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The Theoretical Framework and Practice of Goal-Centered Problem-Oriented Teaching Mode

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Abstract: *Currently, there exist some huge problems in the quality of talent cultivation in higher education, such as low comprehensive quality, insufficient practical ability, weak innovation consciousness and innovative spirit. To solve these problems, the paper proposes the goal-centered problem-oriented teaching mode, based on the requirements of school objectives, professional talent cultivation objectives and curriculum teaching objectives on students' comprehensive quality. The application of this teaching mode integrates the specific teaching contents of the course, by carefully designing various types of teaching problems that can promote students' autonomous learning and stimulate students' interest in learning, which has been successfully implemented in many courses, especially during the epidemic.*

Keywords: *goal, problem-oriented, teaching mode, talent cultivation*

1. Introduction

With the advent of the Internet era, contemporary college students' ideology, value orientation, psychological characteristics and moral concepts are deeply marked with the imprint of the Internet. They tend to use Wechat, Microblog, QQ, forums and other platforms for communication in their life and academic study. Colleges and universities should adapt to the current situation by expanding teaching resources and develop new teaching models, and use new media to guide students to learn. Therefore, how to innovate education and teaching mode, teaching methods, and teach students the knowledge and ability they can't find is a new task for higher education scholars and teachers.[1]

At present, the traditional teaching methods no longer meet the requirements of college students and the teaching content of the new era, which needs continuous improvement and reform, and inevitably requires the emergence of new teaching methods and educational theories. There is no education concept that can be implemented all the time without changes. The educational concept that has been implemented all the time must be adjusted accordingly. The higher education mode needs to be improved and innovated to meet the needs of education under the new situation.

2. Theoretical Framework of Goal-Centered Problem-Oriented Teaching Mode

2.1 Background of Proposing a New Teaching Mode

Currently, there are some problems in the quality of talent cultivation in higher education, such as low comprehensive quality, weak applied knowledge and practical ability, weak innovation consciousness and innovative spirit. In the final analysis, the problem is that the school running goal and professional talent cultivation goal have not been well realized. The main reason lies in the course teaching. Curriculum teaching is the core link to achieve the goal of running a school and cultivating talents, and it is also the key factor that affects and even determines the quality of education and teaching and talent cultivation. Teachers' teaching is often based on theoretical knowledge and professional knowledge, which is obviously insufficient for the cultivation of students' quality. [2] It is mainly reflected in: more teaching tasks, less teaching design; more teachers, less interest; more immersive screen, less exploration and communication; more knowledge imparting, less enlightening wisdom; more explanation by teachers, less thinking of students; more explicit content, less implicit content; more attention to common, less individuality.

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It is found that students' unwillingness to attend class is related to students' lack of self-discipline and self-improvement, but it is more closely related to the imperfect curriculum and teaching management system, the unreasonable curriculum structure, the teachers' improper teaching attitude, the need to improve their ability, and the unsound or ineffective implementation of classroom teaching management system.[3]

Through in-depth analysis of these phenomena, the specific reasons are summarized as follows:

2.1.1 School's Insufficient Thinking and Promotion of Talent Cultivation

Each school has a clear school objectives rich in contents and each discipline has corresponding talent cultivation objectives. The connotation of these goals can fully reflect the basic requirements of talent cultivation. However, in the practice of education and teaching, the school lacks effective and scientific concept innovation in talents cultivation, and even lacks the detailed design of application approaches.

The common situation is that each school has its own goal which can fully reflect its fundamental requirements, and each discipline has its own cultivation objective with clear requirements for comprehensive quality. The problem is that few people know and understand the specific connotation of these goals, and even fewer people use these goals to guide education and teaching practice. The root cause of this phenomenon is that the school does not pay enough attention to the implementation of talent cultivation and in-depth promotion.

2.1.2 Teachers' Insufficient Thinking, Understanding and Action Consciousness

The contemporary curriculum teaching task of teachers is mainly to teach knowledge and skills. Teachers should think more about education and teaching and first know what kind of people to educate and then what kind of books to teach.

Due to the unclear understanding of the logical relationship and connotation requirements of the three objectives of "school objectives, professional cultivation objectives and curriculum teaching objectives", teachers do not have enough requirements for the breadth and depth of curriculum objectives, and pay insufficient attention to the achievement and support of curriculum teaching objectives. As a result, in the actual teaching process, many teachers' teaching activities and objectives are separated from each other. The most direct reason is that there is a lack in the action consciousness of goal-oriented teaching.

2.1.3 The Current Teaching Modes Loosely Tied with Teaching Goals

There are many teaching modes, such as all-round development, quality education, student-centered, personality development, problem orientation, OBE concept, etc. These concepts pay close attention to the progress and development of students, and have a strong theoretical guidance role in teaching activities. However, from the perspective of practical operation, these ideas tend to focus on the theoretical level or the macro requirements after some refinement or decomposition of talent cultivation objectives. However, there is a problem of weak guidance on how to operate in education and teaching, especially in the specific practice of curriculum teaching. It is difficult to guide the curriculum teaching practice to effectively approach the talent cultivation goal and can not overcome the possible causes. Due to the phenomenon that the teaching activities and talent cultivation objectives are not close, the goal of teaching concept is inevitably not obvious.

2.2 Connotation of Goal-Centered Problem-Oriented Teaching Mode

Based on the analysis of the problems existing in the quality of talent cultivation in higher education and their causes, this paper puts forward the idea of goal-centered problem-oriented teaching mode. In short, it is based on the requirements of school objectives, professional talent cultivation objectives and curriculum teaching objectives on students' comprehensive quality, integrate the specific teaching contents of the course, carefully design various types of teaching problems that can promote students' autonomous learning and stimulate students' interest in learning, and turn the requirements of target quality into a problem system to effectively guide teaching design.

The goal-centered problem-oriented teaching evaluation adopts mixed integration of the process evaluation and teaching process, and interactive integration of evaluation subject and object. It takes the growth process of students as the focus of teaching evaluation, and makes teaching evaluation integrate into all aspects of teaching and learning. Under the guidance of learning objectives, from the aspects of information acquisition, content structure, points of view, etc., the growth process of

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students' discipline ability is evaluated, and students' learning enthusiasm and learning attitude are evaluated from the aspects of participation, initiative, cooperation and innovation spirit. The development of teaching evaluation provides the basis for the adjustment of teaching strategies and guarantees the achievement of learning objectives.

The program proposed in the *Research Report on the Core Attainment of Chinese Students' Development* published in 2016, which included the three aspects of cultural foundation, independent development and social participation in students' core literacy, the six qualities of humanities, scientific spirit, the ability of learning how to learn, healthy life, responsibility, practice and innovation, as well as the relevant 18 basic points, provide relatively clear ideas and practical principles for the specific purpose of education, the design of main courses, the selection of teaching mode, the orientation of classroom activities and the determination of evaluation criteria.

In today's concept of core accomplishment, in the process of implementing problem-based teaching, we should adhere to the goal-centered problem orientation, emphasize the relevance of the problem and the carrier of the situation, highlight the subjectivity of students, clarify the leading role of teachers, and pay attention to the process of development and evaluation, so as to optimize the teaching effect and achieve the goal of improving students' comprehensive quality.

2.3 Composition of Goal-Centered Problem-Oriented Teaching Mode

The general quality requirements of course teaching include: autonomous learning, effective learning, literature reference and review, thinking and analysis, practice and innovation, humanistic quality, team cooperation, communication and expression, cultivation of patriotism, internalization of value identification, etc. At least five kinds of problems should be designed as follows:

(1) Basic problems: the problems that students should be able to give the answer, promote self-study ability;

(2) Key problems: the problems that must be mastered and the answer can be found by reading and self-study.

(3) Difficult problems: the answer to the problems can be found through reading and self-study. When designing this kind of problems, pay attention to skills and interest.

(4) Practical problems: the important application of knowledge in daily life and national economy, or application of knowledge to solve practical problems.

(5) Expansion problems: either multi-quality comprehensive problems, or multi key, difficult and comprehensive problems, etc.

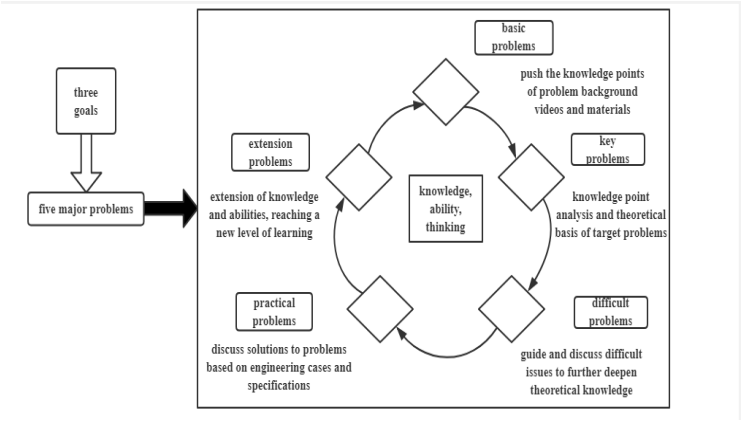

Figure 1 Structure Chart of Five Problems Based on Goals

In the goal-centered problem-oriented teaching mode, the goals and problems are consistent. The goals are the accumulation of problem-solving, and the process from quantitative change to qualitative change. The solution to a single problem is quantitative change, and the solution of a series of problems will cause qualitative change. The goal-centered problem-oriented teaching mode reflects the epistemological point of view, from the traditional active "teaching" to guiding students to actively "learn". The core of traditional "teaching" is to teach knowledge, and the core of guiding students to actively "learn" is thinking, ability and knowledge.

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3. Application of Goal-Centered Problem-Oriented Teaching Mode

Due to the sudden outbreak of Covid-19, online teaching had to be implemented for every course for the purpose of “continuing education”. In order to achieve better teaching effects, Guangdong University of Petrochemical Technology (GDUPT) organized six "Goal-Centered Problem-Oriented Teaching" series seminars, and carried out four relevant teaching mode series training. A total of 896 full-time teachers received the "goal-centered problem-oriented" teaching mode series training through Tencent video online conference. Through in-depth study, a broader consensus has been formed. Many teachers consciously apply the "goal-centered problem-oriented" teaching concept to guide their own teaching practice. According to the statistics of the online teaching quality report weekly report of GDUPT, 68.39% of the 1680 online courses have been conducted with the "goal problem oriented" teaching design. This semester (the first half of 2020), the University selected 65 school level demonstration teaching cases, covering the disciplines of engineering, liberal arts and science, of which 10 teaching cases were awarded excellent teaching cases in Guangdong Province, which were published in the bulletin of excellent online teaching cases of Guangdong undergraduate colleges and universities during the epidemic prevention and control period sponsored by Online Course Steering Committee of Guangdong Undergraduate Colleges and Universities.

3.1 Application Cases of Goal-Centered Problem-Oriented Teaching Mode

In the spring semester of 2020, online teaching was carried out due to the sudden outbreak of the epidemic. After a long period of planning, the teaching plan was carefully prepared, and the new teaching mode was applied to practical teaching. The teaching of some pilot new modules of the courses mainly involved some classes in four majors, namely Electrical Engineering and Automation, Measurement and Control Technology, Intelligent Science and Technology, as well as Energy and Power. Take the teaching of Electrical Engineering and Automation as an example. The new mode is adopted in the teaching of the electrical part of the power plant substation. The course is an academic core course, and students are from Class 1, 2, 3 and 4 of the Grade 2017 Electric Engineering and Automation Major. Through a semester of teaching, students responded enthusiastically, the learning atmosphere was active, and the teaching effect was good. The teaching effect of the new mode is significantly greater than that of traditional teaching methods, compared with the teaching situation of previous students.

At present, the key professional teaching team has carried out teaching cooperation with Guangdong Huibo Robot Technology Co., Ltd., Foshan Xiling Robot Technology Service Co., Ltd., Shenzhen Xinyingda Electronics Co., Ltd. to continuously improve the quality of application-oriented talents training.

3.2 Application of the Teaching Mode to Teaching Process

3.2.1 Specific Description of the Three Objectives

In the course teaching of "Electrical Part of Power Plant Substation", the design of three major objectives should be followed to serve the talent cultivation and development planning of the school.

Course goals: master the basic theory and method of operation and design of electrical main system in large and medium-sized power plants and substations, master the basic principles and mechanisms of primary equipment, have a complete understanding of the main electrical wiring and auxiliary wiring of various power plants, and be able to solve the simple engineering problems of power plants and substations.

Classroom goals: Taking "5.3 auxiliary power wiring of different types of power plants" as an example, master the auxiliary power wiring system and high-voltage equipment of 300MW and 500MW power plants, master the main wiring form and characteristics, and master the design of simple auxiliary power system.

3.2.2 Specific Description of Five Types of Problems

Take "5.3 auxiliary power wiring of different types of power plants" as an example

Basic problems: give students a preliminary understanding, according to experience or previous knowledge. Firstly, videos of power plant operation are played and converted to videos of overall effect of auxiliary power supply. The power consumption of power plant is demonstrated by videos, and the

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service environment and scope of service power are introduced. It belongs to the category of perceptual knowledge.

Key problems: The theoretical problems of how to achieve auxiliary power supply for the power plant, the function of power plant to generate electricity, how to achieve the power supply of power plant itself delivered by the videos of power plant power consumption. It belongs to the category of rational understanding.

Difficult problems: On the basis of solving the problems above, the teacher puts forward some difficult problems. What are the differences of auxiliary power supply modes of different types of power plants (thermal power and hydraulic power)? How to select the main wiring and power supply source? First, let the students use the knowledge they have learned to say their personal analysis. Then the teacher guides the students to look up the teaching materials and refer to the reference materials to get the answer. And in the process, from the perspective of divergent thinking, learn to ask questions by themselves and enhance the depth of understanding of the theory.

Practical problems: to solve the problems in production practice, to use the internalized knowledge to guide practice, to solve the problems in actual production, and to produce new understanding, is the ideal goal of theoretical teaching.

Taking the thermal power plant of 1000MW ultra supercritical unit as an example, the auxiliary power scheme for 1000MW ultra supercritical unit power plant can be proposed by using the existing 300MW and 500MW auxiliary power supply methods, and several main problems can be solved, such as main wiring, transmission system and cooling system.

Expansion problems: inspire thinking, break away from the stage of pure learning knowledge, reach a learning level, and deepen understanding with new practice.

It can solve the auxiliary power design of 1000MW ultra supercritical units and similar power plants, which is the embodiment of engineering capacity. In the process of solving problems, we should further analyze the problems from the perspective of thinking and ability, and use divergent thinking to analyze and consider problems from the perspectives of technical factors, economic factors, environmental factors and social management factors.

3.2.3 Realization of Teaching Links

This part is an important part of teaching, to ensure the completion of teaching tasks and one of the criteria of student performance assessment, which can help to judge students' self-learning ability and assess learning effects through the discussion.

Discussion session design:

(1) According to the topic, group discussions are arranged, answers to questions are recorded each time, as the peacetime achievement basis.

(2) One representative in each group will answer, and others will comment on the speech. The best ones will get extra points according to their answers.

Content interaction and discussion:

Taking 300MW and 500MW as examples, this chapter discusses why the auxiliary power system structure of different power plants is different? (prompt: power supply level, reliability)

Practical problems: on the basis of students' discussion, from the perspective of engineering and investment, according to the survey and design data and national standards, the problems related to engineering practice are put forward for discussion and then explained.

For example: 1000MW ultra supercritical unit was put into operation for the first time in China in 2012. Based on the existing 300MW and 500MW auxiliary power scheme, and referring to relevant national codes such as the technical code for design of thermal power plant (DL / T 5153-2014 technical code for auxiliary power design of thermal power plants), the following problems are analyzed and solved:

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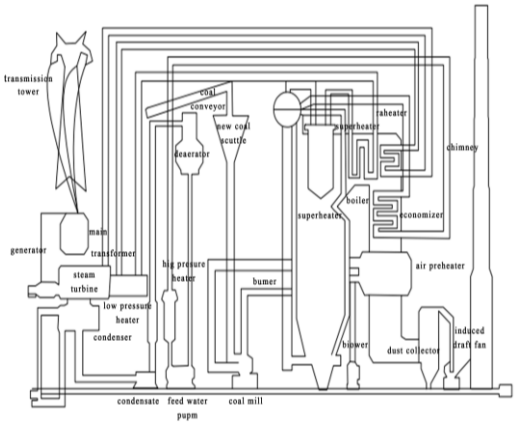

Figure 2 Power plant internal equipment and production process diagram

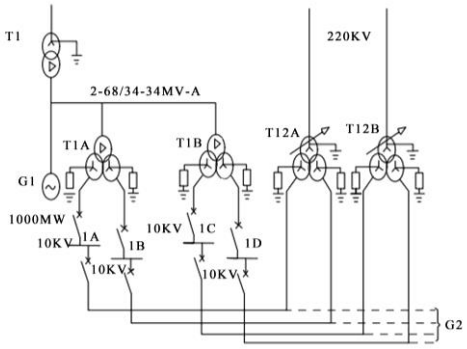

Figure 3 Auxiliary power scheme for 1000MW power plant

(1) Engineering design: how to design auxiliary power scheme for 1000MW ultra supercritical unit power plant? The main major aspects, such as wiring, transportation system and cooling system, should be taken into consideration .

(2) Analysis of engineering problems: why should the auxiliary power of large capacity unit be supplied by this unit? (an important factor to ensure safe operation of the unit)

3. Conclusions

On the basis of teaching practice and teaching management, the goal-centered problem-oriented teaching mode is put forward after analyzing and summarizing the teaching process from the perspective of how to cultivate talents. It is a summary and exploration of the mode of higher education teaching reform and how to improve teaching and improve the quality of personnel training. The proposal of goal-centered problem-oriented teaching mode reflects the innovation of teaching mode in higher education. With the continuous development of teaching practice and the continuous application of new ideas, a large number of teaching achievements will be produced, which will further reflect the scientific nature and wide application prospect of the teaching mode.

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(3) 2020 Guangdong Provincial Higher Education Teaching Reform Project "Eplicative Study on

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the Impact of the Problem-based Goal-oriented Teaching Mode Based on Mobile Platforms on ESP classroom anxiety ";

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