

A Study on Undergraduate Tutorial Talent Training Model Based on OBE under the Background of New Engineering

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Abstract: Higher education aims to cultivate individuals with both moral and professional abilities, as well as comprehensive development. The implementation of undergraduate tutorial is considered as a feasible way to achieve optimal results. In the era of big science where technology continues to innovate and empower higher education, new possibilities have emerged for the implementation of tutorial. Although many universities are currently exploring the undergraduate tutorial system, a standardized paradigm has not yet been established. The core of our research on the OBE based applied talent training model for new engineering undergraduate students is to reform the traditional talent training model from two dimensions: method reform and institutional reform, enhance students' knowledge application and transformation abilities through multiple channels and methods, and cultivate new and composite talents.

Keywords: Higher Education; Method Reform; Undergraduate Tutorial System; OBE; Institutional Reform

1. Introduction

In response to the new round of technological revolution and industrial transformation, supporting a series of national strategies such as service innovation driven development and "Made in China 2025", and responding to the Ministry of Education's "Notice on Conducting New Engineering Research and Practice" and "Notice on Recommending New Engineering Research and Practice Projects", we actively promote the construction of new engineering disciplines, fully explore the formation of a leading Chinese model and experience in global engineering education, and assist in the construction of a strong higher education

country. The implementation of the undergraduate supervisor system is one of the important measures to accelerate the construction of new engineering disciplines in universities [1], which is necessary for the development of engineering education in higher education institutions. It is of great significance in promoting the reform and development of undergraduate education and teaching in local universities, accelerating the construction of new engineering disciplines and innovating talent training models, further improving the quality of undergraduate students in higher education institutions, and cultivating high-quality and outstanding talents for the country.

With the gradual deepening of the construction of new engineering disciplines and the introduction of a series of directional documents by national ministries and commissions on the directory of new engineering disciplines, the computer major, as a key construction major in the directory of new engineering disciplines, has new and higher requirements for talent cultivation. Currently, talent cultivation plans need to be revised according to engineering certification standards. The undergraduate tutorial system is an effective way to achieve personalized education, and it is also an inevitable trend to improve teaching quality and cultivate outstanding talents [2].

2. Research Status

2.1 Engineering Teaching

In 2004, the UK first released the UK Engineering Professional Competency Mark developed by the Royal Chartered Engineering Commission. Under the influence of the "Socrates Plan", the European Union began to reform engineering education in 1995 and published the "Union Special Report: Advancing Engineering Education in Europe" in 2004, which deeply influenced the subsequent

development of engineering education in Europe. In the same year, the European Union also issued the "Teaching and Research in European Engineering" (TREE) program, which mainly focuses on macro level education reform such as the European education structure and the enhancement of the attractiveness of engineering education. In September 2004, the European Union of Engineering Associations launched the European Engineer Certification Program, hoping to improve the level of engineering talent and avoid uneven participation in talent levels.

In 2016, China joined the Washington Accord, and in 2017, the Ministry of Education conducted research and practice on new engineering disciplines. It proposed that the reform of new engineering disciplines mainly includes the concept of engineering education, disciplinary and professional structure, talent cultivation mode, new quality and classified development system of education and teaching, professional certification, etc. Afterwards, the Ministry of Education proposed the "Fudan Consensus", "Tianda Action", and "Beijing Guidelines", which clearly explained the strategic significance and core concepts of the construction of new engineering disciplines, providing guidance and suggestions for the development path of new engineering disciplines and the research and practice of new engineering disciplines. Professor Lin Jian from the Education Research Institute of Tsinghua University further explained the meaning of "new" in the field of new engineering, which includes three aspects: "emerging", "new", and "new". From this, it can be seen that new engineering disciplines include new disciplines, new disciplines upgraded from traditional engineering disciplines, and new disciplines born from cross integration with other majors.

2.2. OBE

In the continuous development of engineering education, a focus on practical engineering education has gradually emerged, which mainly includes three types: CBE, OBE, and CDIO. Among them, the OBE concept developed in the 1990s, which provided new opportunities for the development of education in the United States. With the rapid development of higher education in China, the OBE concept has been introduced into higher education teaching, and in-depth research has been conducted on the relationship between OBE theory and the exercise and

improvement of scientific thinking and comprehensive application ability of college students [3]. In the context of engineering education certification and new engineering disciplines, more and more universities and majors are revising their professional talent training programs in accordance with the requirements of engineering education certification.

OBE is an educational model based on goal orientation, also known as demand orientation or outcome orientation. The OBE concept starts with the expected learning outcomes of students, and then analyzes their learning efficiency, progress, and mastery in conjunction with diverse and flexible personalized learning needs. By analyzing the expected learning outcomes of students, reverse construct the education and teaching curriculum system and related evaluation system. The OBE concept focuses on enabling students to achieve self realization in learning through experiential learning. By providing feedback on the results, we can reverse improve the original curriculum teaching mode and design, and adhere to the principle of continuous improvement to form a virtuous cycle. Through effective learning methods, we can intervene positively in the learning outcomes of students. Gradually clarify the progress and direction of cultivating goals in this virtuous cycle, and develop without deviating from the expected direction. Ultimately, the cultivation process will infinitely approach the cultivation goals and ultimately achieve a high degree of unity.

2.3 Tutorial System

The tutorial system originated from the University of Oxford in the 14th century and was initially only applied in graduate education. At the end of the 19th century, the University of Oxford and the University of Cambridge further extended the tutorial system originally used for graduate education to undergraduate education. The success of the tutorial system has become the most proud innovation of Oxford University, known as the "treasure on the crown" [4].

In 2012, "reform the talent training model and implement a mentor system" is proposed in the "Several Opinions on Comprehensively Improving the Quality of Higher Education". Subsequently, the undergraduate tutorial system was fully implemented in Chinese universities [5]. At present, some domestic universities have

made some beneficial explorations in promoting the talent cultivation mode of new engineering construction. For example, Tongji University has launched an exploration of new engineering talent cultivation based on the undergraduate mentor system, combined with the personalized training requirements of undergraduate students, providing new ways for student development. However, due to its late start, the current undergraduate tutorial system is still in the exploratory stage, and due to significant differences in undergraduate education among different universities, the implementation models, stages, and effects of each university are also different. Some borrow the British tutorial system, positioning it as a teaching system, some define it as a teaching or consulting system for individual guidance, and some consider it as a supplement to conventional forms of classroom teaching, classroom teaching, and so on. Overall, the concept is too general and the training objectives are too broad unclear, not conducive to organizational implementation. Therefore, in the process of implementation in China, there have been common problems such as unclear training objectives and expected results, overly vague work content of the mentor system, and training models and management processes that do not meet the personalized training needs of students, which directly affect the implementation effect.

3. Research on Undergraduate Tutorial System

3.1 Research on the Relationship and Role between Undergraduate Tutorial System and OBE Concept Talent Training Methods

Integrating the OBE teaching philosophy into the undergraduate tutorial system in the talent cultivation process will directly correspond to the 12 graduation requirements, including the ability to design/develop solutions, scientific research ability, engineering and society, professional norms, individual and team, communication, project management, and lifelong learning, as shown in Figure 1, especially the cultivation of non-technical abilities, thereby improving the quality of undergraduate talent cultivation [6].

3.2 Establishment of Training Objectives for Applied Talents in the New Engineering Undergraduate Tutorial System Based on OBE

The development and cultivation of students throughout the entire process mainly includes: firstly, personalized development goals, which are structured on the "college track" and mainly combine the connotation and content of the tutorial system to set the basic situation of achieving goals for students in each grade; The second is the common development goal, which mainly focuses on cultivating student common development around the school's general education system on the school track [7].

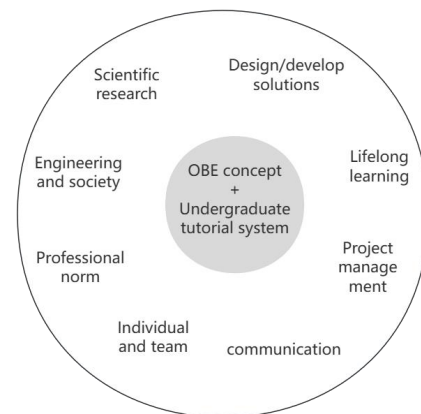


Figure 1. The Relationship between Undergraduate Tutorial System and OBE Concept Talent Cultivation Methods

3.3 Research on the Application oriented Talent Training Model of the New Engineering Undergraduate Tutorial System Based on OBE

Starting from two dimensions of methodological and institutional changes, this study explores the training model of applied undergraduate talents in the context of new engineering disciplines.

(1) Method change: In response to the demand for improving the innovation and entrepreneurship abilities of undergraduate students, we explore the integration of OBE education concepts into talent cultivation. Combining with practical needs, we clarify the expected learning outcomes of students, design the curriculum system and carry out teaching activities in reverse based on the final learning outcomes, and combine personalized training plans. Finally, through evaluation feedback corresponding to the expected results, we continuously improve the original curriculum system and teaching activities [8].

(2) Institutional change: Implement tutorial systems for undergraduate students of different grades, such as science and technology innovation competition tutorial, thesis patent

tutorial, and entrepreneurial practice tutorial [9]. The process of matching teachers and students in the implementation of the tutorial system includes "qualification screening and optimization, information release, two-way selection, group learning, adjustment and adjustment, and final matching." This project aims to reconstruct the basic functions of the components such as mentors, mentoring, and learning guidance in the talent cultivation model, so as to enable students to develop their overall quality in a subtle and silent manner during the learning process. Among them, mentors refer to personnel who have the ability to guide students, rather than narrow guidance teachers [10]. Therefore, those who can fulfill the functions of mentors can be on campus teachers, enterprise experts, etc. The guiding students mainly emphasize the function of developing their own abilities and consciousness, with a focus on engineering consciousness and innovative spirit. Through the complementary role of mentors, mentors, and mentors, we will promote the operation of talent cultivation models in applied undergraduate colleges under the background of new engineering disciplines.

4. Effect and Reflection of Undergraduate Tutorial System

This paper is about the development connotation of the tutorial system in the context of new engineering disciplines. It creatively integrates the OBE education concept into the undergraduate tutorial system, mainly focusing on the balance between student moral character and cultural literacy education. Therefore, the perspective is slightly different from the current undergraduate tutorial system. It not only focuses on cultivating students' engineering practice and innovation abilities in the context of new engineering disciplines, but also emphasizes the accumulation and cultivation of excellent ideological and moral values. We will pay more attention to the spiritual quality of life and personalized learning needs of students, and mainly reflect three major characteristics: mentors are no longer limited to on duty teachers, but widely absorb social personnel, such as corporate mentors, for collaborative education of industry and education. From guiding "learning" to guiding "education", teachers should truly transform from academic mentors to life mentors, pay attention to the process of guiding "education", and enable

students to unconsciously learn from the successful experiences of mentors and improve their moral character cultivation; From the guidance system of "teacher" to the guidance system of "student", the ultimate goal of teacher guidance is to stimulate students' potential for independent innovation and practical ability. This relies on full trust and communication between mentors and students, encouraging students to personalize the viewpoints and ideas generated in practice.

5. Conclusion

Implementing a tutorial system for undergraduate students of different grades, with a focus on constructing the basic functions of the components of tutorial, education, and learning in the talent cultivation model, so as to enable students to develop their overall quality in a subtle and silent manner during the learning process.

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