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Preliminary Exploring the Classroom Teaching Reform of Engineering Majors under the Background of Emerging Engineering

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Abstract: *The classroom teaching reform of engineering majors under the background of new engineering is a hot topic in the field of education. The purpose of this study is to discuss the problems existing in the classroom teaching of traditional engineering majors, analyze the influence of new engineering ideas on education, and how to introduce new engineering ideas into the classroom of engineering majors. The research found that under the background of new engineering, the classroom teaching of engineering majors needs to pay more attention to interdisciplinary integration, practical teaching and the cultivation of innovative thinking. Therefore, the reform should focus on the update of curriculum content, the innovation of teaching methods, and the improvement of student participation. Through this study, we can better adapt to the educational needs of the new engineering era, and cultivate engineering professionals with comprehensive quality and innovative spirit.*

Keywords: *Emerging engineering, The classroom teaching reform, Teaching method, Teaching content, Assessment method*

1. Introduction

The classroom teaching reform of engineering majors under the background of new engineering is designed to adapt to the needs of the rapidly developing fields of science and technology and engineering, and to cultivate engineers and scientific and technological talents with interdisciplinary knowledge, innovative thinking and practical ability. The Outline of the National Medium-and Long-term Education Reform and Development Plan(2010-2020) clearly puts forward the requirements of building applied technology universities, promoting the transformation and development of local universities, and improving the level of institutions of higher learning serving regional economic and social development[1]. The transformation of local undergraduate colleges and universities should not stay in form, but to implement substantive transformation. It must be based on classroom teaching reform. We should further deepen the classroom teaching reform from the aspects of teaching mode, teaching method, teaching structure design, assessment method and so on, and transform the traditional teaching-based classroom teaching mode into a mixed classroom teaching mode.

2. Construction Content

2.1. Reform of Teaching Methods

The outdated teaching methods in the past lead to the unsatisfactory teaching effect, so the classroom teaching should be redesigned. Educators have been exploring and trying to find the teaching methods that can improve the teaching effect. Project-based teaching and flipped classroom emerge as now. Project-based teaching is to break and reconstruct the theoretical system and link the boring theoretical knowledge with enterprise production practice. Through case analysis, discussion and open questions, stimulate students' innovation potential. Project-driven teaching methods that allow students to learn and solve problems from practical projects. This method can improve the students' practical application ability and team cooperation ability. The flipped classroom teaching model allows students to watch the teacher's video explanation before or outside the class. Students complete their independent learning. Teachers no longer take up class time to teach knowledge. The classroom has become a place for interaction between teachers and students and between students and students, including answering questions, cooperative inquiry, completing studies, etc., so as to achieve better educational results[2].

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The core of the flipped classroom is the transformation of student participation. Students' learning process is completed through the active learning of teaching resources before class. Students change from passive learning to active learning. Through the interaction between teachers and students in the classroom, the knowledge learned through the teaching resources to check the gaps, so as to better master the knowledge points and knowledge system. Flipped classroom has been recognized by many educators. In the past two years, in the front line of teaching, everyone has practiced flipped classroom and popularized flipped classroom. However, by analyzing the mode of flipped classroom, we can clearly see that watching teachers' video explanations before and after class is the first step, and then teaching resources will become the basis for the realization of flipped classroom. Therefore, teachers are encouraged to make teaching resources, give play to the characteristics of individual knowledge, show the content in a short and concise form, to directly hit the target knowledge points, and clearly classify high-quality individual teaching resources is the basis of the reform. In short, classroom teaching should encourage students' innovative thinking and creative ability to problem-solving. Therefore, teachers are encouraged to produce teaching resources. Individual knowledge characteristics should be developed. Video shows the content in a short and concise form, which can directly hit the target knowledge point. Therefore, high-quality individual teaching resources with clear classification are the basis of the reform. In short, classroom teaching should encourage students' innovative thinking and creative problem-solving skills.

2.2. Reform the Teaching Content and the Teaching Links

Taking the design course of mechanical engineering major as an example, there are the following main problems in the teaching link: (1) The practice link is not obviously targeted, and the form is more than the content. (2) Classroom teaching design is simple, and theory is more important than practice. (3) The construction of the practice platform is not perfect, and the docking of the practice units is not specific. Reform of classroom teaching according to talent demand of the market is the fundamental place of the transformation of talent training mode. We should reasonably adjust the teaching content according to the training index. At the beginning of each design course, the stage of internship, and the internship content is closely related to the core content of the course. Students serve as the main body of classroom learning. Let the students personally do it, practical operation and experiment, to deepen their understanding of the engineering principles.

We should design the classroom teaching, link the boring theoretical knowledge with the enterprise production practice, and select the current advanced production equipment or the equipment knowledge that students are interested in as the theme. We should flexibly use guided teaching, and let students actively participate in teaching activities through group lectures and discussions. In the teaching process, the professional design competition is combined with classroom teaching. Students participate in the competition in the form of a project team, division of labor and cooperation, and lead the new with the old, so as to improve the main position of students in learning. By guiding and encouraging students to participate in the competition, students can improve their professional knowledge application ability, practical ability, independent learning ability and innovation ability, and combine theoretical learning with practice to promote the dominance of students' tacit knowledge. It can realize the phased improvement of the professional quality of applied technical talents. At the same time, the knowledge and technology in the engineering field are constantly evolving, and the curriculum should be updated regularly to reflect the latest trends and technologies.

2.3. Reform of Assessment Method

The study of assessment methods of classroom teaching reform in engineering majors is to evaluate and promote the effective implementation of teaching reform and ensure that students can obtain high-quality education in engineering majors. According to the requirements of professional ability training, establish a perfect assessment link of design courses of mechanical engineering major. Instead of evaluating the overall level of a student by the results of the final examination, the internship design, classroom discussion, competition discussion, student teaching and other assessment forms are integrated to assess students through a variety of ways[3], and focus on the assessment of engineering application ability. The assessment is carried out in classroom teaching and practical teaching respectively. Through the process assessment, the assessment promotes students' theoretical knowledge and practical ability, and promotes students' mastery of knowledge and knowledge application ability. In the teaching reform, we should focus on the performance of students under the new teaching mode, and their ability in solving practical problems and applying knowledge. We should pay attention to student evaluation. We can collect students' feedback to understand their views and feelings on the teaching reform. This can be

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implemented through anonymous questionnaires, group discussions, student feedback meetings, etc. Peer evaluation can provide advice and advice from a professional perspective. We should invite other teachers or field experts to conduct peer evaluation and evaluate the quality of teaching reform. The effect assessment of teaching reform can be achieved by reviewing the course design, teaching plans and teaching materials. It can be measured by checking whether there are novel teaching methods, practical curriculum designs, and content related to practical engineering applications. We should also ask teachers to reflect on and summarize the teaching, and evaluate the impact of the reform on students' learning experience and performance through the teaching reform reports submitted by teachers. If the teaching reform involves project practice, it can be assessed by assessing students' performance in the project, project results and their ability to solve practical problems. The teaching reform should encourage students to participate in subject competitions. Evaluate their ability in practical application by obtaining relevant certificates. This can be used as an additional indicator of classroom teaching reform. According to the actual needs of engineering majors, professional skills assessment can be designed to test students' skill level in engineering practice. In short, a continuous evaluation mechanism should be adopted for teaching reform, regularly monitor the progress of teaching reform, and timely adjust teaching strategies. The above assessment methods can comprehensively evaluate the effect of the classroom teaching reform of engineering majors, and ensure that the reform can really improve students' practical application ability and innovative thinking.

2.4. Reform of Technical Means

The classroom teaching reform of engineering majors needs to combine advanced technical means to improve the teaching effect, stimulate students' interest and promote the practical application. For engineering majors, learning programming and using simulation software are important skills. Teachers can introduce relevant programming and simulation tools, so that students can deeply understand the theoretical knowledge through practical operation. We can use the virtual laboratory and simulation software, so that students can conduct experimental operations on the computer to simulate real engineering scenarios. In the case of practical equipment is not easily available, this helps to improve students' practical ability. We can use online teaching platforms, such as Moodle and Blackboard, to build online courses, resource sharing and learning communities to promote the interaction and cooperation among students. We can use teaching videos and multimedia materials to present abstract concepts through images, animations and other forms, so as to help students better understand and remember them. We can enable students and teachers through remote real-time interaction technologies, such as video conference and online real-time q & A, to interact in different locations, solve problems and exchange experiences. We can use the online platform to provide practical projects, allowing students to participate in practical projects through the Internet, and exercise their teamwork and problem solving skills. We can use the intelligent teaching system, through learning analysis and data mining technology, personalized to provide students with teaching resources and guidance, to promote personalized learning. We can use the real-time interactive voting system, where teachers can conduct classroom tests and ask questions at any time to stimulate students to participate and think. We can use VR and AR technology to create virtual engineering scenarios, allowing students to operate in the virtual environment and improve their practical operation skills. We can use social media and collaboration tools to build online communities related to courses for students to communicate, discuss and share academic resources. The application of the above technical means can make the engineering class more vivid and interesting, and improve students' learning enthusiasm and practical application ability. In the use of these technical means, teachers need to use flexibly, according to the characteristics of the course and students' reasonable selection and integration.

2.5. Reform of Curriculum Construction and Innovative Thinking

The course construction should clarify the core competencies that engineering graduates should have, such as innovation ability, problem solving ability, teamwork ability, etc., and integrate these core competencies into the course design. Curriculum construction should emphasize the orientation of practice, so that students can apply the knowledge they have learned in real engineering scenarios, and cultivate the ability to solve practical problems. The field of engineering often involves the knowledge of multiple disciplines. In order to cultivate students 'comprehensive literacy, the curriculum construction should promote interdisciplinary integration, integrate engineering majors with other disciplines, and cultivate students' comprehensive literacy. For example, combine engineering technology with business management, environmental science and other fields. The course construction should introduce the concept of sustainable development into the students, so that the courses of engineering majors should

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pay more attention to environmental, social and economic sustainability, and cultivate students' sense of social responsibility. Curriculum construction should establish cooperation with relevant industries, introduce industry-oriented courses, so that students can better understand the practical engineering application, and promote the course content closer to the needs of the industry. In the classroom of engineering majors, the curriculum construction should also pay attention to the integration of ideological and political courses. By discussing ethics, social responsibility and other issues, guide students to establish correct values and professional ethics. In addition, based on the individual differences of students, we will explore the possibility of providing personalized learning paths, including personalized tutoring, customized courses and flexible learning models, to meet the learning needs of different students. Use emerging technologies (such as artificial intelligence, virtual reality, etc.) to integrate into classroom teaching, create a more vivid and interactive learning environment, and improve the learning effect and learning experience. Promote the sharing and interconnection of open teaching resources, with the help of network platform and online resources, let more students obtain high-quality teaching resources and knowledge. Encourage teachers to become guides and partners of learning, and promote students' independent learning and the cultivation of innovative thinking, not just the ters of knowledge. These innovative thinking can help to cultivate students' innovative ability, practical ability and the ability to adapt to the future work, so as to better meet the needs of the society for engineering talents.

2.6. Reform of Teacher Construction

The success of the classroom teaching reform of engineering majors cannot be separated from the active participation of teachers and the improvement of their professional ability. We should provide regular professional knowledge update training, so that teachers can keep up with the development of technology and disciplines, and understand the latest engineering technology and industry trends. We should guide teachers to understand modern educational concepts and cultivate their cognition of innovative teaching methods, such as problem-driven learning, project-driven learning, online learning, etc. We should arrange successful practical experience sharing meetings, so that some teachers who have made remarkable achievements in the field of engineering teaching can share their teaching experience, and promote the interaction and communication between teachers. We should cultivate teachers' teamwork spirit, encourage interdisciplinary teamwork, so that teachers can work better together, and promote interdisciplinary comprehensive teaching. These studies can help to improve the ability and quality of teachers in the classroom teaching reform of engineering majors, so that they can better adapt to the educational needs of the rapidly developing science and technology and engineering fields.

3. Conclusion

In general, the classroom teaching reform of engineering majors under the background of new engineering emphasizes the synchronization with industry trends and technological development. In order to students can acquire a wider range of knowledge and skills, the problem-oriented learning model is widely adopted, and the course content needs to be constantly updated and adjusted, so as to cultivate students' innovative ability and practical engineering skills to adapt to the changing needs of the engineering field. These reforms aim to provide a more challenging and practical education to meet the expectations of students and society.

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