Constructivism Theory and Its Application in Information Hiding Teaching

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Abstract: Information hiding is an important specialized course in the curriculum of information security major. Besides the foundation knowledge of information hiding theory, many other areas' elementary knowledge is involved in, such as image processing, audio signal processing and video signal processing. It is always difficult for students to master the knowledge by the receptive style teaching method. Constructivism theory focusing on students and autonomic learning gives an approach to information hiding teaching method. Based on the constructivism theory, the special teaching methods and teaching process are designed for different content of the course.

Keywords: information security; teaching method; constructivism theory; information hiding; meaning construction

1. Introduction

Started from the 1990s, Information hiding and digital watermarking research have been put an emphasis on gradually and vigorously developed. Along with the continuous improvement of its theoretical principle, it has already become a hot spot of information security domain. And information hiding curriculums have also turned into an important specialized course of information security major in college and university. Because information security is the interdisciplinary subject of computer, communications, mathematics, physics, law, management and other discipline, the specialized course of this major also tends to involve more multi-disciplinary elementary knowledge. Information hiding curriculum is not exceptional. Besides information hiding's elementary knowledge, it also relates to image processing, audio signal processing and video signal processing and other aspects. In view of the fact that information security major in various schools focus on the different emphasis point, the students do not necessarily have all the knowledge in this area. Even if a general understanding is haven been gotten, their understanding depth is also difficult to achieve the flexible application level in the field of information hiding. This requires teachers firstly to guide students to deepen their understanding of the related fields. And on this basis enable the students to expand the study in the field of information hiding

knowledge. But for the specialized courses such as information hiding, the class hours are often limited and even quite few. How to complete the teaching of so great information content within the limited class hours is a difficult problem faced by teachers. And constructivism theory provides a good theoretical basis to solve this problem.

2. Overview of Constructivism Theory

Constructivism, also known as structuralism, was proposed by Switzerland psychologist Pi Yajie in 1966. The individual's cognitive development is closely related to the learning process in the viewpoint of the Constructivism. It is the criticism and development of the traditional learning theory. It emphasizes that knowledge is not the absolutely correct attribute to the real world and also not the one-size-fits-all doctrine. It is in a constant state of development. And in different situations, it needs to be re-constructed. It is not the fact that the learners entered the classroom with blank brains, and in the past life, study and contact activities, they gradually formed their own understanding and views of the various phenomena. They have the intelligence potential of using existing knowledge experience to carry on the deduction. Correspondingly, learning is not only the simple transmission and delivery of knowledge from the outside to inside but also the process that the learners construct own knowledge experiences on their initiative.

The analysis of constructivism theory gives out a new understanding of knowledge and the learning process of knowledge. In the viewpoint of the constructivism knowledge is not the absolutely correct attribute to the real world theory and it is not the ultimate answer but an interpretation, an assumption. It has denied the static theory of knowledge and advocated that the knowledge is dynamic growing. The theory changes peoples' perspectives from knowledge being a product to knowledge being a process. Therefore, knowledge is not mainly obtained from the teachers, and it is required by the learners in certain scene and under the society cultural context with the aid of other people (including teacher and study partner) using the essential study resources by way of meaning construction. The learner is no longer the passive stimulation receiver and needs to make the initiative choice and the processing to the extraneous information. That is, how much the learner obtains the knowledge depends on the ability to construct the related knowledge according to their own experience rather than the ability to remember and recite what the teachers taught. On the basis of constructivism theory, teaching is student-centered, and emphasizes the students' active exploration, the initiative discovery and the initiative construction of knowledge. And students are the main body of the information processing and initiative constructor but are not the exterior stimulation passive receiver and the object instilled into. Teachers are the construction assistors and promoters of sense making, rather than the knowledge disseminators and instillers.

The educational model which adapts with the construction theory of learning may summarize as follows: take the student as the center, and the teacher plays the role of the organizer, the shepherd, the assistor and promoter's in the entire teaching process, displays student's initiative, the enthusiasm and the creativity in the use of context, collaboration, conversation and other learning environmental factors and ultimately achieve purposes for the students of effective meaning construction. In this kind of pattern, the students are the initiative constructor of knowledge significance, and the teachers are organizers, shepherds, assistors and promoters. The knowledge provided by the teaching materials is no longer the con-

tent that the teachers taught, but is the object of their own initiative meaning construction for the students. The media is no longer a method to help teachers impart knowledge, but a way for the students to establish the situation, carry out collaborative learning and sharing sessions, namely, as a cognitive tool of active learning and collaborative exploration for student.

3. Information Hiding Teaching Based on Constructivism Theory

Information hiding is an important specialized course in the curriculum of information security major. It is the basic courses of the research engaged in information hiding and digital watermarking. It is quite strong overlapping and requires the students to have a more broad-based theoretical knowledge, such as: image processing, audio signal processing and video signal processing and the basic theory of information hiding. For different teaching contents, different teaching process has been designed separately, using different teaching methods for students guide.

3.1 "Summary-Perceptual Knowledge-Rational Knowledge" Teaching Method

In the information hiding technology, the carrier information or the secret information exist by certain form. For example: Image, audio frequency, video frequency and documents and so on. Therefore, the acquaintance of the carrier and the secret information's processing technology will be the basis for the completion of information hiding. However, the students do not necessarily possess the knowledge, and the class hours can not be met for detailed description in class curricular. It requires instructors in the teaching process not only give a clear main point of the related knowledge, but also teach the students to confirmation and study method. Here, we applied the "summary-perceptual-rational understanding" teaching methods.

Take the understanding of the time and the frequency domain as the example. The time and the frequency domain are two domains to carry on the analysis in the signal processing. But students' understanding of why the

two domains should be distinguished as well as the mutuality and characteristics of the two domains tends to not be thorough.

Firstly, enable the students to describe the signal manifestation intuitively when establishing the time- domain through the teacher's explanation. But the signal independence is bad, and Frequency-domain signal energy is concentrated, easy to carry out further analysis of the signal concept. Then graphical representation of the simulation software makes the student to establish the perceptual knowledge. Finally the concrete programming unifies the perceptual knowledge and the theory operation, and the understanding rises to the theoretical level.

3.2 Anchor's Teaching Method

Anchor's teaching approach is also called "teaching based on the question". The actual situation in the real events or real problems identified refers to as "anchor". These questions must be able to elicit the basic concept and principle closely related studied subject in order to stimulate student's academic motivation and arouse them the interest of explore and study. The student's abstract thinking ability and logical thinking ability gradually are trained In the process of solving the problem.

With regard to the information hiding technology, the performance which first needs to be met is the invisibility, that is, the carrier information is from the visual or hearing not much difference before and after hiding secret information from the visual or hearing. This phenomenon will often arouse the student big interest and exploration desire, so we use Anchor's teaching method to guides the student to analyze and study this phenomenon independently so that make the students preliminarily understand of the reason that hides the secret information in the carrier and the information hiding manifestation to lays the foundation for following theory study.

Take the image information hiding as the example. First contrast the carrier image and the image hiding the secret information secret, and could not see any difference from the surface. Then guide the student to analyze its actual difference, that is, Express the image as the data in form, then there is a difference between the carrier image and the hidden image. Analyzing the difference can guide the students have a discussion on the concrete realization of information hiding method.

3.3 "Teaching-Practice-Design" Teaching Process

Information technology is an ever-changing field, and new technologies and ideas appear at any time. Just like the information hiding technology itself, its predecessor of steganography has already been used as early as BC. With the development of society, information hiding and gradually have more meaning. This requires that the teachers in the teaching process do not limit to content of textbooks but take the curriculum content in correlation technique's developing process as the guidance to Trains the student to look at the issue and the study knowledge from a development perspective in order to make the students gain the ability of self-teaching and develop the ability of innovation

To achieve this goal, we have designed the "teaching-practice-design" teaching process. Specifically speaking, describe the development process and the corresponding realization of the program in the teaching part, the students are required to verify the development process through the consult literature. And then analyze the characteristic of the different plan so as to get the final experimental result. And the final design aspect is the improvement of already available programs.

Through the teaching process, Students can not only master the knowledge and application skills, but also develop a diligent habit of thought and conduct scientific research, so that the study of the curriculum is not limited to the understanding of existing content and easy to broaden the thinking of students.

4. Conclusions

Constructivism theory gets more and more attention as a new learning theory in educational circles. It emphasizes that knowledge is a process, and the knowledge learning is the process that learners carry on the construction on own initiative using the study resources. Under the constructivism theory's instruction, the information hiding teaching process is designed as that teachers are taken as

the leadership and students play the main role. This teaching process's implementation can display fully student's initiative and the enthusiasm and achieves final goal that students can construct the knowledge effectively.

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