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The Application of Reverse Thinking Based on the Course Teaching of Educational Technology in Colleges and Universities

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Abstract

Reverse thinking as a common way of thinking has been recognized in course teaching of higher education , but it is only mainly applied in the traditional subjects and rarely used in the professional course teaching of educational technology. This paper makes use of the principle of reverse thinking, designs the teaching process of distance education with the strategies of "reverse conversion", "process inversion," "reversing the position" and "finding causes from results", the "distance education", and summarizes the application of reverse thinking in the teaching of higher education technology field.

Index Terms: Way of thinking; mind mapping; distance education; independent study; inquiry teaching

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1. Introduction

Way of thinking, also known as the habit of thinking, thinking preferences and thinking mode. As a mode of habits of thinking activity, way of thinking is " people's rational way of knowledge at a certain age, and is a relatively stable style of thinking which integrates all elements of thinking based on certain structures, methods and procedures. "Way of thinking, as the determined way of thinking when the thinking subject does its understanding, computing, is a system with complex hierarchical structure, including the thinking subject, the object of thinking, thinking tools (including theoretical tools and material technical means) and other elements [1]. The so-called reverse thinking is to ask people to think about the problem from the opposite point of view, different positions, and the other side, and when a thought is blocked, people can quickly move to another idea, in order to solve the problems smoothly [2].

The role of reverse thinking is not merely to clear the issue, what's more important is that as a form of thinking, reverse thinking breeds the seeds of innovative thinking and is one of the essential qualities of thinking possessed by the creative talents. Throughout the history of human development and design, there are many examples of using reverse thinking. The innovative activities conducted according to the way of thinking provide the human society with various new technologies and products. In ancient, there was "Sima Guang

breaking the tank", which changed the thought of "person out of water" to the mindset of "water leaving person" [3]. Currently, the reverse thinking has been used in education, economy, finance, journalism, financial services, engineering design and other fields. Reverse thinking is a new way to cultivate the creative thinking of students.

In the teaching process of higher education, the reverse thinking is often used in the strongly logical subjects such as mathematics and physics. The use of reverse thinking not only makes the problem-solving ideas simple but also overcomes the difficult logical analysis, greatly improving the speed and efficiency of solving problems. However, it is rarely used in the teaching of educational technology, not even mentioned. This paper takes "distance education" courses of educational technology as an example, uses reverse thinking to organize teaching so as to explore the application of reverse thinking in higher education.

2. Reversal from the teacher imparting students knowledge to students actively exploring knowledge——"reverse conversion"

Reverse thinking is applied to reverse the method of teachers imparting students theoretical knowledge to students' cooperating in groups and teaching. Most students in the traditional teaching classes were not interested in the theoretical knowledge, feeling boring and reluctant to think, and the effect is not satisfying. Transposition in the way of reversion can greatly improve this situation. First of all, the students are divided into several groups, and the learning contents are assigned to different groups in certain quantity; let each student preview in advance; the groups discuss with each other in class, make summary of the discussions and presentation in turn so as to communicate. The model of organizing grouping is shown in Fig 1.

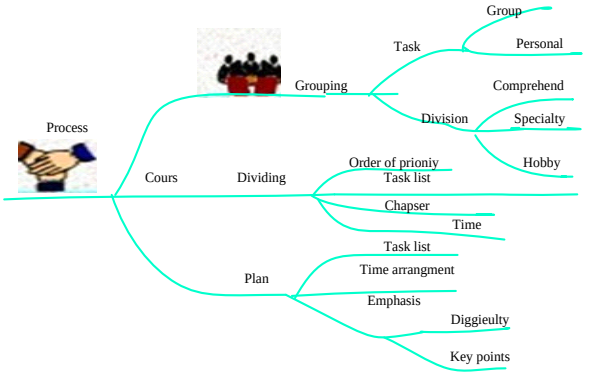

Figure 1. Organizationl model of reverse teachingger

Students will have stronger sense of responsibility and collectivity in the scope of self-cognitive ability. Meanwhile, it can also improve undergraduates' ability of collaboration and enhance their sense of collective responsibility. After the students finish their presentation, teachers and students can give some comments to

enhance self-confidence of students, which can promote students' understanding of knowledge while making corrections to some ideas. Teachers should summarize the contents of each chapter and make "Mind Map" together with the students [4]. As the mind map is a tool to organize and describe the knowledge, it can identify the relationship between two concepts through the connection between them and allow students to construct their own internal knowledge network via building the network of external knowledge. The students summarize the mind map of the course content, and then teachers and students evaluate and improve the mind

map together. Students have mastered part of the knowledge in the textbook through their own learning and thinking, and their knowledge may be messy, however, through the form of mind mapping, knowledge network can be in full swing in the minds of students so that students can easily turn knowledge into an organic and overall connection, which is in clear order and also deepens understanding. Mind mapping model is shown in Fig 2.

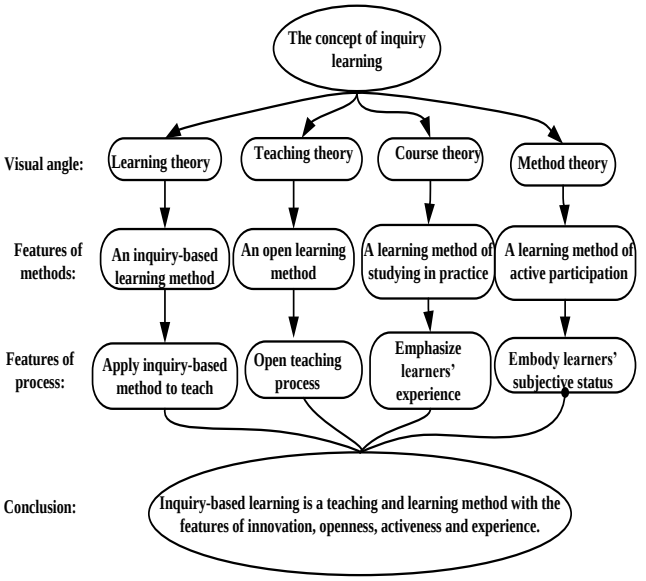

Figure 2. Mind mapping model

This allows students to learn the knowledge of teaching materials and can also improve their ability of searching for information, judging and processing information, thus develop the ability of thinking of college students.

3. Teaching content taught in reverse order —"process inversion"

"Process inversion" of reverse thinking can be used in a lot of teaching activities. Changing organizing teaching in the sequential order to in reverse order, applying structured policy to organize teaching can achieve better teaching effects [5]. The learning process of moving from individual knowledge to common knowledge can more easily grasp the key features and understand the relationship between common features and individual features.

"Distance education" is a course combining theory and practice together with more abstract theory. The purely mechanical and procedural knowledge in the course can not meet the needs of the students, while the technical principles with creative contents and social practice full of challenging can activate the students' desire to learn. As some contents of the course are of relatively strong logic and others can be adjusted, teachers do not have to design teaching rigidly in accordance with the textbooks, and they can reorganize the structure of the course according to the associated knowledge of previous courses in order to achieve the best results. From point of view of thinking mindset, the design of teaching materials is sometimes thought to limit the instructional design, and teachers just follow the materials. If some of the contents of the material are explained in a reverse order, teaching would be better. Of course, what is needed to be explained in a reverse order depends on the situation. Process inversion of reverse thinking provides a good reference for teaching and learning activities.

4. Changing teachers assignment to students designing their own tasks — "reversing positions"

"To reverse positions," is to give students the right to choose. From beginning to end, the students are the main roles, enabling students to design the themes of their choice, to plan, to organize and to report. The thinking way of position reverse thinking is applied, which means the thinking way that people understand things based on the reverse side of things, thus creations and inventions are made. On the one hand, adopting this way of teaching can, stimulate the students interest in learning and make the objectives of learning clear so as to effectively improve the students ability of analyzing and solving practical problems; on the other hand, the teaching method can also train students' information literacy, and can improve students' ability of organization and collaboration [6].

The chapter of designing education website in the course of distance education mainly involves website planning, design, implementation, publishing and management. When designing teaching programs, it should be based on the perspective of designing and developing website in accordance with the theory of distance education. Use the way of thinking, "reverse positions", make the plan of web development, design web page structure, determine the production program in the way of team cooperation, select the best solution through comparison and evaluation, and finish the website suitable for distance education according to the program. As to the arrangement of the designing tasks, teachers should provide multiple design tasks for students to choose, for example, setting up the LAN containing two to three computers, campus network construction, class website construction and others, and asking students to finish their task in a certain time. Although this can test what has been learned, it can not make students actively create websites. According to the analysis of young people in psychology, students do not want to be arranged to do the task, and some even think that they are forced to do the design, which will make them have a sense of pressure and a psychological burden, making it ultimately difficult to achieve the desired results.

Based on this cognitive psychology, the teacher can not assign specific tasks to students, but arrange in the form of groups and design tasks based on the curriculum, enabling students to reverse positions. For example, after completing teaching the chapter of "design education website", the teacher can enable students to mix into several groups, and each group chooses their own task of construction website. When the panel decides what website to construct by themselves, the students will be very active to do and will take the initiative to read the materials, finding methods to build class websites. At the same time, the teacher can provide the materials that the students can't collect by themselves, take the responsibility of technical guidance and monitoring of the progress, communicate with the head of each group at any time to communicate and answer inquiries. After the teams finish their tasks, they can judge each other and make progress together. This approach of "reversing positions" has inspired students' enthusiasm in learning.

5. Conclusion

The choice and exploration of teaching methods and strategies are the challenges faced by teachers. In particular, in some courses, such as how to present the technical principles, how to grasp the technical depth, how to concise technical approach, how to create technical situations, students' learning motivation and other issues, it has been difficult to achieve teaching objectives of the course with the general teaching methods, teaching strategies and ways of thinking, but using reverse way of thinking to organize teaching could make us have the feeling of going out of the problems and finding a way.

In the teaching of distance education, in order to evaluate the effectiveness of using reverse thinking, 30 students were surveyed through anonymous questionnaire and the results are shown in Table 1.

TABLE I. SURVEY RESULTS OF THE EFFECT OF REVERSE THINKING TEACHING

Evaluating items of reverse thinking teaching	Very good	Good	Little effect
Enlarging the information of knowledge	27	3	0
The activeness to acquire new knowledge	25	5	0
Improving the ability of critical thinking	22	8	0
Improve the activeness and interest of learning	26	4	0
Grasping the methods of obtaining new knowledge	28	2	1
Improve the ability of synthesis and induction	21	9	2
Improve the ability of self-study	15	15	0

The effect of the application of reverse thinking will not be further stated here. In the reforms of teaching methods, ways of thinking is particularly important, and from the perspective of their ways and procedures, thinking activities can be divided into two kinds: forward thinking and reverse thinking. In this paper, respecting the forward thinking at the same time, it's concluded: converting the way of teacher imparting knowledge to students actively exploring knowledge in the way of reverse conversion; changing teaching knowledge in the original order to in reverse order in the way of process inversion; changing the main subjects in class from teachers to students who actively explore the tasks in the way of "reversing positions"; to reverse the presenting method of teaching effect and teaching strategy with each other in the way of "finding causes from results" [7]. The four reverse thinking teaching strategies can be applied respectively in related courses in the colleges and universities, which will have a particularly good teaching effect.

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