



Influence of Cognitive Factors on the Process of Readers' Reading Comprehension

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Abstract

Reading comprehension, which is consistent with language comprehension and general comprehension, is a complicated psychological process. During reading, readers have to recognize words and understand sentences of the new reading materials to achieve comprehension. In order to comprehend the text completely and correctly, readers need to relate new information to the knowledge stored in their brains. Readers' reading comprehension is influenced by many factors, such as readers' intelligence, innate ability, psychical conditions, psychological factors and language basis. Cognition is a part of psychological activities and a rational thinking process in contrast to emotion, motivation and readers' endurance. In this paper, the author will explore how cognitive factors influence readers' reading comprehension on the basis of a case study. By the study, it's proved that cognitive factors influence readers' reading comprehension in two aspects, one is readers' knowledge structure and the other is readers' abilities structure.

Key words: Cognition; Reading comprehension; Knowledge structure; Abilities structure

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INTRODUCTION

Reading comprehension, which is consistent with language comprehension and general comprehension, is a

complex psychological process. Reading comprehension is an interaction between the reader's background knowledge and the text, between writing symbols and abstract information (Skehan, 1998). While reading, readers must be armed with language knowledge, such as words, sentences in order to comprehend the surface structure of writing symbols. Furthermore, they have to understand the transference of the deep structure of semantics in order to process, analyze, associate and presuppose the information transferred by reading materials. Thus, reading comprehension is the result of interaction of the author, language information and the reader.

1. WHAT IS READING COMPREHENSION AND COGNITION?

Many factors influence readers' comprehension in reading activity, such as readers' language ability, emotional factors, and comprehension ability, especially cognitive factors (Chen, 2001). Cognitive psychology regards people's cognitive process as a process of exploring the objective world, and emphasizes the high-level psychological process as memory, learning, thinking, language and sensibility. Cognitive psychology generalizes "cognition" as a total human being's psychological process, and regards human beings as a computerized information processing system. Modern cognitive psychology which explains human beings' psychological using information processing terms and computer's working rules believes that cognition is a total process of transference, analysis, processing, storage, recovery and sense input. Cognition, which is a part of psychological activity and a rational thinking process in contrast to emotion, motivation, and endurance, is a readers' active recognizing process.

On the cognitive point of view, reading can be formulated as (Hua, 2001):

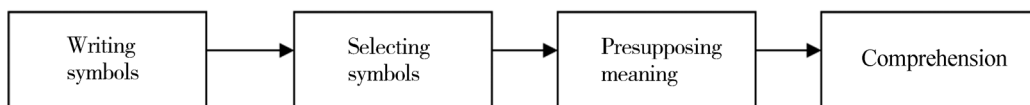


Figure 1
Formulation of Reading Comprehension

From the figure, it is clear that reading comprehension is an interactive process of “bottom-up” reading and “top-down” reading. That is to say, when readers read an article, they precede at least two activities: One is readers’ literal understanding of the article on the basis of words, phrases, and the other is readers’ reconstruction of new information by the use of background knowledge stored in their brains. The second activity is based on the presupposition of the first, i.e. this kind of readers’ cognition is set up on their own original cognition. Comprehension of one article is greatly based on the presupposition of experiences or is an informational processing of the new reading materials depending on the original information.

2. CASE STUDY

2.1 A Questionnaire Survey

This questionnaire survey aims to investigate the change of the undergraduates’ interests and their attitude to English reading, and then find out whether cognitive factors are effective in cultivating the students’ interests in English reading class and improving their English reading ability. Participants in this study are students from 2 classes including 120 students in Grade 2 of a university.

The study will follow the following procedures:

Firstly, 120 questionnaires are handed out to investigate undergraduates’ attitude and interests in English reading before cognitive factors are introduced to them. Then, the author collects all the questionnaires, counts the handed number and analyses the data. Every question is analyzed through calculating the percentage of every option. By analyzing the percentage, participants’ attitudes towards the questions in the questionnaire can be seen.

Secondly, cognitive factors, which influence reading comprehension, and the way of how to use cognitive factors in reading comprehension, were explained to students of class two. After a training of one term, the author handed out the questionnaire to the two classes again.

Finally, the author analyzes the students’ attitude and interests in cognitive factors. The Questionnaire has ten detailed questions attempting to know the students’ interests and attitude toward English reading class. The final outcome of pre-questionnaire and post-questionnaire is shown in Table 1 and Table 2:

Table 1
Analysis of the Questionnaire Before Experiment

Class	Class 1				Class 2			
	No	A	B	C	Total	A	B	C
1	16	36	8	60	22	28	10	60
2	20	22	18	60	24	26	10	60
3	22	30	8	60	28	25	7	60
4	18	34	8	60	11	24	25	60
5	10	28	22	60	14	20	26	60
6	11	29	20	60	11	22	27	60
7	20	26	14	60	20	25	15	60
8	12	33	15	60	20	24	16	60
9	18	30	12	60	24	14	12	60
10	20	21	19	60	19	23	18	60
M	17%	26%	15%	60%	22.5%	21.5%	16%	60%

Table 2
Analysis of the Questionnaire After the Experiment

Class	Class 1				Class 2			
	No	A	B	C	Total	A	B	C
1	40	15	5	60	26	24	10	60
2	38	15	7	60	25	25	10	60
3	40	14	6	60	26	25	9	60
4	34	18	8	60	11	25	24	60
5	30	20	10	60	15	21	24	60
6	41	14	5	60	11	23	26	60
7	26	20	14	60	19	24	17	60
8	29	9	22	60	21	25	14	60
9	31	18	11	60	25	13	12	60
10	25	18	17	60	20	22	18	60
M	20%	16%	15%	60%	23%	21.2%	15.5%	60%

In the questionnaire, the purpose of questions one to ten is to know undergraduates’ interests in English reading class, and their reading habit. In Table 1 and Table 2, 1 means the question one, 2 means question two, 3 means question three, and so on. Then, A means the answer A, B means the answer B, C means the answer C, and D means the answer D, and M means the average option rate of different options for different choice questions. In questions one to question ten, the

options A are positive, and the options B is neutral, while the options C is passive. Therefore, it can be concluded that the higher the average option rate of option A, the more interests and better habit in English reading that senior high school students have. The lower the average option rate of option C, the senior high school students have fewer interests and worse habit in English reading.

According to Table 1, it can be found that before the experiment, in question one to question ten, the options B is the most popular option in Class 1 and the average option rate of option B in Class 1 is 27%. The average option rate of option A in Class 1 is 17%, and the average option rate of option A is lowest. While, options A are the most popular options in Class 2 and the average option rate of option A in Class 2 is 22.5% higher 5.5% than that in Class 1, and the average option rate of option B is 21.5% lower 4.5% than that in Class 1.

According to Table 2, after the experiment, in question one to question ten in Class 1, the students who choose A are the most and the average option rate of option A is 20%. The average option rate of option B is 16%, and the option C is the most unpopular options. In Class 2, options A are the most popular options in Class 2 and the average option rate of option B is 23%. The average option rate of option B is 21.2% and the option C is very unpopular. It is higher 9.7% than the average option rate of option A from Class 2. It means that the senior students in Class 1 have more interests and better habit in English reading after the experiment.

By comparing the average option rate of different options of Class 1, it can be seen that the average option rate of the option A increases 11% in Class 1 before the experiment and after the experiment, and the average option rate of the option C drops 1% before the experiment and after the experiment. By comparing the average option rate of different options of Class 1 and Class 2. It can be seen that the gap of average option rate of the option A in Class 1 and Class 2 closes from 5.5% to 3%. And the gap of average option rate of the option C in Class 1 and Class 2 closes from 1% to 0.5%. It is concluded that the students in Class 2 have more interests and better habit in English reading after the application of cognitive factors.

From the analysis above, cognitive factors are effective in improving students' interests in English reading learning.

2.2 A Feedback Form One Test

The intermediary system of cognition includes readers' knowledge structure and abilities structure. The richer the readers' intermediary system is, the greater the readers' cognition will be. Readers' cognition contributes a lot to comprehension.

Take a feedback from one test for example: The test paper is composed of 30% of lexical questions and 70% of reading comprehension questions. Five articles of reading comprehension are divided into 25 questions with 100 as the full score. The testing result demonstrates that most students' reading comprehension ability is comparatively low, and can be formulated as follows:

Table 3
Test Result

Score	90-95	80-89	70-79	60-69	50-59	40-49
Students number	3	33	27	33	16	3
Percent	2.60	28.7	23.48	28.70	13.91	2.60

Students attending the test summarized factors influencing their comprehension as follows:

- a) Hindrance from some unfamiliar words and sentence structures in reading comprehension,
- b) Lack of lexicons and low reading speed,
- c) Difficulty in grasping the internal relevance between sentences,
- d) Narrow knowledge space or lack of deep comprehension,
- e) Insufficiencies of common sense and social living experiences,
- f) Being unfamiliar with western culture, economy or politics,
- g) Failure to figure out differences between Western culture and Oriental culture,
- h) Using traditional ideas to analyze modern materials,
- i) Difficulty in forming memory in the process of reading,
- j) Getting literal meaning of articles but ignoring deep meaning,
- k) Difficulty in understanding the author's attitudes and attention or misunderstanding the author's intention,
- l) Resolving questions separating from the text.

From the above feedback, it is clear that reading comprehension is not only a simple process that readers construct meaning on the basis of recognition of writing symbols but influenced by many factors, such as language knowledge, corresponding background knowledge, and readers' memory ability, association, inference and thinking ability. Among these factors, readers' knowledge structure and abilities structure, called the intermediary system of cognition, are more important than the others. The intermediary system of cognition directly influences the maneuvering and operation of readers' cognition. The innate factors of the intermediary system of cognition which influence readers' reading can be described as follows:

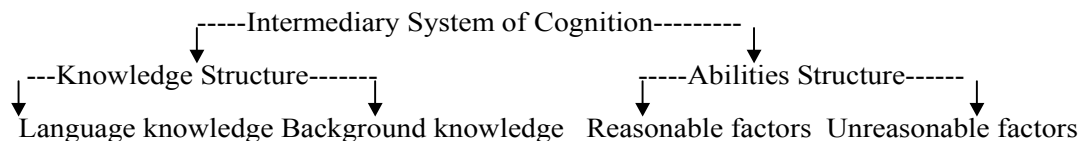


Figure 2
Influence of Intermediary System of Cognition on Reading Comprehension

3. IMPLICATIONS OF THE CASE STUDY

3.1 Influence of Knowledge Structure on Reading Comprehension

Knowledge structure system as one of the intermediary system of cognition is one main factor influencing readers' reading comprehension (Wang & Cao, 1992). It can be defined as a knowledge system constructed or formed in human being's brain while learning and practicing, especially thinking. Any kind of knowledge, people get from books or social practices is stored in their brain orderly in the form of structure and be stimulated when necessary. Concerning reading comprehension, knowledge structure can be divided into language knowledge and background knowledge (Zhang, 1991). Language knowledge consists of words, phrases, sentences, grammar, means, texts and rhetorical speeches, while background knowledge is composed of natural science and technology, social science, modern science, social experience and common sense of daily life. Among these two, background knowledge can provide correct context for readers to understand reading materials.

3.1.1 Influence of Language Knowledge on Reading Comprehension

The first step of reading is readers' sensitive perception of writing symbols. Recognition of surface structure of writing symbols is the base of transformation from language form to semantic meaning. Only when readers master different levels of language knowledge, such as words, phrases, sentences, text, grammar, can they achieve the transformation easily. Readers' lack of lexicons or poor management of grammar, or unclearness of semantics, or insufficiency in the knowledge about text structure will all affect their reading speed or comprehension. It is easier for readers to understand articles if they possess more words and solid grammar knowledge. When readers master basic and solid grammar knowledge and enough lexicons, they could understand the sentence meaning in the semantic aspect.

In the reading process, the first step of reading activity is readers' visual sense of writing symbols readers recognize in order to grasp their meaning. If they cannot recognize these symbols, they will not form correct recognition of what they read. The construction of the surface meaning includes any level of language such as words, phrases, sentences and text. Recognition of surface

meaning will be temporarily stored in the brain for short-term-memory, which is the necessary premise for storage and reappearance of information.

Recognition of writing symbols belongs to low-level phase of perceptual knowledge, mainly concerning the level of language knowledge. "Word is the core of information processing and the basic unit of deciphering but not the basic unit of reading comprehension." (Zhu, 2007) Readers' recognition of writing symbols doesn't go no with each syllable or each word, i.e. more attention will be paid on informational words or meaning groups rather than each single word. The internal structure of language attributes to visual sense.

3.1.2 Influence of Background Knowledge on Reading Comprehension

According to the above, it's shown that while reading, readers should not only recognize writing symbols to get the literal meaning of the sentence but use their possessed knowledge to make inference to find out the correct meaning of sentences under specific conditions. Background knowledge is introduced to analyze this effect, i.e. language knowledge only is not enough for readers to understand reading materials completely (Zhu & Lin, 1986). Readers have to use or transfer other knowledge stored in their brain for information processing to get further meaning. Background knowledge which plays an important role in reading comprehension is composed of many aspects such as social science, customs, and natural science. Among these components, custom's influence is the greatest.

Certain custom of one country may be strange to other countries. If a person reads some materials about another country, and knows little about that country, he may not grasp the real meaning of what he reads. The reason is that he has no corresponding background knowledge necessary to grasp the meaning that the material intends to convey. For example: An article telling a Chinese story was given to one group of American youth, the story is like this: A girl left home for some reason but finally came back home at the moment her mother would be dying. She cut a piece of meat from her arms and cooked for her mother. Most American students didn't understand the deep meaning of this story and were puzzled by what the girl did. Some even supposed that the girl had some special "Kongfu" to cure her mother's disease with her meat. Only one Indian student understand the story because he knew the girl

expressed her filial piety to her mother in a special way and there was such custom in India.

Then we can see background knowledge could help readers to understand what they read besides language writing symbols. Different peoples have different customs and value, that is the reason why some reasonable things in one country may be impossible in another. In cross-culture communication, lack of background knowledge may result in great hindrance and difficulties.

3.2 Influence of Readers' Abilities Structure on Reading Comprehension

Between two factors of the intermediary system of readers, abilities structure is another important element. Ability is an essential individual psychological feature for readers to achieve some activities successfully. It can be divided into cognitive ability, managing ability and social communicating ability. Reading ability is included in the category of cognitive ability. In Thorndike's opinion, abilities structure includes seven elements: a) ability of understanding words, b) ability of using words, c) computerizing ability, d) conscious ability about space, e) memory ability, f) speed of consciousness, g) inference ability.

Ability structure of reading is a combination of a series of readers' individual psychological features in the process of reading, including consciousness, memory, inference, association of words, and ability of thinking in images and abstract thinking. Any insufficiencies of readers' consciousness, poor memory or failure to form thinking in images and logical thinking will result in inferences or thinking mistakes.

3.2.1 Readers' Memory Ability on Reading Comprehension

Memory ability is one of readers' abilities structure. On cognitive view, memory can be analyzed in the principle of information processing, that is, memory is a reflection of past experiences whose basic process of remembrance, perseverance, re-recognition and reappearance and re-recognition are processes of informational extraction, or output and recovery. Memory plays an important role in reading comprehension. any kind of activity of people in reading, speaking, listening and writing involves remembering. Contents of memory involve image memory, logical memory, emotional memory and active memory or involve visual appearance or acoustic appearance of words and sentences, and some regulations of sounds or grammar, of which the important part is memory of words meaning, sentence meaning and utterance meaning. For foreign language learners, if there is no memory of language materials, such as words, sentences, they will not understand meaning of utterance or form logical memory of semantic meaning of utterance.

When people read or listen, they usually unintentionally remember contents of what they read

or listen to. Cognitive activities at this time are mainly recognition of utterance, formation of sentences' relations and follow of speaking speed. However, when they read textbooks or listen to very especially interesting utterances, they would like to remember some fragments or the whole contents. Memories are achieved on the basis of comprehension, vice versa, readers' memory ability affects their depth of comprehension.

3.2.2 Influence of the Readers' Reference Ability on Reading Comprehension

Reading comprehension is a complicated psychological process. When readers make the first step to recognize the writing symbols, they have to transfer their abilities structure in order to understand completely what they read. Inference ability is another factor of abilities structure influencing readers' reading comprehension. when reader carries on reading activity, he may not understand the text completely. In other words, he may recognize any words of the article but not grasp the author's deep attention. In cognitive psychology, we can see there's a missing link between words and text meaning. In order to achieve the complete comprehension, the reader had to make great effort to process, presuppose and infer so as to mend this missing link.

In reading comprehension, readers should develop inference ability to associate from words to meaning. Take American writer Hemmingway as an example, he usually uses simple structures in his several works (such as "The killers", "Hills as white elephants") so readers have to infer for a long time in order to understand the deep meaning. For example, one of his work "Hills as white elephants" describes a story about a discussion of women's abortion between a man and a woman, and meanwhile demonstrates two persons' different attitudes towards abortion vividly. However, through the whole article, there are no words like pregnant, abortion, etc. or any direct expressions of two persons' ideas. It is difficult for readers to understand it if they cannot infer from the words' literal meaning to deep meaning the author intended to convey.

Finally, readers' knowledge background, experiences, net-system of conception, thinking model, emotional and unreasonable factors form a multi-level entity of readers' ability structure system and then are internalized into readers' cognitive schema. Without ability, knowledge stored in the brain cannot be stimulated in reading comprehension. According to "schema theory", readers assimilate what they read using formalized cognitive schema to achieve fitness between them and reading materials. Cognitive process includes assimilation and extension. Only when readers maneuver any factors of cognitive ability of the intermediary system and make them interact orderly, can they master multi-levels hidden information of reading materials. Readers use corresponding knowledge, life experience to think

about any level of language and synthetically analyze information by the use of recognition, re-establishment, memory and association of objective information to grasp deep-level semantic meaning.

Knowledge structure and abilities structure as the intermediary system of cognition play an important role in linking up information between readers and what they read actively and helping readers to master deep meaning of reading materials.

CONCLUSION

In a word, cognitive factors play an important role in readers' reading comprehension. In order to improve the ability of reading comprehension, readers have to know the importance of the cognitive influence in the process of reading comprehension. In the reading process, they have to select the right materials with wide styles and rich thoughts, and at the same time read a lot to enrich their background knowledge. Only by this, can they establish steady language ability and improve their language structure and abilities structure. When they enrich their

intermediary system of cognition, they can basically improve their ability of reading comprehension.

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