Application of Blended Learning in Engineering Practical Courses

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Abstract

environment and teaching requirements. It's also a necessary condition to realize the OBE concept. This paper summarizes the conditions and approaches for blended teaching, such as OBE concept, personalized and customized teaching content and diversified teaching forms and design principles. According to the above principles, we design and reform the molding and processing course-a practical course of polymer material major. Through preview and virtual simulation on the computer, precise and intelligent classroom training, independent learning and flipped classroom, the initiative of students is increased. The blended learning reform of practical courses is realized.

Keywords

Blended learning; Practical Courses; OBE concept; Teaching reform.

1. Introduction

Practical scientific and technological talents are the goal of most colleges and universities. We should strengthen the role of engineering practice in the cultivation of engineering students. At the same time, we should enhance the cultivation of thinking ability, practical ability and hands-on ability in the course. Through training innovative thinking, innovative ability and innovative spirit in engineering practice, students' innovative quality can be effectively enhanced and the overall quality of engineering students improved. In the major of polymer materials and engineering, molding and processing course is a very important practical course, which is a bridge between students' book knowledge and practical ability. Designing a scientific, standardized and effective blended learning is the key to ensure the quality of practical teaching. In the teaching process, we should take scientific and standardized information teaching as the basis, and follow the appropriate teaching theory and the theory and method of educational psychology. At the same time, the connotation of information teaching design and practice concept should be deeply understood, and scientific and effective information teaching design and practice should be designed based on learning situation and subject characteristics and oriented by talent cultivation goal [1]. This paper studies the promoting effect of blended teaching on teaching effect in engineering practice courses by analyzing the ideas and approaches of teaching innovation. Finally, a blended teaching design scheme for engineering practice courses is summarized.

2. Necessity of Blended Teaching Innovation and Reform

Education has become one of the urgent issues to be solved since the National Education Conference in 2018 proposed that education is a major project of the country and the Party. To whom, how, and for whom cultivate students? This question has become the core question that China's higher education needs to answer. As the builders and successors of socialism, college students should always adhere to the core of growth, take moral as the fundamental, and became talents of the Party and the country. According to the above ideas and ideas, we

teachers should take talent cultivation as the essential work, fully realize the importance of undergraduate education. We should focus on students and guide them to pursue true knowledge and practice true skills. Teachers should love teaching, devote themselves to teaching and educating people. We should always adhere to the correct political orientation and promote the combination of professional knowledge education and ideological and political education. We will make every effort to promote innovation in school running philosophy, organization and system, and make every effort to realize the dream of developing China through education.

In this background, the state and the ministry of education have made great efforts to improve and support curriculum construction, such as curriculum ideological and political, new engineering, first-class majors and first-class courses and other types of curriculum construction [2]. At the same time, the construction and application of online courses are vigorously developed in light of COVID-19. At present, MOCC, Xuetang Online, Chaoxing and Cloud Class websites and related Apps are widely used. They have built vast online courses that take full advantage of the internet and enable students to access the newest knowledge online. In addition to the construction of online classroom, a large number of classroom teaching assistant software and websites also emerged, such as rain classroom, Learning pass, etc. Base on the powerful online interaction ability of the program, these software can improve the interaction of classroom teaching, deepen students' understanding of knowledge and strengthen the cultivation of team cooperation ability. In addition to strengthening technology-assisted teaching such as online classroom courses, smart classroom, which is more interactive, is also attracting more attention.

We find that after a series of changes in teaching requirements and environment, the corresponding teaching methods need to be reformed and innovated simultaneously [3]. Therefore, under the background of an innovative teaching reform, blended teaching emerged as a modern information technology. In fact, the innovation of teaching design is emphasized in the above changes, because only in this way can we cultivate talents. Therefore, we emphasize the OBE concept, and take students as the center to reform and improve teaching methods, teaching content, teaching means and other aspects [4]. First, we set students effective learning as our goal. In the practice process, we found that only by taking output as the goal and promoting students' effective learning as the guidance to design the practice teaching course, can better impart knowledge to students, as well as students can have a deep understanding of this knowledge. Secondly, we regard the future development of students as goal. In the course of teaching, students' individual differences should be taken into full consideration, and teaching content should be adjusted according to students' professional development. At the same time, according to the location of the school, we should upgrade the knowledge and add some new content about the application of technical appropriately. Therefore, we carry out blended teaching reform for practical courses of this major. We innovate and explore all aspects of teaching concept, such as teaching objective, teaching content, teaching methods and evaluation process. We fully advocate the OBE concept, and take knowledge transmission, logical thinking development and moral improvement as our ultimate goal. We hope to present the most cutting-edge and timely content to students through careful design, and to complete the course evaluation based on OBE concept.

3. Design Principles of Blended Teaching

In order to improve the teaching effect, we should pay attention to several design principles of blended teaching before it is carried out. Only by fully understand its design principles can blended teaching design be reasonable and effective. It can not be called Blended learning if it is just a simple online-and-offline mode or using high-tech platform in teaching design, or a

single project-based learning. Blended learning is essentially a "multi-dimensional" mixture of multiple learning theories, learning styles and teaching methods. Blended learning is the integration of sharing educational resources, independent learning process, informationization of interactive behavior, individualized learning style, high efficiency of learning evaluation and teaching management.

3.1. Design by OBE Concept

OBE is also known as results-oriented education, ability-oriented education, goal-oriented education or needs-oriented education. OBE concept is a results-oriented, student-oriented, reverse way of curriculum system construction concept. In OBE, outcomes are not the sum or average of previous learning outcomes, but rather the final result achieved by the student after completing all the learning processes. In OBE, results are not just what students believe, feel, remember, know and understand, nor are they temporary manifestations of learning, but a process that students internalize into their inner heart. In OBE, outcomes are not only what students know and understand, but also the practical application ability, as well as values or other emotional factors that may be involved. The closer the outcome is to the "real learning experience of students", the more likely it is to last, especially the outcome after long-term and extensive practice of students. The results should take into account the important content and skills of life, and pay attention to its practicality, otherwise it will become easy to forget information and one-sided knowledge. Final outcome does not mean disregarding the outcome in the learning process. We should design the course according to the final outcome and the principle of reverse design, and evaluate the outcome in stages. In the learning pyramid, memory and understanding are low level thinking, which is the goal we must complete in the learning process, while application, analysis, evaluation and creation are high level thinking, which is the goal of students' ability and thinking development. In view of this higher-level thinking, we should consider from the school positioning, the major positioning, develop appropriate curriculum objectives, so as to scientifically realize the integration of learning and thinking, intellectual unity.

3.2. Personalized and Customized Content

In the process of students' learning, there are differences in knowledge learning and practical ability learning due to obvious differences in basic knowledge and learning efficiency among different students. This also makes it difficult to organize teaching content and apply teaching methods, and students' overall learning efficiency will be greatly affected. Under these circumstances, it is an inevitable requirement for the development of education and teaching system to implement more flexible and individualized teaching based on students' basic situation and personalized learning needs, with students as the main body of learning activities. In addition to establishing corresponding learning modules according to the curriculum standard system, cutting-edge learning content related to professional knowledge and the cultivation of students' core literacy should also be embedded. Moreover, scientific research and foreword application should be presented to students in the form of Micro-course online video, virtual simulation and animation to realize the integration of foreword technology and course content, so as to effectively improve the effectiveness of learning.

3.3. Complementation of Online and Offline Learning

With the rapid development of Internet technology, the online mode of part of the course content can not only promote the process of education reform, realize the optimization and innovation of traditional teaching mode, but also form a new mode of online and offline teaching complementary. This can provide students with sufficient learning space and learning opportunities, and promote the cultivation of students' independent learning ability, innovative consciousness and thinking ability. In the traditional learning mode, students mainly learn

passively by audio-visual way, which has a low degree of knowledge mastery. If students study actively through group discussion and practice, their mastery of knowledge will be greatly improved. We can teach general theoretical knowledge in online courses, and achieve learning objectives through independent learning online. After that, students will be guided by teachers to carry out process and strategic knowledge teaching in class, and improve their understanding of knowledge through activities such as interaction, discussion and group presentation.

4. Method and Effect of Blended Teaching in Practical Courses

We have introduced the blended teaching design into the course of plastic and rubber forming processing, which is a very important professional course for polymer materials and engineering major and an important link between theoretical knowledge and practical ability. This course includes molding processes such as extrusion granulation, injection molding, plasticizing, molding, foaming molding and formula design. It's also including the characterization method of common products, such as tensile strength, impact strength, bending strength test, hardness, heat resistance and oxygen index and other parameters. Through this practical course, students can understand the basic properties of polymer materials and their characteristics. Students can select the most appropriate materials to meet different purposes and determine the optimum process conditions for the production of plastic or rubber products. Students can be familiar with the basic testing and processing methods of plastic and rubber properties, and as a means of production and quality management.

4.1. Online Preview & Virtual Simulation Experiment

In this major, the practice course is the channel to realize the transformation of knowledge into ability, and it is an important link to cultivate students' practical ability. Since the normalization state of the COVID-19 epidemic, we have fully developed all kinds of online experiments and training and virtual simulation platform resources. We carried out experiments and practical teaching through MOOCs, live broadcasting and virtual simulation. A large number of positive and effective exploration practices have been obtained. After two years of large-scale online teaching practice test, this course on the computer previews and observation experiment has developed. At the same time, in view of the high cost, difficult operation and lack of hands-on experiments for students in some theoretical teaching, we use virtual simulation experiments to achieve various experimental environments through virtual reality technology to complete a variety of scheduled experimental projects.

4.2. Accurate and Personalized Wisdom Classroom Teaching

Through the smart classroom, we break the traditional teaching mode and present high-quality materials in a fragmented way to achieve standardized and personalized teaching methods, so as to realize the digital teaching mode. We carry out teaching activities aimed at solving problems in wisdom class. After precise design, problem-oriented thinking mode is adopted to change knowledge learning from traditional passive acceptance to active exploration. Personalized and accurate group discussion should be actively carried out in class, and students' knowledge system was improved by comments and Q&A through teachers' organization and guidance.

4.3. Independent Learning & Flipped Classroom

We adopt the form of independent learning and flipped classroom for some courses. In the process of independent learning, students evaluate themselves on the knowledge. If they can fully understand the knowledge, they will move on to the next knowledge point. If they do not learn well, they will self-correct and study again. In this way, students have a 100%

understanding of this knowledge point. This mode can replace teachers' repeated explanation of knowledge points and realize the individuation of learning. At the same time, it promotes students' deep learning of knowledge. In addition, in flipped classroom, students summarize what they have learned and present it completely through group discussion and after-class preparation. In this process, students not only consolidate knowledge points again, but also form feedback in the interaction of classroom questions and answers, so as to broaden their thinking and enrich their knowledge.

To sum up, we design this course as a student-centered practical course with full consideration of learning situation, and teach the latest knowledge to students in a customized way. Through the hybrid teaching design, we form a emphasizes interaction, personalized and customized, student-centered teaching mode that can learn anytime and anywhere, which effectively improves the teaching effect and promotes teachers' teaching ability and discipline construction. In the Blended learning, students can choose their own learning methods and carry out multi-channel and multi-form teacher-student, student-student and man-machine interaction. Benefiting from being able to study at any time and place, students have more time to evaluate and reflect on the learning process. Teachers have also changed from the original classroom leader and knowledge imitator to the organizer and director of the teaching process. Compared with traditional teaching mode, Blended learning has three main characteristics: flexible learning resources, providing support for individual learning and improving teaching efficiency. Blended learning can strengthen the play of students' main role through the combination of students' subjectivity and teachers' dominance. Blended teaching emphasizes student-centered and attaches importance to the individual differences of students' cognitive process. In the process, students are the subject of cognition and the active constructors of knowledge system. Therefore, blended teaching provides students with a high degree of independent, requiring students to have a high degree of learning initiative and enthusiasm. A comparative study on the teaching effect of various teaching modes shows that the teaching effect of the pure independent learning mode is not good, even worse than the traditional teacher-centered teaching mode. The improvement of students' independent learning ability is often inseparable from teachers' guidance, and the comprehensive application of different teaching modes can often achieve satisfactory teaching results.

5. Conclusion

This project describes the background, necessity and design principles of blended teaching and specific design in the practical curriculum. Through computer virtual simulation, precision intelligent classroom teaching, autonomous learning and flipped classroom, students' subjective initiative is fully mobilized to achieve personalized and differentiated autonomous learning and improve the teaching effect. It fully explains the necessity of blended teaching design in engineering practice courses.

Acknowledgments

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