

A STUDY OF THE TEXT SIGNALING EFFECTS ON READING COMPREHENSION AND INFORMATION RETENTION IN EXPOSITORY TEXTS

Deng Yumei

Guangdong Vocational Institute of Public Administration

Abstract

Two experiments were conducted to examine whether the presence of title plus headings could influence English reading comprehension and information retention in normal reading (Experiment 1) and in fast reading condition (Experiment 2). The results of the experiments indicates that the presence of title plus headings can facilitate readers reading comprehension and information retention both in normal reading and in fast reading condition . All the readers with different reading proficiency can benefit from signaling , however , in normal reading , the low proficient readers benefit more from the presence of title plus headings than the high proficient ones in information retention .

Key words

effects of text signals ; reading comprehension ; information retention ; reading proficiency

1 . Introduction

According to cognitive science , reading is a complex behavior that requires the smooth integration of many basic cognitive structures and processes , including attention , working memory , long term memory , and various linguistic processes . Reading involves at least three types of skills : decoding , comprehension , and reading strategies . Reading comprehension is a complex mental process which involves conscious and unconscious use of various strategies to construct meaning on the basis of the cues in the text . A writer encodes his thought as language . A writer can facilitate a reader s processing of text important topics by using a variety of devices (e. g. , underlining , capitalization , italics , boldface and color variation) or emphasize text structure by using other text signals (Meyer 1975 ; Lorch 1989) . Therefore , a reader must decode the language to understand the writer s thought in the course of reading . An expository text is hierarchically organized around a set of topics that may be related in a variety of ways (Meyer 1975) .

Text signals refer to words , phrases or special devices which appear in different places of the text to attract readers attention and emphasize a certain structure or content of the text without altering the information . Typical signals are titles , headings , previews , overviews , summaries , typographical cues , recall sentences , number signals , function indicators , relevance indicators , etc . (He & Mo 2000) . The effects of text signals mean the facilitating effects of text signals on text reading processing , reading comprehension and information retention .

In the last decades , a great number of experimental studies have been conducted on the effects of text signals in Western countries . For instance , Hartley & Trueman (1982) examined the effect of titles on the writing of summary and found that titles significantly improved the readers writing . Brooks et al . (1983) also found titles significantly improved summarizing and outlining . Wilhite (1986) found that title improved the readers memory of text gist . Lorch (1989) found that headings facilitate reader s reading

and comprehension by explicitly labeling text topics and their hierarchical structure. Lorch & Lorch (1996) examined how headings influence text recall and summarization, and they found that the presence of headings facilitated recall of unfamiliar topics but not familiar topics and that the presence of titles improved the memory of text information.

Since the 1990s, Chinese researchers have made a lot of studies concerning the effects of text signals on reading process. For example, Wan and Li (1992) explored the effects of titles and structural factors on reading comprehension of pupils and found that the presence of titles could facilitate pupils' reading comprehension of the text; Tian and Zhang (2003) examined the effects of text signals on the recall of text and problem solving of good and poor readers in a senior middle school, and they found that the problem solving performance of different level readers could be significantly enhanced by text signals and that there were significant differences between good and poor readers on the recall of text and problem solving; Wang, Yan and Bai (2004) explored the effects of text signals on text summary and showed that signals in a text improved the readers' memory for topics and text signals led readers to selectively process the context; Yang and Liu (2004) found that text signals only facilitated the detailed information retention of reading comprehension difficult students and had impaired effects on the detailed information retention of reading normal students.

However, the previous researches mainly focused on the effects of text signals on memory for text and those studies were carried out with native speakers. In this study, the author intended to explore the effects of text signals on EFL learner reading comprehension and information retention in EFL learning, especially to examine whether there were any different effects of text signals for readers with high and low reading proficiency. According to a survey on reading strategy use of the freshmen in Guangdong Vocational Institute of Public Administration, we found that more than 65% of students couldn't use reading strategies effectively and efficiently in the course of reading, such as predicting the contents of the text, summarizing information, and using signal words to see relationships.

Thus, in this study, we chose the students of Guangdong Vocational Institute of Public Administration as the subjects. We managed to integrate the experimental studies into ongoing classroom reading activities to make a study of the effects of title plus headings on EFL learners' reading comprehension and information retention so as to provide implications for future classroom reading instructions as well as textbook compiling. We only selected title plus headings as the experimental research issue, because titles and headings are the most salient signals in expository texts and their presence may significantly influence EFL readers' reading comprehension and information retention of the text.

2. Research Design

Two experiments were conducted to explore the effects of title plus headings on EFL learner reading comprehension and information retention: Experiment 1 was in normal reading, and Experiment 2 was in fast reading. The independent variables were title plus headings, and EFL readers' reading comprehension and information retention were used as dependent variables. The experiments were used 2 (with signals vs without signals) \times 2 (high reading proficiency vs low reading proficiency) between-subjects design. The participants were required to read an expository passage that contained or didn't contain titles or headings, and then they were tested on two dependent variables: reading comprehension, information retention. Each experiment included two tasks: Task 1 was to examine the effects of text signals on reading comprehension; Task 2 was a delayed test to detect the subjects' retention to the text information. These tasks were also designed to examine whether there were significant differences in the effect of title plus headings in an expository text for the readers with high or low reading proficiency. Then, all the data would be analyzed by using 2 \times 2 between-subjects analysis of variance (ANOVA) with SPSS 12.0 (Statistics Package of Social Science).

2.1 Experiment 1

2.1.1 Method

Participants. The participants (aged from 19 to 22) came from the same department of International Economics and Trade of Guangdong Vocational Institute of Public Administration. All of them didn't

receive any special training of text signaling reading strategies ,yet their English reading proficiency was quite different even though they were in the same class .

In order to divide the participants into different proficiency groups ,a reading comprehension pretest based on nationwide PRETCO -A (Practical English Test for Colleges -Level A) was administered to them . Based on the results of the pretest ,the students were classified into three reading proficiency groups : low ,intermediate and high .44 students (the top 25 % of the total students) were classified into the high -level group ;44 students (the bottom 25 % of the total students) were classified into the low level group , and the intermediate group was excluded in the statistics as this study was designed to investigate the different effect of signaling on high proficiency readers and low proficiency ones . The scores of the pretest were analyzed by means of significance test ,using t test to examine whether there was significant difference in reading proficiency between the high level group and the low level group . The t test results showed that difference was reliably significant , $t_{(87)} = 5.453$, $p < 0.05$. Thus ,English proficiency between the high level group and the low level group was significantly different . Then the participants were divided into four experimental groups :22 high level readers reading texts with signals (Group A1) , 22 low level readers reading texts with signals(Group A2) ;22 high level readers reading texts without signals(Group B1) ,and 22 low level readers reading texts without signals(group B2) .

Materials . The materials were selected from the textbooks for higher vocational college students classroom reading ,but not used by the subjects . An expository passage ,“ Lessons from Jefferson ” (567 words) was from the textbook of College English (Intensive Reading , Book 2) ,and thus it was clearly within the readability level of the subjects . The passage was presented to the participants with two versions :one with title plus headings ,the other without title or headings . The nonsignaled version was identical to the signaled version except for deleting the title and headings .

Procedure . The experiment consisted of two phases :a) a reading comprehension test phase ,b) an information retention test phase . The experiments were conducted in the subjects normal English classes . The participants of Group A1 and A2 were given the versions with title plus headings and the participants of Group B1 and B2 received the versions without title plus headings . According to the basic requirements in College English Curriculum ,the vocational college students normal reading speed should be at least 70 words per minute (wpm) ,so the participants were instructed to read the article at their normal reading speed and finish their reading comprehension task within 11 minutes .

10 days later ,a delayed retention test was conducted to test the participants retention for the text information ,and they were required to finish the test without reading the previous texts .

Scoring . The comprehension test consisted of 5 multiple choice questions ,and the information retention test was 5 True or False statements . Each correct answer scored 1 point and the total score for each test was 5 points for each individual .

2.1.2 Results and analyses

The means and standard deviations for reading comprehension in normal reading were presented in Table 1 .

Table 1 . Means and Standard Deviations for Reading Comprehension as a Function of Title plus Headings in Normal Reading

	High reading proficiency	Low reading proficiency
Signals	3.227(0.812)	2.046(0.653)
No signals	3.091(0.526)	2.000(1.024)

In Table 1 ,the means and standard deviations for reading comprehension showed that both the more proficient readers and the less proficient readers scored much higher in the signaled condition than in the nonsignaled condition in normal reading .

The results of 2 ×2 between subjects analysis of variance (ANOVA) on reading comprehension in normal reading showed that reading proficiency had significant main effect , $F_{(1,84)} = 41.685$, $p < 0.001$. It meant that the more proficient participants scored significantly higher than the less proficient ones in

reading comprehension tasks in normal reading condition. Signaling also had significant main effect, $F_{(1,84)} = 7.880$, $p < 0.01$. That's to say, the participants who read passages with title plus headings comprehended significantly better than those without title plus headings. The results of ANOVA showed that the interaction between reading proficiency and signals was not significant, $F_{(1,84)} = 0.709$, $p > 0.05$. Thus, the significant facilitating effects of title plus headings were found on reading comprehension in normal reading.

Then, the effects of title plus headings on information retention in normal reading condition were analyzed. The means and standard deviations of information retention in normal reading are presented in Table 2.

Table 2. Means and Standard Deviations for Information Retention as a Function of Title plus Headings in Normal Reading

	High reading proficiency	Low reading proficiency
Signals	2.273(0.767)	2.046(0.575)
No signals	2.182(0.958)	1.273(0.703)

Table 2 showed that the more proficient readers scored a little higher in the signaled condition than in the nonsignaled condition, while the less proficient readers scored much higher in the signaled condition than in the nonsignaled condition. The results of ANOVA demonstrated that the reading proficiency had significant main effect, $F_{(1,84)} = 12.187$, $p < 0.01$. Signaling also had significant main effect on the information retention, $F_{(1,84)} = 7.039$, $p < 0.05$. Most importantly, the interaction between reading proficiency and signaling was significant, $F_{(1,84)} = 4.387$, $p < 0.05$.

The simple effect test indicated that for participants with high reading proficiency, the scores in the passages with title plus headings did not differ significantly from the scores in the passages without title plus headings, $F_{(1,42)} = 0.121$, $p > 0.05$. It meant that there was no significant facilitating effect of title plus headings in the information retention for participants with high reading proficiency. It was suggested that the presence of title plus headings only slightly facilitate information retention for more proficient readers in normal reading.

However, for the less proficient participants, their scores in the passages with signals did differ significantly from their scores in the passages without signals, $F_{(1,42)} = 15.928$, $p < 0.001$, which meant that there was significant facilitating effect of title plus headings in the information retention for the less proficient participants. The result implied that the facilitating effect of title plus headings for less proficient readers was more significant than that for more proficient ones in the information retention. It suggested that the presence of title plus headings would significantly facilitate information retention for less proficient readers in normal reading.

The significant interaction between signaling and reading proficiency on information retention could be illustrated in Figure 1. It was obvious that there was no significant difference in signaling condition for the readers with high reading proficiency, but the difference in nonsignaling condition was very significant for the readers with low reading proficiency.

Figure 1. Reading proficiency x Signaling condition interaction

In short, the results of Experiment 1 indicated that the effects of signals on information retention

depended on participants reading proficiency and the less proficient readers benefit more from signaling than the more proficient readers ,especially in the information retention test . The facilitating effects of title plus headings were found both in reading comprehension and information retention test in normal reading .

2.2 Experiment 2

2.2.1 Method

Participants . The participants were the same as those in Experiment 1 .

Materials . An expository passage ,“ How to Plan Your Career ” (580 words) ,selected from the participants classroom reading material (New Horizon English Course , Book 2) was used as the reading material ,and thus it was clearly within the readability level of the subjects . A signaled version and a nonsignaled version were presented to the subjects of different groups . The nonsignaled one was identical to the signaled version except for deleting the title and headings .

Procedure . The procedure of this experiment was the same as that of Experiment 1 . It also included two tasks :a reading comprehension test and an information retention test . Participants were also tested in four experimental groups :Group A1 and A2 reading the versions with title plus headings ;Group B1 and B2 receiving the versions without title plus headings . However ,the subjects were asked to read the reading material at the fastest reading speed . According to the basic requirements in College English Curriculum ,the vocational college students fast reading speed should be at least 100 wpm . The subjects were required to finish the reading comprehension test within 7 minutes .

10 days later ,a delayed retention test was conducted to test the subjects retention for the text information without reading the previous texts .

Scoring . Scoring in Experiment 2 was identical to that used in Experiment 1 .

2.2.2 Results and analyses

The means and standard deviations for reading comprehension in fast reading were presented in Table 3 .

Table 3 . Means and Standard Deviations for Reading Comprehension as a Function of Title plus Headings in Fast Reading

	High reading proficiency	Low reading proficiency
Signals	3 .455 (0 .800)	2 .727 (0 .631)
No signals	2 .864 (0 .889)	1 .909 (0 .684)

Table 3 showed that both more and less proficient readers scored much higher in the signaled condition than in the nonsignaled condition in reading comprehension in fast reading condition . The results of ANOVA showed that reading proficiency had significant main effect , $F_{(1,84)} = 27.096$, $p < 0.01$, which meant that the more proficient participants scored significantly higher than the less proficient ones in fast reading comprehension tasks . Signaling condition also had significant main effect , $F_{(1,84)} = 19.021$, $p < 0.01$,that s to say ,the participants who read passage with titles plus headings scored significantly higher than those without title plus headings . The interaction between reading proficiency and signaling condition was not significant , $F_{(1,84)} = 0.495$, $p > 0.05$.

Then ,the effects of titles plus headings on the information retention in fast reading were analyzed . The means and standard derivations of information retention in fast reading are presented in Table 4 .

Table 4 . Means and Standard Deviations for Information Retention as a Function of Title plus Headings in Fast Reading

	High reading proficiency	Low reading proficiency
Signals	3 .636 (0 .902)	2 .955 (0 .785)
No signals	2 .818 (0 .853)	1 .909 (0 .811)

Table 4 showed that both more and less proficient readers scored much higher in the signaled condition than in the nonsignaled condition in information retention tasks in fast reading condition. The results of ANOVA demonstrated that reading proficiency had significant main effect, $F(1, 84) = 18.335$, $p < 0.001$, which meant that the more proficient participants scored significantly higher than the less proficient ones in the information retention test. Signaling condition also had significant main effect on the information retention, $F(1, 84) = 27.979$, $p < 0.01$. It meant that the participants who read signaled passages scored significantly higher than those who read nonsignaled passages. The interaction between reading proficiency and signaling conditions was not significant, $F(1, 84) = 0.452$, $p > 0.05$. It was suggested that the presence of title plus headings would facilitate information retention for both high and low proficient readers in fast reading.

In a word, the facilitating effects of title plus headings on reading comprehension and information retention were further confirmed in Experiment 2.

3. General Discussion

Why was there a little difference in the results pattern of Experiment 1 and Experiment 2? In Experiment 1, the significant facilitating effects of signaling on reading comprehension were found, but the facilitating effects of signaling on information retention depended on participants' reading proficiency. In Experiment 2, however, the significant facilitating effects of signaling were found both on reading comprehension and information retention, and the effects were independent of participants' reading proficiency. This difference might be resulted from different reading conditions. In normal reading, the participants, no matter how proficient they were, they had enough time to read the passage carefully, so the facilitating effects of title plus headings may not be so salient. Nevertheless, in fast reading condition, the participants had to finish the task within the limited time, and thus, they didn't have enough time to read the whole passage in details. Then the title and headings could be more easily recognized as important signals and might be selectively paid more attention to by the readers, therefore, the facilitating effects of title plus headings in Experiment 2 were more salient than that in Experiment 1.

3.1 Effects of text signals on reading comprehension

The results of the experiments showed that the presence of title plus headings could facilitate EFL learners' reading comprehension because the subjects reading the passages with title plus headings scored significantly higher than the subjects reading the passages without title plus headings both in normal and fast reading condition. This result is consistent with the previous findings: a) titles have significant facilitating effect on the reading comprehension for middle school students (Wan et al., 1992); b) signals in a text improved the readers' memory for topics (Wang, Yan & Bai, 2004).

According to schema theory, the reader's schemata play a critical role in reading comprehension. The quality of the reader's comprehension is determined by the schemata stored in his mind. When the reader has the appropriate schemata and can successfully activate them, good comprehension is achieved. The presence of title plus headings in an expository text significantly facilitates the reader's cognitive processing due to the following possible reasons. Firstly, title and headings invariably are distinguished from the body of the subsequent text both by their special locations and typefaces. Secondly, the title in an expository text usually conveys the theme or the main idea of a text and acts as cues for prior knowledge relevant to a given topic, and thus, providing a title can activate readers' appropriate schemata and enable the readers to relate information from the text to already existing background knowledge. The title, for instance, "How to plan your career", will activate schemata related to career planning. Thirdly, headings signal the topic of the subsequent subsection and strengthen the relationships among the concepts and the facts in a given text, and can activate the appropriate schemata. Therefore, the presence of title plus headings in a text strongly influences readers' cognitive processing and significantly facilitates readers' reading comprehension. Therefore, all the readers can benefit from the presence of title plus headings in an expository text both in normal and fast reading condition.

3.2 Effects of text signals on information retention

In Experiment 1 and Experiment 2, we've found that the signaled groups performed much better than nonsignaled groups on the retention of text information. The presence of title plus headings can

significantly facilitate EFL readers information retention both in normal reading and fast reading . Our results are consistent with the previous findings of some Western researchers :a) Titles improve the readers memory of text information (Wilhite 1986 ;Lorch 1989) ;b) Headings aid memory for the text , and then produce improvements in information retention performance (Lorch &Lorch 1996) ;c)signals in a text improved the readers memory for topics and text signals led readers to selectively process the context (Bai 2004) .

According to the Interactive Model (Rumelhart 1977) ,the most efficient processing of reading is actually an interactive process involving both top down and bottom up processes working together interactively . The flexible processing depends upon contextual circumstances and success at recalling and retaining a text depends heavily on the completeness and coherence of reader s representation of the topic structure of the text . Title plus headings in an expository text may explicitly communicate and emphasize a text topic structure ,and then the readers might produce better understanding and better memory for text information . Furthermore ,title plus headings provide retrieval cues for reader s subsequent recall and may facilitate the readers to represent the texts structurally .In recall ,the readers will search for the text information from the structure representation and then their overall recall and information retention should be better if a text contains organizational signals than if it does not . Consequently ,when an expository text is presented with title plus headings ,readers are likely to produce better retaining for text information .

3.3 Text signaling effects on readers with different reading proficiency

The results of the experiments showed that both more and less proficient readers could benefit from text signaling and that the latter benefited more from the presence of title plus headings than the former . These results confirmed Yang and Liu s findings (2004) :text signals facilitated low level students information retention .

3.3.1 Text signaling effects on readers with different reading proficiency in normal reading

In normal reading ,the results showed that the presence of text signals could facilitate both more and less proficient readers reading comprehension and information retention and that the less proficient readers would benefit more from signaling than the more proficient ones . What are the possible reasons for these results ?

As mentioned above ,the reader s schemata play an important role in reading comprehension . The presence of title plus headings explicitly communicates the main ideas and emphasizes the topics of an expository passage and provides schema and subschema for the readers .In normal reading circumstance ,all the participants have enough time to read the passage carefully and to identify the text information in the text .In this case ,text signaling effects are mainly affected by the subjects reading proficiency .

To the high proficient readers ,they have probably mastered some reading strategies and can utilize decoding skills automatically to promote their comprehension and retention of text information . According to Rumelhart(1977) ,skillful readers can constantly shift between top down and bottom up processes according to the text they are reading .In normal reading ,high proficient readers can cognize the organization and the topic of a passage to decode the language and understand the writer s thought even though they read a text without signals . Therefore ,they scored just a little higher in the signaled condition than in the nonsignaled condition in normal reading condition .

However ,for low proficient readers ,signals may play greater importance in reading as a result of their low proficiency or bad reading habits . According to Li (1997) ,failure in EFL reading is usually caused by the lack of some schema ;mismatch of a schema or over reliance on bottom up process . When low level readers read a text without signals ,they are likely to over rely on bottom up process because of the lack of some schemata or sufficient contextual clues in the text ,failing to activate their background knowledge during text processing . However ,when they read a text containing such text signals as title plus headings ,they could more easily decode the text information ,which may result in their better understanding and retaining of the text . That s why the low proficient readers scored significantly higher in the signaled condition than in the nonsignaled condition and benefited more from signaling than the

high proficient ones in normal reading condition .

3.3.2 Text signaling effects on readers with different reading proficiency in fast reading

In fast reading condition , it was found that signaling and reading proficiency functioned independently . The result pattern of reading comprehension and information retention were almost the same ; both more and less proficient readers scored much higher in the signaled condition than in the nonsignaled condition both in reading comprehension and information retention . What are the possible reasons for these results ?

In fast reading condition , the participants have to finish the task within the limited time . In this case , signals play more important role in reading comprehension . According to schema theory , a reader's failure to activate schema (formal or content) during reading may result in poor comprehension . When a text is provided with title plus heading , it can more quickly activate schema that the reader may already possess , then they may spend less time in processing the text with the help of contextual clues in the text . Therefore , the presence of text signals can facilitate both more and less proficient readers in fast reading condition .

When a reader receives a text without containing title or headings , he or she may spend much more processing time in extracting meaning from the text . According to Mayer (1983) , when the structure of a passage is not clear , the reader is likely to use a rote reading strategy . In this case , the reader must view each idea as a separate entity , and there is little chance to connect the information into a coherent representation . A more proficient reader is likely to use all levels of processing strategies and their background knowledge simultaneously to decode a passage by relying on linguistic cues in the text to identify what is important since they have acquired automatic decoding skills , even though they read a nonsignaled text in fast reading . However , a less proficient reader may fail to pick up the linguistic cues or activate schema (formal or content) to match their own background knowledge within the limited time . Poor readers have not acquired automatic decoding skills , they therefore spend much more processing time on " thinking about " the words rather than automatically recognizing them (Stanovich , 1980) . Thus , text signals may play more important role for low level readers text processing , especially in fast reading condition . When they receive a text containing title plus headings , it is more likely for them to activate schemata they already possess , and then they can decipher the relevant topics and the organization of the text more quickly and construct a more coherent representation during reading , which may lead to a better understanding and retaining of the text information . As a result , the presence of text signals would significantly facilitate both more and less proficient readers reading comprehension and information retention in fast reading .

4 . Conclusions

Based on the results of the two experiments , major findings were summarized in the following points : Firstly , the significant facilitating effects of title plus headings on reading comprehension and information retention were found in normal reading . But there was a slight difference in the result pattern . In reading comprehension , the facilitating effects of signals were found for both more and less proficient readers . However , in information retention , the facilitating effects of title plus headings were more salient for the less proficient readers than for the more proficient readers . Secondly , the significant facilitating effects of title plus headings on reading comprehension and information retention were also found in fast reading . Both more and less proficient readers could benefit from this signaling . The result pattern of reading comprehension and information retention were exactly the same in fast reading condition .

Because of the restricted time and condition , the present experiments were limited to study the effects of title plus headings for EFL vocational college students reading comprehension and information retention . The present study has its own limitations : Firstly , as we used multiple choice to test the understanding of the text , the subjects might guess the correct answer . Secondly , the experimental time could not be under exact control since the experiments were conducted in the classroom , which might influence the results of the experiments . Lastly , the experimental results could not be generalized to other text styles (e. g . , a narrative story) since this research focused on text signals in an expository text . All

these issues deserve further consideration and call for more extensive investigation in the future .

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