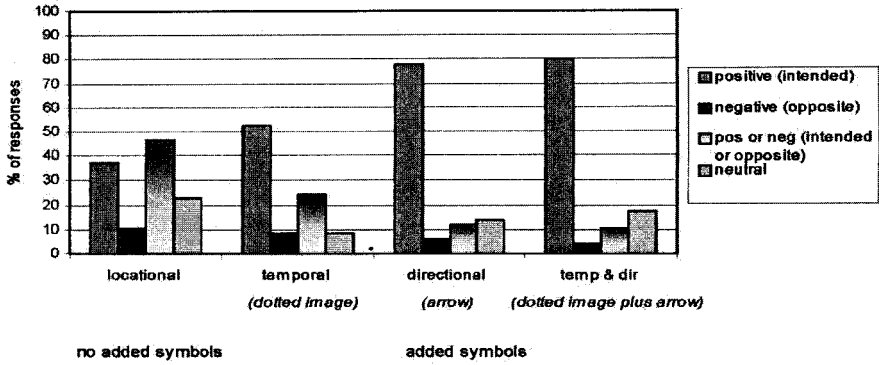
Figure 4. Distribution of Respons for Each Design Feature. N=124

3.2.1 Nature of The Depicted Contents (Symmetrical or Asymmetrical)

On the basis of their nature, the depicted contents (objects) in the static illustrations used in this study belonged to two types: symmetrical (the form contains no embedded directional cues) such as a box, a ball or a balloon; and asymmetrical (the form contains embedded directional cues) such as a lizard, an antlion or a crab. More detailed inspection of the results for the "no added symbols" design showed that the students' choice of the "positive or negative" answer varied with the nature of the depicted contents. Figure 5 shows that the proportion of subjects choosing the "positive or negative" answer was particularly high when the depicted contents were symmetrical objects, varying from 55% (box) to 98% (ball). Neutral was the only other alternative chosen.

Pictures with no added symbols

Figure 5. Distribution of Respons for Symmetrical Object. N=124

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The proportion of subjects choosing the "positive or negative" answer was also particularly high when the depicted contents were speci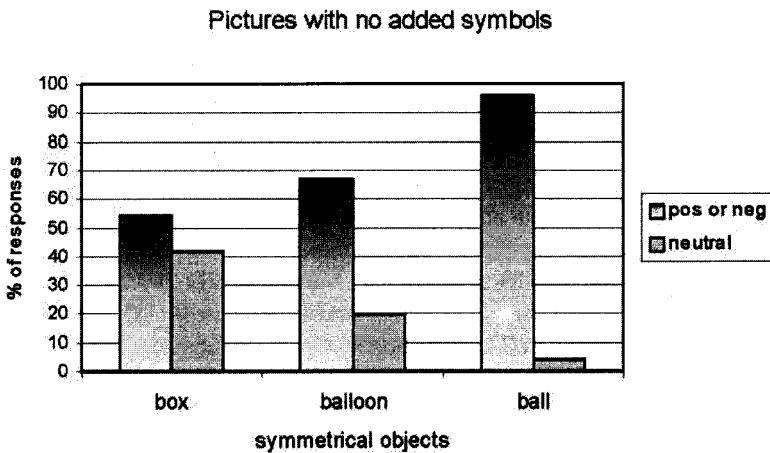fic asymmetrical objects the directions of which are inherently ambiguous, varying from 50% (rubbish bin) to 83% (man climbing) as shown in figure 6. The direction of these specific asymmetrical objects are *ambiguous* because the directional cues embedded in the pictorial form of these objects are unclear.

Figure 6. Distribution of Respons for "Special" Asymmetrical Objects (providing unclear embedded directional cues) Depicted with "Locational" Version. N=124.

However, when the direction of asymmetrical objects was inherently *unambiguous* because the pictorial form of these objects could provide clear and direct embedded directional cues, such as a lizard, a kangaroo, or a mouse, the proportion of subjects choosing the "positive" answer (instead of the "positive or negative" one) was particularly high, varying from 58% (kangaroo) to 84% (mouse), although no external cues were added in the illustrations (see figure 7).

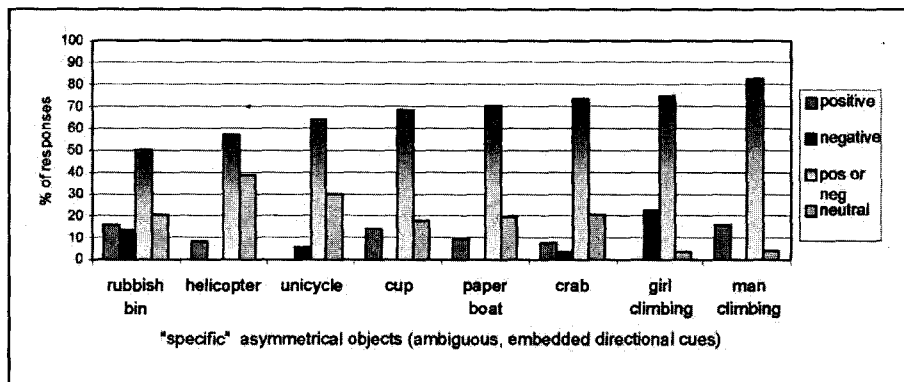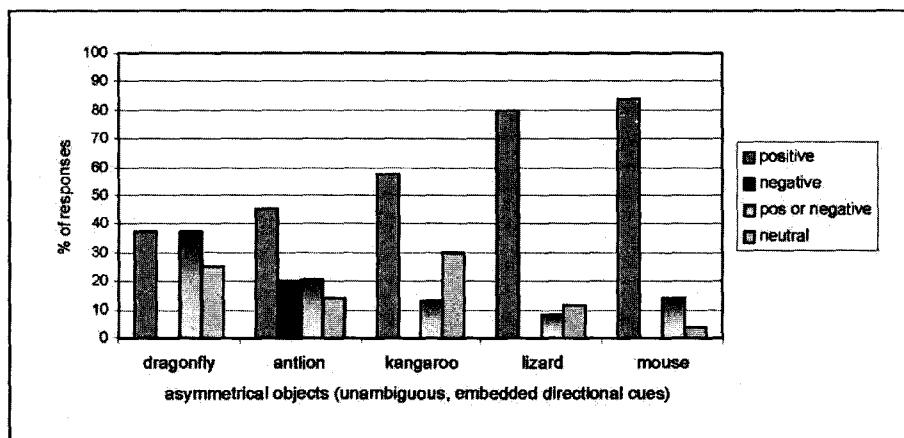

Figure 7. Distribution of respons for "special" asymmetrical objects (providing clear embedded directional cues) depicted with "locational" version. N=124.

3.2.2 Symmetrical Objects (Without Added Symbols)

As mentioned earlier, in implicit picture versions (without added symbols), the object was located either *far* from or *close* to the reference object/destination. As figure 8 shows, the proportion of subjects choosing the "positive or negative" answer for the item "The box floats _____ the beach" was high (79%) when the text was accompanied by the implicit 1 picture version in which the box was located *far* from the reference destination. This proportion, however, turned out to be low (21.7%) when the text was accompanied by the implicit 2 picture version in which the box was located *close* to the reference destination, where the "neutral" answer turned out to have more responses (61%). This pattern was not repeated with the item "The ball goes _____ the house." Contrary to "box," the percentage of the "positive or negative" answer for "ball" was always high in both illustrations, whether the text was accompanied by the implicit 1 (96%) or implicit 2 (91%) picture versions. Hence, the data suggested that for "box," *far* from the reference destination appears more likely to direct students to choose the "positive or negative" answer, as for "ball" but, unlike "ball," *close* to the reference destination appears more likely to direct students to choose the "neutral" answer.
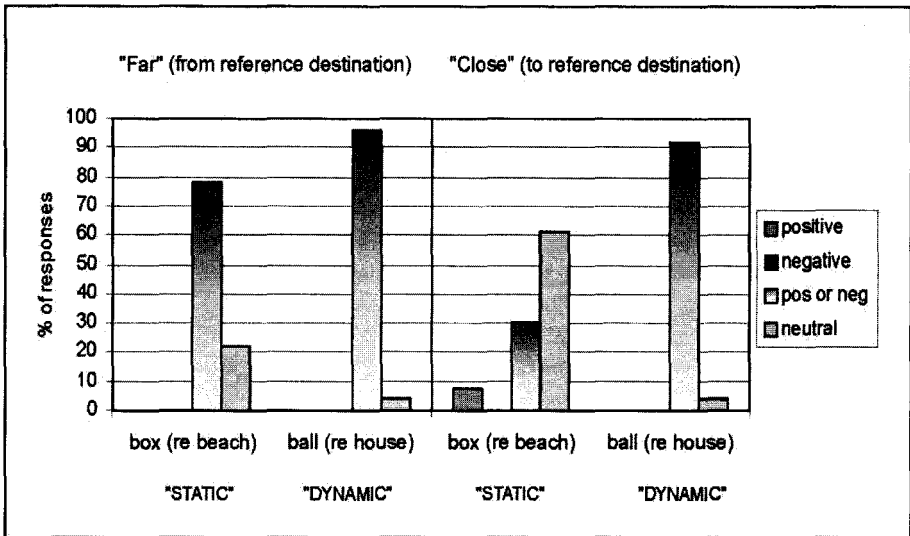
Figure 8. Distribution of Respons for Symmetrical Objects Depicted with "Locational" version (far from and close to the reference object/destination. N=124.

3.2.3 Asymmetrical Objects (with Added Symbols)

For the item "The lizard walks _____ the grasshopper," the proportion of subjects choosing the intended answer was high (in all three design versions: temporal, directional, temporal/directional), varying from 89% to 96%, but for the item "The antlion walks _____ the ant," it was low (37%), in the temporal version as shown in figure 9.
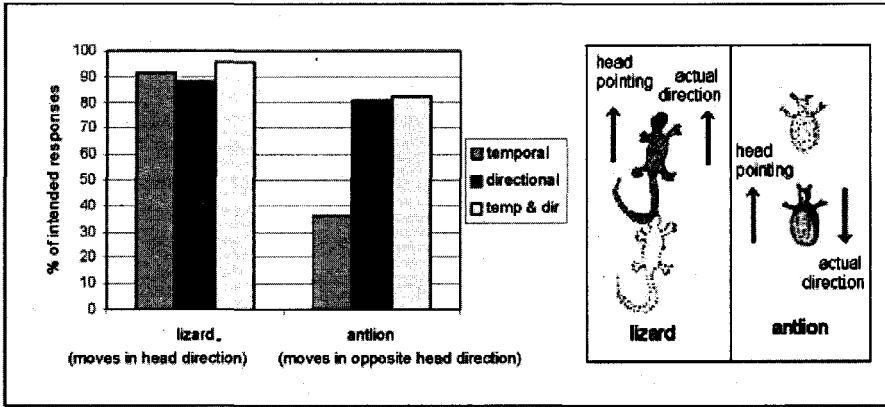
Figure 9. Distribution of Intended Responses for Asymmetrical Objects Decipted with Added Symbols. N=124.

3.2.4 Symmetrical Objects (with Added Symbols)

For the items "The sun goes _____ in the east" and "The ball goes _____ the house," both objects ("sun" and "ball") are symmetrical and above ground. However, as figure 10 shqws, the proportion of intended responses chosen by the subjects who were provided with the "temporal" aspect of picture design was quite different in each case. The proportion of intended responses for "the sun" was very high, whereas for "ball" it was very low.

Figure 10. Distribution of Intended Responses for Symmetrical Objects Decipted with Added Symbols. N=124.

4. DISCUSSION
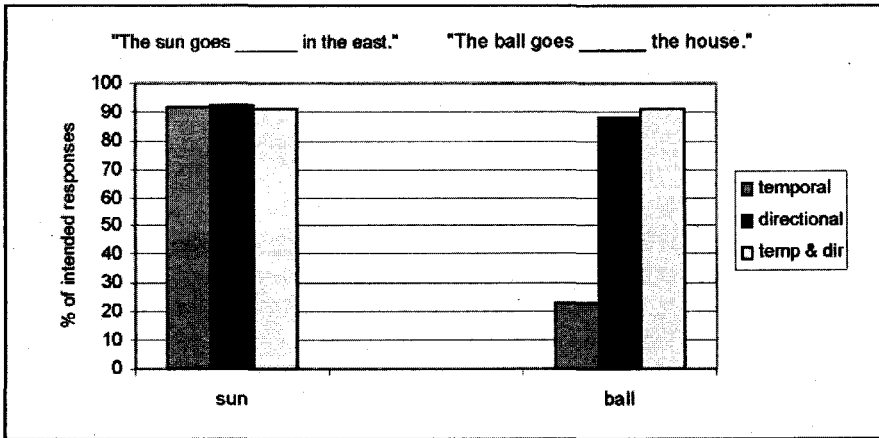
The results from this study are consistent with the verbal-visual processing model proposed by Schnotz, Böckheler, and Grzondziel (1999). Patterns of answers can be explained in terms of the generation of a mental model based upon the sentence, its

accompanying picture and the learner's background knowledge. The sentence with a missing preposition is intrinsically ambiguous until an appropriate preposition is added. With the incomplete text alone, learners are unable to make a definitive choice of an appropriate preposition to complete it because the scope of legitimate meanings is too broad. They must rely on the accompanying picture to disambiguate the text information and extract relevant information from it in order to create an appropriate mental model of the sentence's meaning. On this basis, they choose the "best" preposition to fill the gap in the incomplete text. However, when the picture *itself* is ambiguous or misleading for the learners, it does not help them construct a single appropriate mental model. As a result, they can choose a preposition not intended by the designer. The ambiguity of the picture could be due to a poorly designed illustration or the learners' unfamiliarity with the graphic convention (that is, the added symbols that give external cues).

The results of the study suggest that pictures without added symbols are ambiguous. As a result, they are unable to remove the ambiguity of the text and, thus, are unhelpful in directing learners towards the intended choice of motion prepositions. Pictures without added symbols are likely to direct the choice of ambiguous or neutral answers when used for symmetrical objects such as a ball or a box. However, the nature of the objects (dynamic for ball or static for box) seems to be a factor that influences the learners' choice of prepositions.

In contrast to pictures without added symbols, pictures with added symbols are able to disambiguate the text and help learners make the intended preposition choice. One possible reason could be that they are more able to constrain possible interpretations and, accordingly, help learners create an appropriate mental model of the sentence meaning. However, an arrow (a directional cue) rather than a dotted image (a temporal cue which represents a change in position over time) is a more important design feature in directing learners towards the intended motion prepositions. It seems that the learners are more familiar with an arrow as a graphic convention than with a dotted image. When provided with a picture with a "temporal" cue (dotted image), learners may rely on their background knowledge to choose the intended prepositions. Learners' inability to read the temporal cue in the item "The antlion walks _____ the ant," for instance, may cause them to rely on their background knowledge about the depicted content "antlion." Learners who have background knowledge about the way an antlion usually walks are likely to choose the intended preposition *(towards)* although its head is facing in the opposite direction. Those who do not have the background knowledge are more likely to choose the opposite alternative *(away from)*, that is, they make the choice on the basis of the direction in which its head is pointing. This implies that the type of external cues may be critical for some asymmetrical objects such as antlion because antlion moves *backwards*.

The addition of directional cues is more critical for some objects than for others. Symmetrical objects need more support from the added symbols than asymmetrical objects do, and some particular asymmetrical objects need more support than other asymmetrical objects. The reason for this may be that the pictorial forms of symmetrical objects do not contain embedded directional cues. A box and a ball, for instance, do not have a discernable "front" or "rear." Therefore, the presence of added symbol is critical to show the dynamic aspect of these objects. Similarly, some asymmetrical objects contain embedded directional cues which are less clear than others. For ex-

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ample, a crab, a helicopter, and a man climbing contain less clear embedded directional cues than a lizard, a mouse, and a dragonfly. The likely direction of movement of a crab or a helicopter is not specified by the way they face. They are equally likely to move *towards* or *away from* something, and a man climbing is equally likely to move *up* or *down*: without added symbols, the direction of their motion can be ambiguous. Thus, external cues are likely to be critical for asymmetrical objects such as these. On the other hand, cues are likely to be less critical for asymmetrical objects such as a lizard, a mouse, or a dragonfly, because their directions are inherently unambiguous. These objects contain clear and direct embedded directional cues in their pictorial forms. So directional information is, in principle, already available to the viewer without the need for further external cues.

As Rieber (1994) points out, the first principle of the design of instructional pictures is this: there are times when pictures can aid learning, times when pictures do not aid learning but do no harm, and times when pictures do not aid learning and are distracting. Clearly, in order for illustrations to aid learning, good design is fundamental (Lowe, 1993). Based on the findings of the study, an instructional designer may need to consider the following in designing static pictures for the learning of motion prepositions. The extent to which pictures are successful in disambiguating the required preposition appears to be related to a number of design features:

- *the use of cues.* As discussed above, among the cues used in the study (arrows, dotted images, and combinations of arrows and dotted images), the dotted image seems to be less familiar to the learners. Accordingly, this cue is not likely to disambiguate and direct the learners' choice towards the required prepositions. In order that the picture is unambiguous to the learners, the designer must be sure that any cue used in the illustration is familiar to the learners and that they have been taught its meaning before-hand. Using cues that are more familiar to students is more recommended. Based upon the results of the study, an arrow can be recommended as an external cue to show the dynamics of subject matter, as learners are mostly familiar with this conventional sign for motion;
- *the nature of contents.* Symmetrical or asymmetrical objects appear to have different effects on learners' construction of a dynamic mental model from a static picture of the situation. Since external cues are critical for symmetrical objects (such as "ball"), the picture designer needs to consider giving sufficient explicit cues when designing the dynamics of these objects. Otherwise, the picture will not be helpful, because the pictorial form of these objects cannot provide implicit cues. In addition, external cues are not as critical for objects that are dynamic by nature (such as a ball) as for objects that are static by nature (such as a box). Accordingly, when depicting the dynamics of the "static" object or its motion, explicit external cues are essential;
- *the background knowledge of learners. Learners'* background knowledge of depicted contents appears to be a factor that contributes to disambiguation. The implication is that when learners are not familiar with the depicted content, the picture must be designed as explicitly as possible, by providing sufficient external cues so that, relying on the picture alone, learners will be able to extract the required information and build an appropriate mental model.

5.   CONCLUSION

The conclusions of the study can be summarised as follows: the "locational" aspect alone (no added symbols) of picture designs appears to be unhelpful in directing the choice of motion prepositions when used for symmetrical objects with no embedded directional cues and for particular asymmetrical objects that contain unclear embedded directional cues. However, they are helpful when used for asymmetrical objects that contain clear and direct embedded directional cues; "background knowledge" of depicted contents seems to be important in learners' choice of prepositions; and "external cues" seem to be important when there are insufficient cues embedded in the pictorial form of the content. These findings support the theory of text and picture comprehension proposed by Schnotz, Böckheler, and Grzondziel, that is, pictures in illustrated text facilitate the construction of mental models. An appropriate picture can support the construction of an intended mental model and, thereby, can fill any informational gaps the text may create. Ambiguous pictures may hamper the construction of an appropriate mental model and in this situation learners may rely on their possession of relevant situation-specific background knowledge.

Static pictures can only give an indirect representation of a dynamic situation - the actual dynamics of any change process must be inferred by the viewer from the static information. This inference requirement could potentially cause problems in the correct choice of prepositions, so a more direct method of representing the dynamics would be preferable. The author is currently designing learning materials that provide animated substitutes for the static pictures that are less effective in directing the choice of intended motion prepositions and will compare the effectiveness of these two forms of support.

References

Brala, M. M. 2003. *Understanding and Translating (Spatial) Prepositions: An Exercise in Cognitive Semantics for Lexicographic Purposes.* [Online]. www.rceal. cam.ac.uk/Working%20Papers/brala.pdf accessed on July 19, 2003.

Hegarty, M., and M.A. Just. 1989. "Understanding Machines from Text and Diagrams." In H. Mandl and J. R. Levin (eds.), *Knowledge Acquisition from Pictures* (pp. 171-194). Amsterdam: Elsevier Science Publishers B. V.

Jabbour-Lagocki, J. 1990. "Prepositions of Position: An Analysis for Practical Application in the Classroom". [Microfiche] *ERIC* Document: ED 332 509.

Lowe, R. K. 1993. *Successful Instructional Diagrams.* London: Kogan Page.

Mayer, R. E. 1997. "Multimedia Learning: Are We Asking the Right Questions?" *Educational Psychologist*, 32 (1), 1-19.

Mayer, R. E., and J.K. Gallini. 1990. "When Is an Illustration Worth Ten Thousand Words?" *Journal of Educational Psychology*, 82 (4), 715-726.

Molitor, S., S.-P. Ballstaedt, dan H. Mandl. 1989. "Problems in Knowledge Acquisition from Text and Pictures." In H. Mandl and J. R. Levin (eds.), *Knowledge Acquisition from Text and Pictures* (Vol. 58, pp. 3-35). North-Holland: Elsevier Science Publishers B.V.

Pramono, H. 2002a. "An Analysis of Difficult Prepositions Encountered by Primary School Students in Surabaya." Unpublished Research Report. Perth: Curtin University of Technology.

_____ 2002b. "An Analysis of English Prepositional Errors Made by Primary

School Students in Surabaya." Paper presented at the 6th Humanities Research Students Annual Conference, Curtin University of Technology, Western Australia.

Rieber, L. P. 1994. *Computers, Graphics, and Learning.* Madison: Brown & Benchmark.

Schnotz, W. 2001. "Educational Promises of Multimedia Learning from a Cognitive Perspective." Paper presented at the 9th European Conference on Research on Learning and Instruction (EARLI), Fribourg/Switzerland.

Schnotz, W., J. Böckheler, and H. Grzondziel. 1999. "Individual and Co-operative Learning with Interactive Animated Pictures." *European Journal of Psychology of Education,* 14, 245-265:

Skrzypczynska, J. 1998. "Exercises for Practicing the Use of English Prepositions of Place and Direction, Part 1." http://www.csa.com/htbin/ids51/ procskel.cgi accessed on August 5, 2000.

South, C. 1996. "Teaching Some Common Prepositions." *Forum,* 34 (1), 42-45.

Vriend, D. L. 1988. "Chinese Speakers and English Prepositions: Problems and Solutions." [Microfiche] *ERIC* Document: ED 316 029.

Zughoul, M. R. 1979. "Teaching English Prepositions." *English Teaching Forum,* 17 (3), 24-29.