

Reform and Exploration of New Teaching Mode of Bridge Engineering Major Based on Internet

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Keywords: Teaching reform, Based on internet, Cdio engineering education concept, Bridge engineering

Abstract: With the rapid development of wireless communication technology, learning based on mobile terminals has become a powerful means of supporting education methods. With the help of the internet and video, the teachers of the colleges and universities attempt to realize the network-based teaching of the important knowledge points and extended contents in the professional lectures. In addition, incorporating the CDIO engineering education concept into the teaching reform based on the internet for bridge engineering major. Practice has proved that this reform can improve the teaching efficiency and students' enthusiasm for learning, which is conducive to cultivating the new generation of engineering talents.

1. Introduction

With the rapid development of wireless communication technology, mobile terminals have become an indispensable condition for the implementation of modern learning. The Internet platform has become an important channel for college students to query and exchange information. Internet-based learning has gradually become an auxiliary means of university education^[1]. Research on mobile learning has continued to advance in recent years, and has formed a development consensus from E-learning to M-learning to U-learning. It has accumulated research results from theory to resources, from terminal to platform, from activity to practice, etc. It has become the most advocated learning mode in modern education.

Colleges and universities, as the training bases for high-quality talents, face more and more challenges in the cultivation of practical and innovative talents^[2]. Bridge engineering is an important pivotal engineering in urban development and economic construction. The training of students of this major needs to pay more attention to the combination of theory and practice. In terms of theoretical teaching, the students need to lay a solid professional foundation of mechanics, structural design, engineering materials, etc. In terms of practical teaching, it is necessary for students to flexibly use professional norms, design regulations, construction methods, etc. In terms of scientific and technological innovation, it is necessary to pay more attention to students' understanding of new technologies, new processes and new materials. This puts forward higher requirements for the education system of bridge engineering specialty in colleges and universities.

However, the publication cycle of professional textbooks in colleges and universities and the update of professional knowledge often lag behind. As a result, college students cannot access the latest professional knowledge and technology in a timely manner. "CDIO engineering education model" is a centralized summary and abstract expression of "education and learning based on project", which mix the actual project and innovative practice in the whole process of engineering talent training^[3]. The combination of the U-learning model based on internet and the CDIO engineering education model is the best way for the modern education of colleges and universities, especially for the bridge engineering students to understand advanced professional knowledge^[4].

2. The Demand for the New Education Model Based on Internet and CDIO

With the deepening of the “student-centred” teaching reform concept, major colleges and universities have gradually reduced the class time of professional courses. And implement a new model of extended learning and autonomous learning. College students gradually master the initiative in the process of professional knowledge learning^[5].

In order to investigate the actual learning style of college students, we conducted a survey of 516 students in four grades. By analysing the questionnaires, it is found that among the learning methods for college students to obtain professional knowledge, online inquiries accounted for the largest proportion, reaching 43.3%. The mode of learning in classroom accounted for 25.84%, studying by reading books accounted for 25.77%, and remaining 3.09% relied on asking others. Therefore, the learning mode based on mobile internet has gradually become dominant in the education of higher education institutions.

Due to the relatively slow turnover of textbooks in professional courses and the limited class time, current teaching cannot enable students to master professional knowledge more deeply. At the same time, it cannot meet the requirement that bridge engineering courses require more engineering examples to verify the professional knowledge learned. With the help of internet, the relevant professional knowledge, professional program application learning videos and learning materials have been used to expand the classroom teaching, which is undoubtedly the most reasonable and convenient way for the u-learning model and the CDIO engineering education model^[6]. Based on the relevant knowledge of the internet platform, through the offline interaction, flipped classroom, special discussion and other means led by the lecturer, the “student-centred” teaching reform can be further deepened.

3. The Application of “U-Learning + CDIO” Education Mode Based on Internet

The CDIO engineering education philosophy is committed to combining solid professional basic theory with practical engineering. U-learning enables learners to learn and communicate through the internet anytime, anywhere and at any time through mobile terminals. The bridge engineering major emphasizes the combination of theory and practice, its professional knowledge is changing rapidly. It combines the CDIO engineering education concept with the U-learning mode of learning anytime, anywhere, as well as the online and offline blended teaching, “flipped classroom”, and the assistance of professional software applications^[7]. This is an inevitable model for the teaching reform of bridge engineering based on internet. Its specific measures are as follows:

3.1 Establish a Professional Teaching Resource Library

According to the teaching content of the bridge course, extract the teaching points that need knowledge expansion or in-depth discussion. Combined with resources such as MOOC, online courses, and professional websites on the internet platform, a relevant internet teaching resource library is established. For the teaching resources that are not available on the internet platform, the corresponding online learning content can be established by means of inviting professional teachers recording micro-courses, MOOC, and related videos. At the same time, try to combine the professional needs of students, and select relevant content that can reflect the new structure, new technology and new technology of bridge engineering. These methods can help students get an overview of the cutting-edge developments in bridge construction.

The extended content has strong practicability and pertinence, which can improve the application and expansion of students' professional knowledge. Therefore, students will have higher learning enthusiasm and initiative. At the same time, repeated learning for difficult and difficult points can help students deepen their understanding and improve learning efficiency.

3.2 Combination of Online and Offline Teaching Methods

In the teaching process, teachers need to design online and offline teaching content to ensure the universality of offline teaching and the pertinence of online teaching, and to improve the integration of online and offline teaching. In this education model, teachers need to change their traditional teaching roles, ask questions as guides, and guide the students to find answers and expand

knowledge on the internet platform in a targeted manner. This changes the traditional teaching method depend on the teacher, and makes students the main body of problem solving and knowledge learning.

At the same time, combined with the teaching modes of “class explanation-online expansion-test after class”, “preview before class-class discussion-summary after class”, the learning effect of students can be accurately controlled. In the process of discussion and summary, students can correct mistakes made by students and supplement incomplete content.

3.3 Emphasis on Practical Ability and Teamwork Ability Development

The application of “U-learning + CDIO” education mode based on internet strive to integrate the students' theory and practice, as well as the cultivation of teamwork ability in the structural design and analysis, discussion courses and other links. For the relevant knowledge points and professional questions that need to be expanded in the teaching process, the professional teachers will ask students to study independently or solve relevant practical problems, and test the effect of students' self-study and practice.

For the content that needs to be explored in depth, students are assigned to study tasks in small groups. Combined with a large number of self-study related materials on professional learning platforms, discussion classes are held to allow students to share their learning results. Then, the new learning model based on the concept of “U-learning + CDIO” is completed. For the relatively complex modelling analysis and other content, teachers can guide students in the form of offline teaching and modelling operation recording. At the same time, a thematic library with the bridge modelling process as the leading content can be established for students to study repeatedly.

3.4 Emphasis on Practical Ability and Teamwork Ability Development

In view of the fact that the assessment and test modes of online education platforms are relatively mature, many platforms (such as Rain Classroom and Tencent Classroom, etc.) can be used to test the effectiveness of students' online learning. At present, many teaching platforms can enable students to answer questions on the mobile terminal at any time, and can complete the automatic correction of online test results, the distribution of statistics of test scores, and the establishment of typical question banks with high error rates.

The results of this part of the test can, on the one hand, extract more specific learning difficulties for teachers, and at the same time can form a comprehensive evaluation model for students by combining with the results of the final exam.

4. Conclusion

In the era of mobile learning, the teachers and students can obtain far more information resources than classrooms from the internet. With the popularization of the internet and the improvement of video production technology, video transmission on the internet has become the new normal, and the granulation and fragmentation of teaching knowledge points has become a reality. Based on mobile learning, micro-courses and MOOC at home and abroad have gradually become large-scale, and mobile phones, computers, and PDA that can bring information at any time are the means to realize remote and convenient learning.

Bridge engineering teachers introduce practical problems often faced in science and engineering practice into classroom by combining practical engineering and scientific research projects they are exposed to in the course of teaching. At the same time, with the help of the relevant learning content in the recommended internet education platform and the professional teaching videos recorded for difficult content, the professional knowledge beyond the textbook is fragmented to enable students to achieve U-learning. Based on the blended teaching combined with flipped classroom and professional software, it fully trains the innovative ability and practical application ability of students, making them learning more efficient and becoming the real learning subject. The CDIO engineering education concept embodied in this process is very conducive to cultivating a new generation of engineering talents with interdisciplinary ability, multidisciplinary background, rich

practical experience, forward-looking perspective, innovative spirit and cross-border integration ability, which has far-reaching significance for the cultivation of talents in colleges and universities. We hope you find the information in this template useful in the preparation of your submission.

Acknowledgement

This research was financially supported by The 2017 Advanced Education Scientific Research Project of the Advanced Education Society in Shaanxi Province Government (Project NO.XGH17088).

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