Metaphor, Text Length, and On-line Comprehension of the Concluding Idea in Chinese Texts*

SIU Ping-kee
The Chinese University of Hong Kong

Twelve passages were written in Chinese as experimental texts. Each text contained two parts, a context and a concluding statement. Short contexts were derived from the long contexts, each preceding a concluding statement which induced literal or metaphorical interpretation. Subjects read the context and judged whether the concluding idea adequately described what the text led to. The design was a $2 \times 2 \times 2$ factorial with reading ability, context length and literal/metaphor condition as the between-subjects factors. In terms of comprehension results, higher scores were obtained on the literal rather than the metaphor tasks, on the long rather than the short contexts, and by the good rather than the poor readers. An interaction effect between task type and context length was also significant, with the worst performance being observed in subjects in the short context, metaphor task condition. Regarding response latencies, there was a significant effect on context length, although not on task type or reading ability level. In general, these findings support the schema model in metaphoric processing.

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Comprehending a discourse involves determining both the structural relationship among ideas and their relative importance in the context of a discourse. Skilled readers may anticipate the concluding idea of a discourse prior to the end of the text processing. Research findings have shown that knowledge of the thematic formation aids text processing both at the time of encoding and at retrieval (Englert & Heibert, 1984; Kieras, 1981). Readers have to use contextual cues to tie together the input information and organize the text themes—the macrostructures. These mental strategies used in building macrostructures are referred to as macrorules in van Dijk and Kintsch’s model (1983). Performing the macrorules involves a series of mental transformations, such as deleting, generating, combining, inferring and organizing. Past studies have found that contextual support and coherence facilitates text comprehension, metaphor processing, and macroorganization (van Dijk & Kintsch, 1983; Ortony, Schallert, Reynolds, & Antos, 1978; Siu, 1986; Williams, 1984).

This study focuses on how individual differences, metaphor expression, and text length affect the on-line processing of the macrostructures in short passages.

Reading ability is supposed to interact with context information to influence text processing. Readers’ sensitivity to contextual cues is expected to affect their performance in processing and organizing the ideas in a text. Meyer, Brandt and Bluth (1980) reported that ninth-grade poor readers performed worse than average and good readers on immediate and delayed recalls of text information, due to their inability to use organizational strategies; however, their performance improved on texts with a ‘with-signals’ condition. Similar results were observed in a study by Taylor (1980) in which superior recalls from good readers in an immediate recall condition were attributed to their better use of the passage’s top-level structure. Englert and Heibert’s data (1984) provided additional evidence, showing that third-grade good readers were more sensitive than average and poor readers to recognize the se-
quence and enumeration text, and use this knowl-
edge to discriminate the relevance of incoming in-
formation during reading. Studies on the use of story
schema at subsequent retrieval (Rahman & Bisanz,
1986; Short & Ryan, 1984) also reported differences
in ability between good and poor readers to recall and
reconstruct the story information. There is also evi-
dence that good readers are more efficient than poor
readers in utilizing text signals and in integrating
topic structures on verification tasks (Lorch, Lorch,
& Mogan, 1987). Success in identifying contextual
cues, and hence the text theme, depends greatly on
the reading ability of individual readers.

A distinction is also made between whether the
macroidea is literally or metaphorically expressed in
texts. Considerable research has been conducted to
investigate the differential processes required in the
comprehension of metaphor and the equivalent lit-
eral material (Gludksberg, Gildea & Bookin, 1982;
Ortony, 1979; Ortony, Schallert, Reynolds & Antos,
1978; Reynolds & Schwartz, 1983; Tourangeau &
Two models have been proposed to account for how
metaphors are understood in a text. The stage model
suggests that metaphor comprehension may be ac-
complished in two stages: First, the metaphor is
interpreted literally and this interpretation is rejected
as deviating from the context; then it is reinterpreted
and a search for non-literal meaning is triggered.
One implication of this approach is that compre-
hending the non-literal meaning requires more time
and effort than comprehending the literal meaning.
Verbrugge and McCarrell (1977) generalized from
their studies that a reinterpretation stage was evident
as additional inferences were needed to induce the
'ground' of a metaphor in forming the basis for the
metaphorical recall. A study by Yarbrough and
Blaubergs (1980) showed that due to additional
mental effort invested in metaphoric understanding,
metaphorical sentences were recognizable more of-
ten than literal ones on a subsequent recognition task.

The two stage model also gained support from an
experiment by Yarbrough & Gagne (1987), which
showed that greater cognitive capacity was required
to solve the metaphors in a technical text, thus facil-
itating the recall of the metaphor-related ideas on
a free recall task.

The schema model, however, assumes that both
literal and metaphorical expressions can be readily
understood by readers if schematic expectations can
be generated from the context to guide them through
the comprehension processes. This model was first
tested in an experiment by Ortony et al. (1978). Their
data substantiated the prediction that metaphorical
statements were comprehended at essentially the
same speed as literal ones when preceded by long
contexts. Gerrig and Healy (1984) discovered that
the response latency was significantly shorter in the
context-first metaphor-next condition than the meta-
phor-first context-next condition, thus confirming
the adequacy of the schema interpretation. The equal
processing hypothesis in the schema model was
challenged, however, by Reynolds and Schwartz
(1983) who found contradictory results when repli-
cating Ortony et al.'s study on a recall measure.
They argued that, despite the similarity in response
speed, the nature of the processing itself might still
be different during interpretation of the literal and
metaphorical meanings, and this might account for
the increased facility in the recall of the metaphorical
sentences.

Context length is also found to interact with the
metaphorical task, eliciting different response laten-
cies. Ortony et al. (1978) found that processing time
interacted between literal/metaphor text and context
length. Longer processing times were used to interpret
the metaphorical statements when preceded by short
contexts and no effect due to the metaphor/literal
condition was observed when preceded by long
contexts. In the present study, the experimental pas-
sage consisted of two parts, an antecedent context
and a concluding statement. The context was either
long or short; the short context was formed by simply
deleting the last sentence from the long context.
Shortening the context in this way is supposed to
weaken the invoked schema and hence judgemental
performance.

The literal/metaphor variable was manipulated
in a different way from that of the study by Ortony et
al. (1978) in which the antecedent contexts were
altered to manipulate the literal/metaphorical inter-
pretation of the concluding sentence. In this study,
the context was kept intact but the macrostatement
was altered to produce the literal/metaphor variation.
It is reasoned that the alteration of the macrostatements
rather than the contexts is an adequate and easily-
controlled device to test the equal/differential hy-
pothesis in metaphoric processing. In coming to a
judgment, some subjects might succeed or fail to
recognize the metaphorical meaning without con-
scious effort, or feel confused but try to apprehend
it through reconstructive processes. The schema model
would then be justified in the light of the former case
whereas the stage model would be applicable in the
latter case. Some text samples are given below:

1. **Long Context.** He was appointed to settle the
dispute between the employer and the
employees. He had to identify the source of
the conflict and negotiate between them, and be careful not to irritate either the employer or the employees.

2. **Short Context.** He was appointed to settle the dispute between the employer and the employees. He had to find out the source of the conflicts and negotiate between them.

3. **Concluding Statement** (for both long and short contexts). He was cautious about not hurting the feeling of either party (literal meaning). He was behaving like one who walks on a tight rope in the air (metaphorical meaning).

**Method**

**Subjects**

Subjects were 152 9th-grade students drawn from three subsidized coeducational schools in Hong Kong. They were of average standard in terms of their results in a public examination taken on the middle of 9th grade. The sex distribution was well balanced, there being 49% male and 51% female students.

**Design**

Each subject was assigned randomly to read 12 passages. The design was a 2 x 2 x 2 factorial with task type (literal vs. metaphor), contextual length (long vs. short) and reading ability (good vs. poor) as between-subjects factors. The dependent measures were comprehension latency and performance scores.

**Materials**

Two sets of passages were devised, with 12 in each set. The passages were written according to the following guidelines: (1) all the written passages were of similar length (within a range of 75-85 Chinese characters), (2) the context was cut short by eliminating the last and important sentence/phrase which provided the most significant clues to the macrostructure, and (3) the concluding statement in the context was altered to induce a literal or metaphorical interpretation. Twenty passages were first written and then pilot-tested with a small sample. Twelve of them were selected on the basis of their discriminative power and level of appropriateness with respect to the 9th graders. Samples of the experimental texts, translated into English, are given below:

1. **Long Context.** He is an old poet, highly-educated in the Chinese classics. Only on rare occasions, when people with a deep appreciation of classics gather together, will he share his thoughts. He leads a quiet and undisturbed life and never appears in the public.

2. **Short Context.** He is an old poet, highly-educated in the Chinese classics. Only on rare occasions, when people with a deep appreciation of classics are gather together, will he share his thoughts.

3. **Concluding Statement.** He has great talents but refrains from showing them too freely (literal meaning). He gives the impression of a sharp sword enclosed in its sword-sheath (metaphorical meaning).

The subjects were asked first to read the context and then to judge whether the concluding statement correctly described what the text led to. Long and short versions were prepared for each passage. Of the 12 passages in a set, two were followed by obviously incorrect statements as distractors to guard against the undesirable effect of an acquiescent response.

**Procedure**

The IBM-XT model personal computers were used throughout the experiment. Half of the subjects were randomly assigned to take the long version, and the other half the short version. The literal and metaphor versions were also randomly administered to subjects. The sample was further divided into high-ability and low-ability groups on the basis of the Chinese Reading Test administered each year to ninth graders as a standard measure of reading ability in Chinese. The score distributions were grouped among 6 levels from A through F, those with level C or above being classified as good readers, and those under level C as poor readers.

Subjects first completed a vocabulary recognition test through which they were made familiar with
the testing procedure. Detailed instructions were given before each task. Passages were presented one at a time on the VDU with all contexts arranged with 35 characters to a line and at the same horizontal position. A context stayed on the screen exactly 8 seconds before disappearing automatically. A target statement appeared immediately after each context with subjects being asked to judge whether this correctly summarized the preceding context. They had to press either 'M' key for 'yes' or 'N' key for 'no'. As soon as the subject made a response, the statement was removed and new context appeared. This sequence was repeated for the entire set of experimental texts. Response time was measured from the appearance of the target statement until the subject pressed either the 'M' or 'N' key. Two measurements were then derived from the responses: Subjects' comprehension scores in terms of the number of correct answers, and response times measured in 10 millisecond units. Subjects had sufficient time to read the passage context, i.e. at the rate of about 10 characters per second. They were aware that their response time was being recorded.

**Results**

*On-line Comprehension Results*

Each subject read 12 passages of either long or short context, followed by either a literal or a metaphorical statement. An analysis of variance (ANOVA) was conducted to determine the significant differences and the interactions among the experimental factors. Means and standard deviations of the on-line comprehension scores are summarized in Table 1.

The $F$ ratios obtained from the analysis of the comprehension scores were significant for all three main factors, the reading ability, $F(1,144) = 6.20, p<.02$; the task type, $F(1,144) = 21.89, p<.001$; and the context length, $F(1,144) = 6.66, p<.01$. Follow-up analyses were performed to determine where the interaction effect was located. The results showed that the effect due to the literal/metaphor factor was not significant in the long context condition but was highly significant in the short context condition, favoring the literal task, $F(1,72) = 29.45, p<.001$. Furthermore, the analysis of the effect due to context length yielded a non-significant result for the literal task but showed a significantly better result in the long rather than the short context for the metaphoric task, $F(1,75) = 12.60, p<.001$. This demonstrated that the poor performance of the students on the metaphoric task when preceded by a short context probably accounted for the interaction effect. The present findings clearly indicate that more correct responses were obtained on a literal rather than on a metaphoric task, in a long rather than a short context, and by good students rather than poor ones. A short context followed by a metaphorical target seems to cause the most interference with subjects' performance on an on-line comprehension task.

*Response Time Results*

A separate three-way ANOVA was conducted on response times. Table 2 presents the means and standard deviations in terms of the experimental factors:

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Mean Response Times (in sec) as a Function of Experimental Condition</th>
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<tbody>
<tr>
<td>Condition</td>
<td>High Ability</td>
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<tr>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>Literal Task</td>
<td></td>
</tr>
<tr>
<td>Long Context</td>
<td>23</td>
</tr>
<tr>
<td>Short Context</td>
<td>26</td>
</tr>
<tr>
<td>Metaphoric Task</td>
<td></td>
</tr>
<tr>
<td>Long Context</td>
<td>28</td>
</tr>
<tr>
<td>Short Context</td>
<td>19</td>
</tr>
</tbody>
</table>
Inspection of the analysis results revealed that only the contrast between context length was found to be significantly different, favoring the long context condition, $F(1,144) = 8.63, p < .01$. Neither of the two main factors, task type and reading ability, nor the interaction effects yielded a significant $F$ ratio. Thus, the short contexts, irrespective of the task type and reading ability, tended to demand higher response latencies than did the long contexts. The response times on the on-line comprehension test were not affected by the literal or metaphoric task nor by the reading ability of individual students, although they were affected by the context length that preceded the concluding statement.

**Discussion**

Individual differences in reading ability did have an impact on comprehension performance but had no influence on the response latencies. These results concur with the previous findings by Englert & Heibert (1984) and Lorch et al. (1987). The data in the present study indicate that the poor readers made more incorrect responses on the comprehension tasks than the good readers although both groups responded at essentially the same speed. One possible interpretation is that schematic expectations invoked by the poor readers were inappropriate to guide them to make a correct judgment. It is contended that good readers are more sensitive to contextual cues and more efficient at utilizing cognitive strategies to abstract macroideas than poor readers on either literal or metaphoric tasks with long or short contexts. This contention is consistent with the study by Britton, Muth, & Glynn (1986), in which they observed that when processing time was controlled, individuals might allocate different cognitive effort and organizational strategies in their attempt to construct the macrostructures.

The significant effect on context length indicates that subjects made more mistakes and took longer to come to a judgment on short contexts. The effect due to context length was fairly consistent for the comparisons on both performance and latency measures. The macrostructure generated from the short context was insufficiently specific to allow as fast and correct judgments as were derived from the long context. The omission of the last sentence in the context reduced the context support, and thus entailed the activation of loose and defective schemata and resulted in longer and weaker processing. For both good and poor readers alike, the last part of the context would formulate the important and significant links to invoke the proper schemata.

A significant effect due to literal/metaphor condition was observed on comprehension scores, but not on the response latencies. Metaphorical statements did not induce significantly longer latencies to respond but did elicit more incorrect responses than literal statements on the on-line comprehension task. In a study by Glucksberg, Gildea, and Bookin (1982), the data obtained supported their prediction that the true metaphorical interpretation might conflict with a false literal interpretation and so slow up response latencies. Their prediction, however, does not concur with the present findings. The interaction between the task type and context length on latency measures reported in the study by Ortony et al. (1978) was not found in this experiment. However, the present study identified the same interaction effect on the performance measure. The subjects in this experiment did not differ either in their response to the literal or metaphor tasks when preceded by long contexts but differed significantly when preceded by short contexts, favoring the literal task group. This indicates that more deficient schemata are generated from the short contexts and metaphor task condition.

In this study, students took a similar amount of time to interpret both the literal and the metaphorical statements, although their performance was poorer on the metaphor task. When faced with a metaphor, subjects tended to disregard the fact that it was a literal alternative and proceeded to interpret it without attempting to undertake any elaborate processing. The comparable latencies spent in response to the literal or metaphor task does not appear to concur with the ‘conflict’ interpretation as suggested by Glucksberg et al. (1982). Although the metaphorical statement took no longer to interpret than the literal one, it was taken as a false literal statement more often than the literal task, thus resulting in more incorrect responses in the metaphorical condition. This indicates that the unsuccessful responses were due more to the inability to connect the contextually-induced schema with the metaphorical task than to the lack of reconstructive processes, as implied in the stage model. Furthermore, the longer latencies spent on the short context condition did not produce any improvement in the performance scores, particularly in the short context, metaphor task condition. In terms of performance measure, more time spent on the judging task did not help to restore the schematic information omitted from the impoverished context. This points out that the loose expectations generated from the short context appeared particularly weak to cope with the metaphorical representation. The data from the performance and latency measures (Tables
I and 2) taken together tend to be interpretable on the basis of the schema model as the significant effects due to literal/metaphor condition and to the interaction of task type by context length on the performance measure seem to better fit the schematic interpretation.

An expression is interpreted metaphorically by virtue of its context. Longer and weaker processing necessarily results from the reduction of the contextual support in the short context condition. Deletion of the last part of a brief discourse has been proven to inhibit significantly the development of a proper metaphorical schema. Different parts of a context may share the importance in their contribution to the understanding of the metaphorical ideas. Little effort has been made, however, to examine the relative importance of the contextual cues distributed among different parts of a text. Future research should aim to determine the differential contributions made by the schematic cues among different parts of the text structure involving metaphoric processing.

When proceeding through a passage, a reader may be guided by the text information to search for the macroideas which may be implicitly embedded in the schematic context. The judgment task required in this study is exactly analogous to the searching or inferring processes inherent in normal reading behavior. Knowledge of the processes involved in organizing the concluding idea in texts and of the topics in the construction of passage macrostructure. Discourse Processes, 4, 1-15.


References


Author

SIU Ping-kee, Reader, Department of Educational Psychology, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong.