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Study on correlation model between case teaching and deep learning

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Abstract: *Deep learning requires learners to establish connections between old and new knowledge and experience, learn and reflect critically, and construct personal knowledge systems, which is highly consistent with the concept and characteristics of case teaching. This paper first analyzes the concept connotation and characteristics of deep learning, and studies the correlation between case teaching and deep learning. Secondly, a deep learning process model based on the case is established, and the execution process of the model is analyzed in detail according to the division of prediction, process and result. Finally, the characteristics of case-based deep learning process model are summarized.*

Keywords: *case teaching; deep learning; process model; knowledge transformation*

1. Introduction

Research in learning science has found that deep learning can be achieved when learners participate in activities that are the same or similar to real situations. Creating learning environments that promote a deeper understanding of knowledge to help students reason about real-world problems is a fundamental fact that learning scientists agree on. Groves has stated that the learning environment is more important than the learner's intrinsic characteristics in determining the learning style. Case teaching takes real and vivid cases as the starting point of classroom teaching activities, brings students into a special learning situation, carries out effective communication and discussion in a specific situation. In this way, we can create a good atmosphere of independent thinking, communication and cooperation, and free exploration, and establish a favorable environment for the occurrence of deep learning. Therefore, the study of case-based deep learning has certain theoretical and practical significance.

2. Connotation and characteristics of deep learning concepts

In 1976, two American scholars, Ference Marton and Roger Saljo, published their book titled *Essential Differences in Learning: In Results and Process*, where the concept of deep learning was proposed for the first time[1] and well discussed in detail. Later, researchers Ramsden, Entwistle and Biggs made a more in-depth study from different perspectives. In their book *How People Learn: Brain, Mind, Experience, and School*, John D. Blansford and others argued that deep learning is the learning of conditional knowledge and metacognitive development through the community of inquiry learning. Deep learning is active and understanding learning, which requires learners to critically integrate new and old knowledge and experience, complete the construction, transformation, transfer and application of knowledge, and creatively solve complex problems in real situations, so as to develop higher-order thinking ability.

Through the above conceptual analysis of deep learning, it can be found that deep learning has several obvious characteristics[2]:

(1) Deep learning is student-centered. Deep learning places a special emphasis on being student-centered, making students the "masters" in the classroom. Teachers students charge the class, let the students fully show their own personality, and play the designer of the course, the organizer of activities and the guide of learning. Teachers, as facilitators, will try to find out the students' views on the problems they are facing, and give them certain guidance or correction to help them examine their thinking and readjust their views.

(2) Deep learning is a kind of understanding learning. The emphasis on understanding is one of the

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fundamental features of the new science of learning[3]: the new science of learning is concerned with the process of cognition. If the learner's cognitive process is only through memory and simple repetition, lack of understanding, knowledge will not be long-term preservation and easy to be confused. Deep learning emphasizes learning on the basis of understanding, and memorizing knowledge after clarifying concepts and grasping the intrinsic relationship between essential features and elements will deepen the impression of knowledge and is not easy to forget.

(3) Deep learning can promote knowledge construction. Deep learning requires learners to take the initiative to understand and judge new knowledge and information, analyze, identify and evaluate previous knowledge and experience[4], complete assimilation or adaptation to new knowledge and ideas, thus forming self-understanding. At the same time, they constantly adjust the original cognitive structure according to the two-way effect between new and old knowledge, and form a new knowledge system.

(4) Deep learning focuses on criticism and reflection. Deep learning is a kind of learning that is both critical and reflective[5]. The criticism of deep learning emphasizes that learning is a skeptical and analytical process, requiring learners to always hold a questioning attitude, dare to challenge authority, question existing opinions and conclusions, and express their own understanding and opinions, so as to form a more comprehensive and profound understanding of things. When learners hold critical thinking in learning, they will be more likely to find problems, dare to question, and take the initiative to think positively. Only in this way can learning reach depth and innovative thinking be developed.

(5) Deep learning can develop higher-order thinking. Deep learning emphasizes learners' understanding and application of knowledge, which is at the four higher cognitive levels of "application, analysis, synthesis and evaluation" in Bloom's classification of cognitive goals, and involves higher-order thinking activities. Higher-order thinking is not only the core feature of deep learning, but also the key factor to achieve the goal of deep learning.

3. Correlation between case teaching and deep learning

The choice of learning style has a great relationship with the learning experience under the teaching mode, because the learning style is not a fixed psychological feature, and it is largely influenced by the learning experience, especially the teaching style of teachers. Therefore, exploring how to carry out deep learning in the classroom should become an important research issue. Through the research, it is found that the characteristics of case teaching in the classroom are highly consistent with the occurrence conditions of deep learning, so that case teaching can be used as an effective form to support deep learning. The relationship between the two is shown in Figure 1.

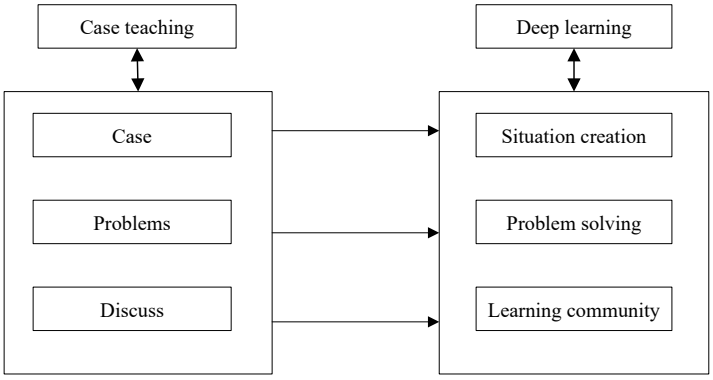

Figure 1: Relationship between case teaching and deep learning

(1) The case creates a real situation. Case is the core of case teaching, which is anchored in real situations and provides external learning environment for deep learning. Learners solve problems or explore in the real situation created by cases. Through free discussion and free thinking activities, learners actively use original knowledge and experience to acquire and understand new knowledge [6], and can clearly understand the application of these knowledge in actual situations. This process deepens learners' understanding of knowledge and combines theoretical knowledge with practical situations, helping learners to transfer knowledge and apply it to new problems and new domains. It can be seen that through the interpretation, thinking and application of theoretical knowledge or the essential attributes of things and phenomena embedded in these cases, deep understanding and transfer

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will naturally occur, that is, deep learning will occur.

(2) Problem-oriented learning. An important feature of case teaching is problem-oriented. Setting questions can engage students to conduct meaningful, subject-related tasks for learning and provide students direction for discussion[7]. Students start learning through questions, and the learning content is organized around questions. There is a mutual transformation relationship between the knowledge contained in the case and the problem. Students construct the knowledge in the process of problem solving, and the knowledge is in turn used to solve the problem. In this process, on the one hand, students need to construct new knowledge or meaning, on the other hand, they need to strengthen practical ability, flexibly apply the learned knowledge and experience to new practical situations to solve new problems. It can be seen that problem-oriented case teaching can promote students' deep learning.

(3) Discussion Community. Classroom discussion is the core link of case teaching, which is generally organized by teachers and takes the form of group discussion. In the process of classroom discussion, students, as the main body, take the initiative to participate in the discussion of cases, think and solve problems independently, and teachers, as guides, provide corresponding guidance. They need to build learning communities and discussion communities around common learning goals and tasks, participate in dialogues with an equal and positive attitude, share knowledge, experience and wisdom, and work together to achieve learning goals[8]. In an open and dynamic dialogue environment, further reflection is triggered by the collision of viewpoints, which will reorganize their understanding and ideas, adjust the original cognitive structure, and form a new knowledge system. It can be seen that the establishment of community in case teaching supports students to learn more effectively and achieve a deep understanding of learning materials, thus promoting the occurrence of deep learning.

4. Case-based deep learning process model

Based on the connotation, characteristics and other relevant theories of deep learning as well as the relationship between deep learning and case teaching, the general process model of deep learning is first constructed, including eight basic links: pre-assessment, attention and anticipation, activation of original knowledge, connection between old and new knowledge, critical analysis, knowledge construction or transformation, summary evaluation, application and creation. These basic links are summarized into three stages: prediction, process and result[9]. According to the relevant theories of case teaching, the process of case teaching implementation generally includes three basic links: preparation before class, implementation in class and consolidation after class. Therefore, this study builds a case-based deep learning process model according to the general process model of deep learning and the process of case teaching implementation, as shown in Figure 2.

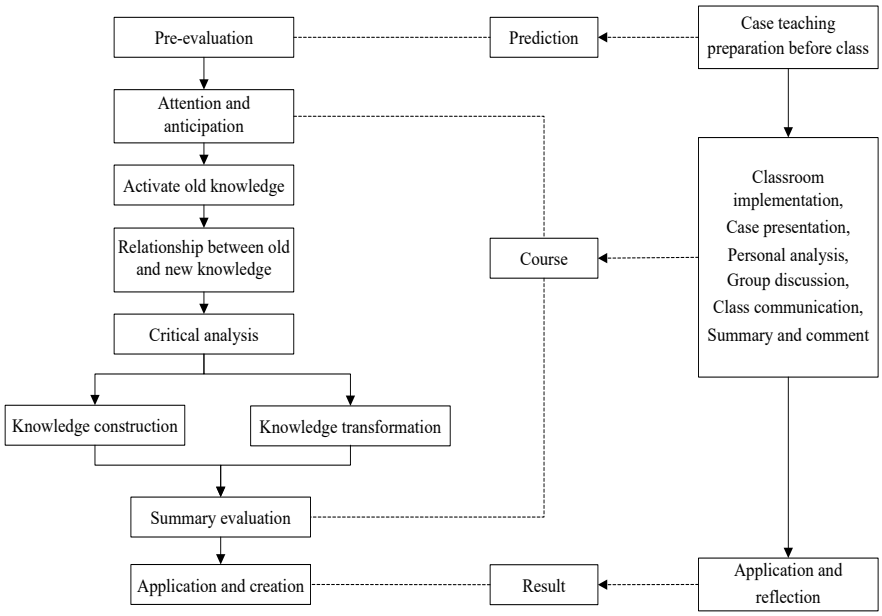

Figure 2: Case-based deep learning process model

The process of case-based deep learning can be divided into three stages: prediction, process and

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result. The general process of case teaching implementation corresponds to these three stages[10], which promotes the occurrence and realization of deep learning.

(1) Case selection and preparation in the prediction stage. The prediction stage is a prerequisite preparation stage before deep learning activities[11]. The main task of case teaching is for teachers to choose appropriate case materials and prepare for teaching according to the teaching objectives of each class on the basis of knowing students well. For case teaching, teachers' selection and preparation of appropriate cases is an important guarantee for the successful implementation of case teaching. From the perspective of deep learning, learning is a process of meaning construction based on original knowledge and experience. Therefore, in the prerequisite stage of case-based deep learning activities, case selection and preparation are to adapt to learners' prior knowledge, experience and personality characteristics, and lay the groundwork for deep learning activities.

(2) Case analysis and discussion of the process stage. The process stage is the main stage of deep learning activities, and the main link of case teaching in this stage is case analysis and discussion, which will promote the occurrence and implementation of deep learning activities. This process can be divided into three stages, "attention and anticipation" and "activation of original knowledge" are the first stage of deep learning activities, "connection between old and new knowledge", "critical analysis" and "knowledge construction and transformation" are the second stage, and the final "summary evaluation" is the third stage[12].

The first stage is the preparatory activity before the deep learning activity begins, which requires learners to pay conscious attention to the learning activity and activate the original knowledge experience. After the formal implementation of the case teaching class, the teacher will show the case materials prepared in advance to the learners, and use real and fresh cases to attract students' attention and stimulate students' learning interest and deep learning motivation.

The second stage is the development stage of deep learning activities. After connecting old and new knowledge and critically analyzing learning materials, learners may still be in a shallow learning state and need to deeply process new knowledge and information to actively construct new knowledge or acquire new skills in order to reach the height of deep learning[13]. In the process of case teaching implementation, learners should critically think, analyze and integrate old and new information on case materials after case presentation to complete the meaning construction of new knowledge.

The third stage is the summary of the deep learning process. Learners should summarize, evaluate and reflect on their own learning process and results. In the final stage of case teaching implementation, teachers summarize and evaluate students' learning activities and results. By commenting on students' performance and revealing the theories and principles of the course content, teachers can improve students' deep understanding of cases and improve their ability of analysis and summary.

(3) Case application and reflection in the result stage. The final result stage of deep learning is to be able to flexibly apply the learned knowledge to actual new situations and creatively solve existing complex problems to improve the learning effect[14]. The main task of case teaching is to write reflection diary or case analysis report and finish homework. In this way, students can consolidate knowledge, deepen understanding, realize internalization of knowledge, and improve their thinking level and practical ability while completing tasks. It can be seen that the tasks in the final stage of case teaching can promote students to realize the transfer and application of knowledge and the development of higher-order thinking ability more efficiently, so as to improve the learning quality and realize deep learning.

5. Conclusion

Deep learning requires learners to make connections between old and new knowledge and experiences, to learn and reflect critically, and to construct a personal knowledge system, which is highly consistent with the concept and characteristics of case teaching. Based on the theoretical research of deep learning and case teaching, this paper analyzes the correlation between them and points out that case teaching can promote deep learning. By constructing a case-based deep learning process model, this paper analyzes the implementation links and functions of case teaching corresponding to the prediction, process and result stages of deep learning.

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