ISSN 2522-6398 Vol. 5, Issue 16: 21-25, DOI: 10.25236/FER.2022.051604

Research on the Integration of Subject Competition and Professional Course Teaching Mode Based on OBE Concept

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Abstract: *Based on the demand of training applied innovative talents in mechanical specialty and OBE educational idea, this paper discusses the effect of the integration of discipline competition and professional course teaching mode on improving students' innovative practical ability. At the same time, this paper also puts forward the reform of professional teaching mode based on subject competition, which provides more practical measures for students to transform subject competition and professional knowledge into ability.*

Keywords: *OBE concept, Discipline Competition, Mechanical specialty, Innovation practice, Teaching mode reform*

1. Introduction

The 2015 UNESCO research report pointed out that the world higher education is undergoing revolutionary changes, showing the trend of "popularization, diversification, internationalization, lifelong and informatization"[1]. And the higher engineering colleges and specialties are naturally among them, and follow the above trend to gradually change to the direction of "new engineering", from the former "technology paradigm" to the current "engineering paradigm", so the proportion of practical teaching in engineering specialty teaching is becoming higher and higher. Under this background, discipline competition has become the key to cultivate college students' practical ability [2]. In order to improve the efficiency and effect of knowledge to ability transformation, "discipline competition" and second classroom practice teaching activities have become a new way for most colleges to cultivate innovative talents. The OBE (Outcome Based Education) education concept provides a reform direction for the integration of subject competition and professional teaching. OBE philosophy follows the principle of "student-centered, output-oriented, and continuous improvement"[3], that is, allocating educational resources around students, taking training objectives as the guidance, and promoting the continuous improvement of training quality through continuous improvement [4]. Under this concept, the teaching objectives of professional courses are indexed. Teachers can use students' practical achievements to test and evaluate students' practical ability, and then make continuous improvement on this basis, transforming the knowledge orientation in traditional teaching into the result orientation.

2. Significance and Present Situation of Discipline Competition

Discipline competition is an important platform for contemporary college students' innovative practice ability to be reflected and promoted. Discipline competition can test students' ability to apply comprehensive knowledge, and it is also of great significance to students' innovative spirit and team spirit, including the improvement of engineering practice level. At the same time, the results of the discipline competition are also an important link to test the teaching of basic knowledge and the cultivation of practical ability in colleges and universities, so they are very important for schools, teachers and students.

At present, there are more than ten kinds of discipline competitions involved in mechanical majors every year. The theme and content of the competition covers almost all disciplines of mechanical majors, and puts forward higher requirements for students' professional knowledge and practical ability. This situation leads to the low participation rate of students in current subject competitions. Moreover, the

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participation rate of junior students is higher than that of senior students, and the entries of many institutions are not excellent. This is mainly due to the weak basic knowledge of the junior students, while the senior students can't give attention to both study and subject competition. It can be seen that in the current mechanical colleges and majors, discipline competition and professional teaching have not formed a good integration and promotion.

3. The Dilemma of the Integration of Discipline Competition and Professional Teaching Mode

3.1. Contradiction between applied knowledge and theoretical knowledge

As a comprehensive practice link, discipline competition focuses on training students' comprehensive application ability of professional knowledge, and the process of completing innovative works is closer to the process of enterprise product research and development. It is an innovative activity carried out after students have a certain professional knowledge base and professional ability by default. Therefore, discipline competitions pay more attention to the cultivation of professional ability, and students who can complete the process are required to first have "Application oriented professional knowledge system". The teaching of professional curriculum system should first follow the basic teaching law, follow the gradual learning process of "From shallow to deep", "From basic to professional" and "From knowledge to ability", and pay more attention to the learning and mastering of theoretical knowledge from the aspects of teaching methods, teaching content organization and teaching evaluation.

Therefore, although the subject competition and professional teaching are aimed at the same students, their knowledge systems are obviously different. This leads to the irreconcilable contradiction between the two. If the relationship between the two is not handled properly in the teaching process, it is very easy for students to fail to learn the essence of both knowledge systems and the phenomenon of "Imitate others and thus lose one's own individuality".

3.2. Unbalance between innovation ability and professional knowledge

The extensive development of academic competitions in colleges and universities has promoted the competition level year after year, so the requirements for students are not only limited to professional knowledge, but also put forward higher requirements for students' innovative ability. The innovation work is based on solid "Professional knowledge". The current competition subjects do not have such conditions, so they often take detours in the innovation work, increasing the investment of time and economic costs. In subject competitions, it often appears that the innovation of competitions is blindly improved, while the students' professional knowledge learning needs are ignored. The formation of students' innovation ability needs a long transformation time from knowledge learning to initial application to improvement. Therefore, how to correctly establish an efficient "Learning" and "Innovation" transformation channel has become the key to solve this problem.

3.3. Teachers' Multi-role Conversion in Colleges and Universities is Poor

Most of the instructors of competitions are professional teachers, so college teachers need to take on multiple roles at the same time, and different roles need different abilities. However, due to the differences between curriculum teaching and discipline competition guidance, teachers' experience accumulated in curriculum teaching can hardly be directly transferred to discipline competition guidance. At the same time, the requirements of competition for students' ability are characterized by complexity, diversity and comprehensiveness, while tutors usually pay attention to the teaching of a single course for a long time, lacking the whole professional vision. In addition, teachers' curriculum teaching and competition guidance adopt different teaching methods and guidance modes, which requires a lot of time and energy, so it is easy for competition instructors to feel powerless. At present, most teachers run each role independently, so it is inevitable to attend to one thing and lose another, and it is difficult to cover all aspects. How to integrate all work around "student centered" to achieve the goal of improving teaching quality is an urgent problem to be solved.

4. Professional Teaching Reform Based on OBE Concept

As an important part of practical teaching activities, subject competition has distinctive characteristics compared with the original curriculum teaching of the specialty. The organization and implementation

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of the competition can neither completely copy the curriculum teaching mode, nor form a completely independent system separated from the professional curriculum teaching. In terms of teaching objectives, there is no obvious difference between subject competition and professional curriculum teaching, so they should be able to form a symbiotic relationship that complements, promotes and integrates with each other.

4.1. Refine the teaching objectives in stages, and double-line parallel teaching of theory and practice

The difference between OBE education idea and traditional education idea is that it emphasizes the cultivation of students' practical ability. The formulation of teaching objectives needs to be implemented according to the talent training plan of the major. There are many professional competitions, and each kind of competition has different requirements for students' knowledge and ability. Therefore, it is necessary to give full play to the role of discipline competition in promoting the teaching process and formulate the training objectives of mechanical discipline competition according to the characteristics of discipline competition, the requirements of professional talent training, and the needs of students' personalized development. The training objectives of discipline competition are divided into four stages, and each stage cultivates different abilities:

The first stage: Strengthen the basic knowledge of the discipline and promote the application ability of knowledge. Be able to flexibly use discipline knowledge to analyze and solve a given single discipline competition topic.

The second stage: Cultivate the comprehensive application ability of professional basic knowledge. For specific engineering problems, we can comprehensively apply the knowledge of many courses, use modern tools to predict and simulate engineering problems, and understand their limitations.

The third stage: Relying on the technology development platform of discipline competition, select the professional direction, expand and master a certain professional technology, and cultivate the practical application ability of new professional technology.

The fourth stage: Around the "actual engineering project", comprehensively apply the knowledge of various disciplines, carry out the research and development practice of complex mechanical products, and enhance the innovation and entrepreneurship ability.

In the process of implementing the training plan, instill the "project system" management mode, so as to improve the ability of project management, team management and economic management.

4.2. Take the discipline competition as the traction and flexibly construct the teaching content

The discipline competition itself has the characteristics of "multiple competitions" and "multiple grades". There are more than ten competitions held every year, covering the whole college life from the first grade to the fourth grade. However, the prerequisite for students to participate in discipline competitions is that they have a certain reserve of professional knowledge. Therefore, based on this, students can be informed of the subject of the upcoming discipline competition in advance, and the actual problems of the competition can be used as a traction to stimulate students' interest in learning professional knowledge, and then the knowledge they have learned can be converted into practical ability through the competition. For example, the "National Undergraduate Mechanical Innovation Design Competition" requires students to have the necessary professional knowledge related to mechanical design. The courses involved include Mechanical Principles and Mechanical Design. Teachers can build their own teaching content according to the actual requirements of the competition, and integrate the content into the overall scheme design, transmission scheme design, selection of parts and materials, installation and commissioning of finished products.

4.3. Taking discipline competition as the carrier, develop the teaching mode of discipline competition

The curriculum of subject competition should adapt to the characteristics of the competition and improve the quality of the competition, so it is necessary to plan a suitable teaching model. The competition needs to offer many courses, and each course has different training contents for students. However, a similar teaching mode can be planned to reduce students' adaptation time and improve the teaching effect at the same time. The teaching mode of mechanical discipline competition course is shown in Figure 1, and the specific operation steps are as follows:

(1) The course content is divided into several relatively independent stages, each stage lasts for 2-3

ISSN 2522-6398 Vol. 5, Issue 16: 21-25, DOI: 10.25236/FER.2022.051604

weeks.

According to the mechanical product development process, follow the practice teaching mode of "learning while doing" to guide teachers to plan and design the curriculum. At the same time, the specific task book of the course is given, and the schedule and assessment methods of the course process are explained to students in detail. Students are divided into several teams according to the competition items.

(2) Each stage is divided into "2 activities" and "3 points".

Point 1: Instruct teachers to explain their knowledge. Instruct the teacher to explain the teaching content in detail, and provide the learning reference materials and templates for submitting technical documents at this stage.

The first "activity": The students will guide the teachers to impart knowledge and apply it to the development of the competition project. The internal communication of the project team will carry out task division and cooperation.

Point 2: Interaction between teachers and students. PPT students explain the current work progress, list the problems they are facing, and instruct teachers to give specific suggestions for revision.

The second "activity": students summarize the current stage work and write the stage technical report.

Point 3: Stage technical review: Instruct the teacher team to assess several competition projects and put forward suggestions for modification.

(3) Multiple competitions are carried out at the same time and the progress is consistent. Multi-project parallelism can not only ensure the guidance efficiency of teachers' team, but also improve the learning efficiency by learning from each other and promoting each other among project teams.

(4) Each competition course forms a complete course teaching material.

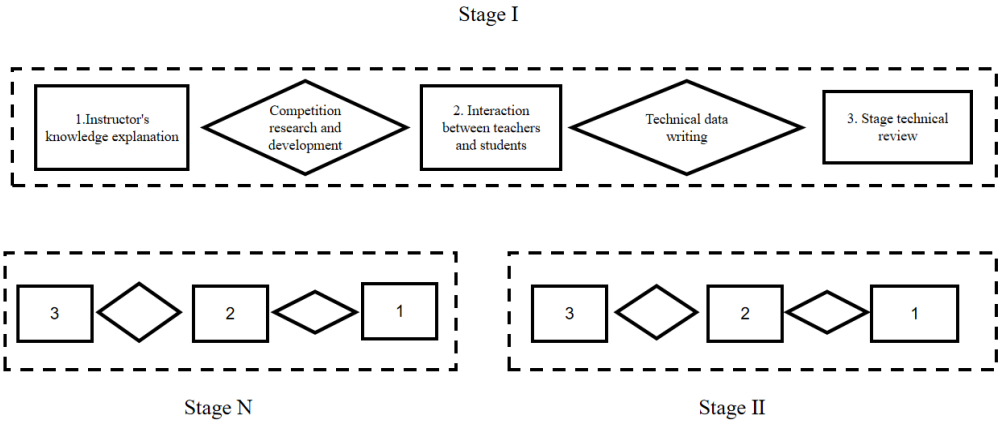

Figure 1: Teaching Mode of Discipline Competition Course

4.4. Establish a team of discipline competition instructors to avoid ambiguous role positioning

In view of the poor effect of the role transformation of college teachers, we must refer to the multi-project and multi-team operation mode of discipline competition, and strengthen the management of tutor team. According to the role of tutors in different links, the tutors are divided into five teams, namely, the strategic decision-making team of discipline competition, the professional tutors team, the teachers team of new technology platform, the basic ability guidance team of individual discipline and the competition management teachers team. The functions of each team are positioned with reference to the following:

(1) Strategic decision-making team of discipline competition: To formulate teaching management of various competitions of discipline competition from a macro perspective. Including the formulation of competition training objectives, curriculum setting, curriculum content, teaching mode, student evaluation and assessment, student participation management, etc.

(2) Professional instructor team: Able to cover all the processes of "research and development of complex mechanical products" and give overall guidance to the subject competition works.

(3) Teacher team of new technology platform: Improve the application ability of new technology in discipline competition, comprehensively analyze the latest technology trends and competition technology

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requirements in the industry, set up new technology platform, and offer new technology application courses.

(4) Instructor of basic ability of single discipline: When organizing a comprehensive discipline competition, the instructor is responsible for the guidance of a certain link in the student's work.

(5) Competition management teacher team: Responsible for student management during the competition, including course learning management, team management, competition project management, competition materials management, etc. In the long-term competition practice, various perfect management systems have been gradually formed.

4.5. Evaluation and continuous improvement of the achievement of curriculum objectives

Because the final result of the subject competition is determined by many factors, it is difficult to objectively evaluate the achievement of the course objectives by taking the competition result as the evaluation index alone. Therefore, it is necessary to establish a competition evaluation system that combines process assessment with competition results. The evaluation system consists of three parts: project (team) evaluation, individual evaluation and curriculum evaluation. Evaluate the technical documents submitted in each stage of the competition, and divide specific 3-6 evaluation index points in each stage and give scores. The process evaluation and competition results are combined to give the total score, so as to evaluate the achievement of the curriculum objectives, and then find out the problems and analyze the causes, so as to make necessary adjustments and improvements to the follow-up teaching and constantly improve the curriculum quality.

5. Conclusion

Discipline competition is of great practical significance to the cultivation of new engineering talents, and it can help students transform their theoretical knowledge into applied knowledge, thus improving their practical ability. However, in the current engineering major, the subject competition is often separated from the professional teaching link, and there are problems such as insufficient knowledge transformation, insufficient innovation ability, and vague teacher role positioning. The principle of "student-centered and achievement-oriented" in OBE education concept provides a brand-new direction for the mutual integration of discipline competition and professional teaching. By refining the teaching objectives at different stages, flexibly constructing the teaching content, developing the teaching mode of integration of competition and teaching, establishing a professional tutor team, and improving the evaluation system and the strategy of continuous improvement, the teaching mode reform of integration of discipline competition and professional course teaching can be effectively realized.

Acknowledgements

Fund project: Hebei Higher Education Teaching Reform Research and Practice Project (2019GJJG200)

The research was supported by the Project of Research and Practice for Higher Education and Teaching Reform of Hebei Province (No. 2019GJJG200)

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