ISSN 2522-6398 Vol. 7, Issue 3: 183-189, DOI: 10.25236/FER.2024.070331

A Study of Illustrations in Senior High School English Textbooks from the Perspective of Cognitive Psychology—A Case Study of PEP Optional Compulsory Four

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Abstract: *From the perspective of cognitive psychology, this paper presents a classification and statistical method of textbook illustrations based on the understanding and selectivity of perception, and analyzes the fourth optional textbooks of PEP senior high school English textbooks. This method is used to analyze textbook illustrations and help teachers make full use of illustrations.*

Keywords: *High school English; Cognitive psychology; Textbook illustrations; Teaching strategy*

1. The significance of textbook illustrations studied from the perspective of cognitive psychology

Textbook is one of the important carriers of teaching content. With the diversification of textbooks, textbook writers have made a lot of attempts both in the form and content. For example, the number of color illustrations in textbook illustrations has greatly increased and decreased; The role of illustration is gradually expanding. However, effective textbook illustrations need to conform to students' cognitive abilities, be understood by students, and appear in the form of supporting texts. Therefore, from the perspective of English teaching, the study of illustration should not only analyze its quantity, but also its effectiveness. The study of validity needs to start from the perspective of cognitive psychology and people's perceptual characteristics, and fully consider students' actual experience, learning cognitive rules and picture reading habits. [1] Therefore, from the perspective of cognitive psychology and from the perspective of perceptual comprehension and selectivity, this paper analyzes the illustrations of the four optional compulsory high school English textbooks in the New edition. This method is used to analyze textbook illustrations, which can help teachers understand the efficacy of textbook illustrations more fully and improve teaching.

2. The theoretical basis of cognitive psychology for the validity of textbook illustrations

The dual coding theory is put forward by psychologist Paivio. The theory holds that human cognitive system consists of two sets of codes, verbal code and non-verbal code. [2]Both verbal and non-verbal systems play equally important roles in the storage, processing and extraction of information. Paivio also postulates the existence of two distinct units of representation: the "lexeme" for linguistic entities and the "pixel" for mental images. Lexical elements operate in a sequential and hierarchical manner. [3][4] That's why it's so much harder to write a word backwards. The mode of operation of the pixel is continuity, integrity and cluster. [5] For example, people can use a melody as a cue and then conjure up a number of things from a particular scene to form a complete "re-enactment of yesterday". This is the law of integrated operation of non-linguistic coding systems.

Dual coding theory also proposes three types of processing of information: representational, referential, and associative. As shown in Figure 1. Representativeness refers to the direct activation of verbal or nonverbal representations; Reference refers to the use of non-verbal systems to activate speech systems; Associativity refers to the internal activation of representations within the same verbal or non-verbal system. In the comprehensive reading of pictures and texts, students use both the linguistic system and the non-linguistic system, and can get a more correct understanding through the reference connection. Therefore, students' understanding of illustrations is influenced by the words before and after the illustrations. Only effective illustrations with appropriate words to supplement the illustrations can help

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students have a more accurate and comprehensive perception.

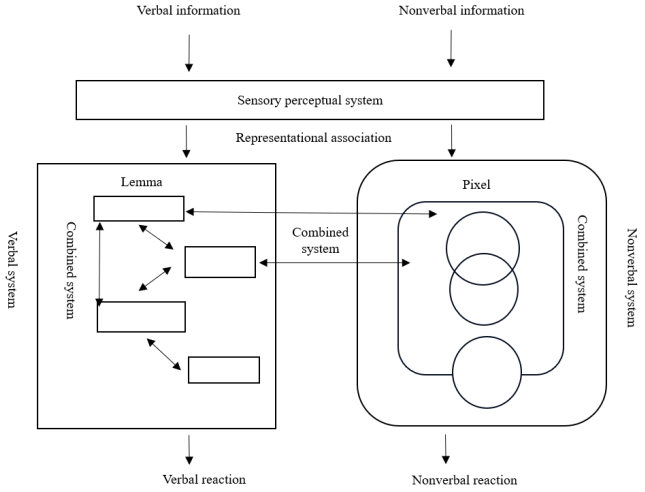

Figure 1: Dual coding theory

3. Research on perception-based comprehension of textbook illustrations

According to the "English Curriculum Standards for Senior High Schools" (revised in 2020, 2017 edition), illustrations should be closely combined with teaching content and teaching purpose. Similarly, from the perspective of cognitive psychology, human perception is understandable. People also show understanding when looking at illustrations.

According to previous studies on illustration, Levin et al. [6] believe that illustration can make the text more coherent, specific and easy to understand. Hunter[7] et al. classified the functions of illustration into five categories: Reinforcement; Decoration; Expand; Summarize; Compare. From a cross-cultural perspective, Tang[8] classifies the functions of textbook illustrations into three categories: decoration and embellishment: illustrations arranged to enhance the aesthetics of textbooks; Summarize, strengthen and promote text understanding: emphasize and summarize part of the content of the textbook, and show the more abstract narration with illustrations; Accurate dissemination of knowledge and information function: to help readers accurately understand a certain knowledge of the textbook, or to expand readers' horizons.

In view of the previous studies on the function of textbook illustration, we find that most of the studies focus on the mutual interpretation between illustration and text, but ignore the attention of the reading object. Textbook illustrations should take into account both text and reading objects. Based on this, the function of textbook illustration can be summarized into the following three aspects: decorative function, explanatory function and promoting function. Therefore, the illustrations in the textbook can be divided into two parts according to whether the pictures and texts are related, that is, the illustrations with unrelated pictures and the illustrations with related pictures. In the case of interrelated graphics, they can be divided into illustrations that explain the function and illustrations that promote the function according to the degree of combination of graphics and texts, as shown in Figure 2. Since illustrations with unrelated decorative functions are hardly educational, they are not considered in this article.

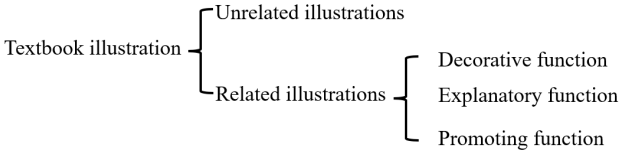

Figure 2: Classification of the illustrations from perceptive perspective

As shown in Figure 3, this illustration is from Optional Compulsory Four. Unit 2 Iconic Attractions Reading and Thinking Experience the iconic features of Australia. The theme of the section is "Experiencing Australia's iconic characteristics". The text consists of four blog posts about the author's

ISSN 2522-6398 Vol. 7, Issue 3: 183-189, DOI: 10.25236/FER.2024.070331

notes and feelings during his trip to Australia. The third section describes the indigenous people's way of life in close distance with nature from a musical point of view. It describes how people play the didgeridoo, a special instrument made from the branches of trees. The text describes the instrument as "The didgeridoo is made from a tree branch which is hollow. To play the didgeridoo, you put your mouth on one end and blow while vibrating your lips. Unlike a horn, there are no figure holes. The didgeridoo player has to change the shape of his mouth in order to change pitch." The illustrations at the top right of the textbook further explain the text and give readers a more visual understanding of the Didgeridoo. Therefore, the illustration has explanatory function.

Figure 3: Explanatory function

As shown in Figure 4, this illustration is from Unit 4 Sharing Opening Page. The illustration occupied the whole page. When the teacher asked the students to describe what they saw, the students described the illustration as children drawing water and "CHINA AID" at the bottom right, but it was difficult for the students to connect the well in the illustration with "CHINA AID". At this time, the teacher should further explain to the students that "CHINA AID" is a Chinese relief organization. This illustration shows a group of students fetching water from a well rescued by China in the village of Guayouzi, eastern province of Ghana, Africa. In the illustration, there are not too many words to explain the illustration, but in the process of students' self-learning or teachers' teaching, the illustration promotes students' cognition and expands readers' vision. Therefore, the illustration has the promoting function.

Figure 4: Promoting function

Through the analysis and research of optional compulsory 4, it is found that 33 illustrations belong to the promoting function and 45 illustrations belong to the explanatory function. The main function of the textbook is to transfer knowledge, so it is reasonable to have more illustrations explaining the function than promoting the function. There are many illustrations with explanatory function, which can help students deepen their understanding of the text, while the illustrations of promoting function can help students divergent thinking, apply knowledge, and reflect the epochal nature of the textbook.

4. A study of textbook illustration based on selectivity of perception

The selectivity of perception is reflected in the analysis of textbook illustrations. When students observe illustrations with multiple objects, they will choose one or two of them as the objects of perception, while the other objects are regarded as the background and ignored. When students watch illustrations with only one object, they will have less room for choice and a higher degree of concentration. The selectivity of perception is not only related to subjective interests and needs, but also affected by objective image characteristics. The color, shape and clarity of pictures are factors that affect the

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effectiveness of illustrations. [9]

Based on the principle of selectivity of perception and according to the expression form of textbook illustrations, it can be divided into two categories: physical drawings and tables. Different types of illustrations have different functions. The single object of the table can better focus students' attention and avoid the disadvantages of selectivity of perception in learning. However, only the table will make the textbook boring and out of touch with reality, while the appearance of the physical map can play a role in connecting with reality.

The effectiveness of different types of illustrations also needs to be determined in relation to where illustrations appear in the textbook. According to the position of illustrations in the textbook, illustrations are divided into illustrations in the stage of knowledge explanation and illustrations in the stage of application consolidation. The physical drawings are the closest to the real world, and the use of it in the knowledge explanation stage can arouse students' learning interest and expand their vision. Tables can summarize information and have the function of making thinking more careful, which is more suitable in the application consolidation stage.

The physical drawing is shown in Figure 5. The illustration is selected from Unit 2 Iconic tractions Using Language Discuss what best represents a place. The theme of the event is "Discuss what best represents New Zealand." The listening text is a radio interview in which the host invites three media and publishing professionals to give their views on what best represents New Zealand. The things proposed by the three professionals and these technical terms are missing in the original schema of the students. At this time, in order to reduce the difficulty of listening, 8 illustrations are presented in Task 1 of the text. These illustrations are all physical drawings, showing the real face of New Zealand. It can help students rebuild their picture of New Zealand.

Figure 5: Physical drawing

Table is a common image type in English teaching materials. Tables can be further divided into knowledge presentation tables and fill-in tables[10]. Tables that present knowledge are tables that present new knowledge or summarize information in textbooks. Fill-in forms are forms with some or all of the information missing, requiring students to complete the information after listening or reading according to what they have heard and seen.

As shown in Figure 6, this illustration is selected from Unit 1 Science Fiction Using Language Voice your opinions on robots and AI. The text is composed of four activities. Activity 4 requires students to think, discuss the development of robots and artificial intelligence, and express their own opinions in combination with the three laws of robotics. Below Activity 4, students are provided with topic changing phrases that they might use in a communicative task. This type of table is a table that presents knowledge.

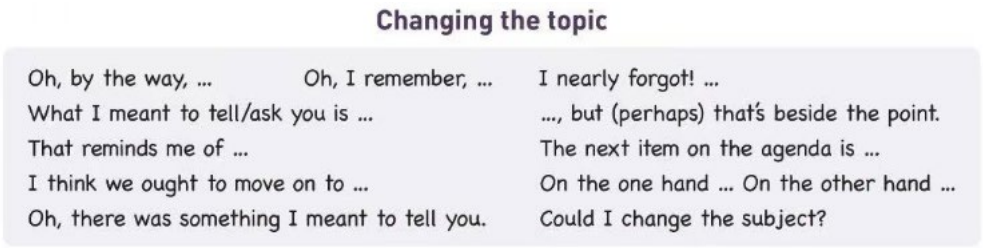

Figure 6: Knowledge presentation tables

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As shown in Figure 7, this illustration is selected from Unit 1 Science Fiction Reading for thinking Explore the relationship between humans and robots. Activity 4 aims to help students sort out the emotional development and changes of the female protagonist Claire in the story, understand the reasons behind them, grasp the narrative storyline of the story, and use vocabulary to describe psychological activities. Activity 5 combines reading strategies to guide students to use common phrases and mind maps for comparison, and analyze the similarities and differences between robot Tony and humans. The following two illustrations require students to reorganize and summarize the content they have read, and finally complete the table, which is a fill in form.

Occasion	Claire ...	Occasion	Claire ...
1 before he arrived	disliked him	5	called him a dear
2	was alarmed	6	felt his warmth
3	felt embarrassed	7	felt being envied
4	admired him	8	cried all night

Figure 7: Knowledge presentation tables

Research shows that the number of fill-in forms is much greater than the number of forms that present knowledge. Since the tables presenting knowledge are of low knowledge level to students, students only need to summarize new knowledge through the tables presenting knowledge to promote knowledge acquisition. However, filling-in forms have higher requirements for cognitive level and generalization ability. Therefore, it is inferred that textbook illustrations focus on cultivating students' ability to extract, process and summarize information, and emphasize the development of students' English thinking ability. It can also be inferred that the illustrations of high school English textbooks are in line with the cognitive level of high school students.

As is shown in Table 1, in the analysis of the illustrations of senior high school English textbooks, it is found that in knowledge explanation, physical drawings are mainly used to introduce and raise questions, which is in line with the proactive organizer strategy in psychology and can help students connect the existing knowledge with the new knowledge. In addition, in the application and consolidation stage, the illustrations of senior high school English textbooks are mainly tables, and the sample questions of the textbooks are evenly distributed. In shot, the illustrations of senior high School English textbooks are in line with the cognitive structure of students in terms of the location of the textbooks and the classification of illustration types.

Table 1: The number of physical drawings and tables in the different illustration location

	Physical drawing	Table
Knowledge explanation	45	2
Knowledge consolidation	14	22

5. Suggestions for frontline teachers

From the perspective of cognitive psychology, the above analysis of the new edition of high school English textbook illustrations has important guiding significance for English teaching.

5.1. Use schemata to explain illustration meaning

Schema theory of cognitive psychology holds that people need to associate new things with existing knowledge or experience, namely schema, when understanding new things. The interaction of old and new knowledge can not only integrate new knowledge into the original schema or behavior pattern, but also make the old schema transform or combine with each other to produce a new schema. Therefore, the key to the learning process is whether students are able to make substantial, non-arbitrary connections between new knowledge and existing cognitive structures. According to this theory, in the process of analyzing illustrations, teachers should make full use of the existing cognitive schemata in students' minds. When presenting new knowledge, teachers should start from students' existing schemata and help students extract the most relevant old knowledge and new knowledge from the existing schemata to "consolidate" or "update".

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5.2. Activate cognition to use promoting meaning

Students who study optional compulsory 4 have mastered a lot of knowledge about history, geography, politics, chemistry and other subjects, which means that they already have a certain number of cognitive schemata in their brains. Among the existing schemata, some are clear, stable, and can be directly and appropriately related to the new proposition. Clear and stable schemas can be activated automatically when students understand information, while vague and uncertain schemas cannot be activated automatically, and it is difficult for them to participate in the processing of new knowledge. When students learn new foreign language texts, teachers should be good at discovering the schemata associated with new text information in students' cognitive schemata, and strive to activate these schemata so that they can participate in the processing of new information, and promote the understanding and absorption of new knowledge. Because the learning and memorization of texts is not a process of pure reproduction, it is a process of construction and revision.

5.3. Train strategy to use informative illustrations

Cognitive psychology emphasizes that as knowledge builders, students should take the initiative to participate in authentic activities and tasks, think creatively and critically in the process of completing tasks, and constantly construct their own knowledge in cooperation with team members, and examine their own construction of knowledge at the metacognitive level, and finally complete the construction of knowledge by learners themselves. This kind of teaching activity is carried out in two aspects: cognition and metacognition. Therefore, teachers should not only teach students various cognitive strategies, but also train students to use metacognitive strategies.

5.4. Deep reading to focus on table illustrations

English teaching materials contain a variety of tables with rich meanings, some of which carry information closely related to students' life and are within the scope of students' cognitive level and knowledge. In English reading teaching, students should observe and improve the illustrations of various forms, not to mechanically copy the information and data of the text, but to conduct in-depth analysis of the internal logic between the forms. Teachers should design the reading task chain according to the tables in the textbook illustrations, and push students to read into the deep water in the process of "seeking-extracting information, processing-integrating information, inferring-discovering information, pondering-using information" to promote the development of students' higher-order thinking.

6. Conclusion

This paper analyzes the illustrations of senior high school English textbooks from the perspective of perceptual comprehension and selectivity, and provides a new method of textbook classification and statistics. In terms of perceptual comprehension, textbook illustrations can be divided into explanatory illustrations and promoting illustrations. The illustration of the explanatory function serves the text, visualizes the internal text, presents the complex concepts, processes and principles in an intuitive way, and enables the reader to understand the text. The illustration that promotes the function relies on and serves the text, but has a certain independence and can convey additional information. It is found that among the textbook illustrations for the new edition of senior high school English Optional Compulsory 4, the illustrations with explanatory function are more than those with promoting function. In terms of perceptual selectivity, according to the position of illustrations in textbooks, illustrations are divided into illustrations at the stage of knowledge explanation and illustrations at the stage of application consolidation, and illustrations are divided into physical drawings and tables according to their forms of expression. It is found that in the knowledge explanation stage, illustrations are often based on physical drawings, which aims to establish a connection between students' existing schemas and new schemas, and the presentation of physical drawings in the knowledge explanation stage can greatly improve students' learning interest. In the knowledge consolidation stage, textbook illustrations are dominated by filling-in tables, because the cognitive development level, comprehensive generalization ability and logic ability of high school students have developed to a relatively high stage. Through analyzing the illustrations of the new edition high school English textbook from the perspective of comprehension and selectivity of cognitive psychology, it is found that the illustrations of the textbook are in line with students' psychological cognition. At the same time, this study can enable teachers to re-examine textbook illustrations from the perspective of students' cognitive psychological development, so as to

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further improve the role of textbook illustrations in teaching design according to the needs of teaching.

Acknowledgements

Project supported by the Innovation Fund of Gannan Normal University for Postgraduates in 2022, "A study on the representation meaning of illustrations in senior high school English compulsory textbooks based on visual grammar theory" (Grant No. YC2022-s909).

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