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Research on the Construction of Teaching Cases of Curriculum Ideology and Politics Based on BIM Technology—Taking the "Engineering Valuation" Series of Courses as Examples

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Abstract

Under the background of the era of construction informationization, BIM technology is becoming more and more important in the construction industry. In order to adapt to this environment, colleges and universities must rapidly integrate BIM technology into the teaching of professional courses. At the same time, in order to realize the fundamental task of "cultivating people with moral character" in colleges and universities, it is necessary to make professional courses and ideological and political theory courses go in the same direction, form a synergistic effect, make clear the fundamental purpose of higher education, and build a teaching system of ideological and political teaching in the courses that are compatible with BIM technology. This paper takes the Engineering Valuation Series Course as an example, analyzes the existing problems of the course according to the characteristics of the course, proposes to solve the existing problems of the course by incorporating BIM technology into the course design of Engineering Valuation, and applies the Civic and Political elements into the teaching cases of the course.

Keywords

BIM Technology, Curriculum Ideology and Politics, Engineering Valuation, Teaching Cases

1. The Necessity of Integrating Education in Specialized Courses with Civic and Political Education

On May 28, 2020, the Ministry of Education issued the Guidelines for the Con-

struction of Curriculum Ideology and Politics in Colleges and Universities (hereinafter referred to as the Outline), which emphasizes that the construction of curriculum ideology and politics should promote Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era into teaching materials, into the classroom, and into the minds of the students, guiding them to be firm in the four self-confidences, internalizing the core socialist values into spiritual pursuits and externalizing them into conscious actions. "The professional character of university education determines that college students not only need to master solid basic professional knowledge in the learning stage, but also must strengthen a good sense of social responsibility and moral spirit" (Liu, 2021). Among them, professional education is an important carrier for the construction of curriculum ideology and politics, and curriculum ideology and politics also injects the soul into professional education, making it more vivid and lively.

The ideology and politics of the curriculum goes deep into professional education, grasps the construction of the ideology and politics of the curriculum, realizes the integration of professional education and ideological and political education, and effectively combines "establishing morality" and "cultivating people". This is conducive to the establishment of a perceptual understanding of the profession while students are learning professional knowledge and skills, so that students will have a sense of identity, a sense of belonging and a sense of mission to the profession, and expand the depth of professional education.

By expanding the boundaries of professional education, especially in practical courses that emphasize students' hands-on abilities, the curriculum concept has significantly enhanced students' innovative thinking and talents, while forging their character in the face of difficulties. By strengthening the ideological and political education content of the curriculum, the in-depth integration of professional knowledge and ideological and political education has been realized, and this measure has effectively promoted the reform and innovation of the professional education system. As a result, professional education has not only become more modern, open and forward-looking, but also richer and more complete in content, and the depth and breadth of professional education have been significantly enhanced.

Curriculum ideology and politics raise the temperature of professional education. Through the establishment of curriculum ideology and politics, the professional curriculum will focus on strengthening students' education in values and beliefs, promoting the cultivation of family and national sentiments and upgrading moral qualities. In addition, such courses stimulate students' enthusiasm for learning and contribute to the development of their personalities, while promoting the emergence of innovative thinking and creativity, thus playing an important role in improving students' overall abilities. The learning and education that students receive is all-encompassing and multifaceted, promoting their all-round development, which fully reflects the temperature of professional education (Xu, 2021).

2. Characteristics and Existing Problems of the Engineering Valuation Course

2.1. Characteristics of the Engineering Valuation Course

Engineering Valuation (formerly known as: Construction Budget) is the main course of engineering cost, engineering management, real estate development and management and other majors, as well as the core professional course for the training of cost engineers. The content and form of its lectures play an important fundamental role in the cultivation of students' professional skills and the guidance of their value orientation. With the development of BIM technology, simulation experiment teaching method is widely used in this course. For this reason, in the series of courses of Engineering Valuation, the reform of curriculum ideology and politics based on the simulation experiment teaching method realizes the triple cultivation of knowledge, skills and ideology, and contributes to the high-quality cultivation of "red cost engineers".

The course "Engineering Valuation" is characterized by a high degree of comprehensiveness and practicality (Liu, 2016). In terms of multifaceted and comprehensive quality, the course covers a wide range of knowledge domains, touching on important areas such as architectural literacy, structures, use of materials, and engineering economics. In terms of practicality, the core objective of engineering valuation is to produce a comprehensive document analyzing the cost of a project. This requires not only a mastery of the basic theory, techniques and processes of valuation, but also the ability to assess and prepare in-depth evaluations of specific projects.

2.2. Existing Problems of the Engineering Valuation Course

As it stands, there are several major problems with the actual teaching and learning process in Engineering Valuation courses. First, students generally experience challenges in interpreting drawings, especially in Engineering Valuation courses where the design drawings are directly derived from actual projects, covering construction drawings for architectural, structural, plumbing and electrical and other installation projects. The initial goal of the course is for students to analyze these drawings in order to grasp the designer's ideas and needs. These traditional 2D drawings require students to be able to spatially analyze them, i.e., to convert a 2D view into a 3D model in their mind. However, most students lack a real-world engineering background and a systematic education in engineering drawing, which makes it challenging to fulfill these requirements. Students who do not understand drawings will have difficulty in making accurate calculations of quantities.

Second, the volume of work is a heavy computational task. A typical construction project usually has very many sub-projects. It takes a long time to calculate the amount of work for certain projects. And the design time of most colleges and universities in this stage of the course is one week, the current teachers usually use the method of directly reducing the calculation of the amount of work, or

adjust the course schedule in advance to achieve the purpose of reducing the students' calculation tasks or increasing the time of calculation work, but these ways are inadequate, do not have the ability to solve the problem from the root, and the contradiction between the course design and the calculation tasks in the valuation course still exists.

In addition, the effectiveness of course design is more difficult to assess and errors cannot be directly fed back to students. The design of the engineering valuation course involves many engineering measurement and pricing items, and the relationship between the measurement and pricing of items is complex (Zhu & Huang, 2018). Students' computational errors may be due to faulty methodology or only faulty results, which elevates the difficulty of reviewing the course design by the instructor and makes it necessary for the instructor to spend more time reviewing the student's course design. This contradicts the limited time and energy of the teacher and the timeliness of submitting the results of the students' course designs, resulting in the teacher's inability to view each student's course design one by one, and the teaching effectiveness of this teaching session is greatly reduced.

Modern engineering projects of all kinds are becoming more and more complex, which poses a serious challenge to traditional teaching methods. With the rapid development of information technology, many teachers mainly use multimedia hardware equipment to cope with the dilemma faced by the traditional teaching methods, mainly in the classroom through the use of multimedia hardware facilities to show pictures, audio, video way to assist teaching, these courseware to play a certain degree to help learning, teaching role, but they have not yet broken through the limitations of the traditional education model.

The teaching mode of practical classes has been widely implemented in many domestic higher education institutions. However, due to the limitations of the engineering construction cycle and students' actual class schedules, students' visits to construction sites are often intermittent, resulting in their understanding of the construction process being fragmented and one-sided. In this mode of teaching, students are mostly in a passive learning state, which is contrary to the educational concept of student-centered and teacher-led emphasized in modern education (Guo et al., 2016).

3. The Realization of BIM Technology Integrated into the Teaching Cases of Curriculum Ideology and Politics of Engineering Valuation Course

3.1. Solutions to Existing Problems in the Engineering Valuation Course

The actual project designed for the course can be modeled by BIM software, thus allowing students to view the 3D model of the project directly after the modeling is completed. In addition, for complex constructions, 3D rebar drawings can clearly show the layout of each rebar. Modeling with BIM software is very friendly to solve the problem of students who have difficulty in reading drawings in the

early stages of their course work.

At present, some colleges and universities have already tried to use BIM models to help students understand drawings in class, and some teachers have achieved good results. In the current domestic engineering software field, leading suppliers such as Glodon, Luban and Sware have realized the effective integration of BIM models with engineering surveying and pricing. By importing BIM models into these software programs, students are able to perform preliminary quantity calculations. In order to improve the accuracy of calculations and pricing, students also need to make adjustments based on the specifics of the project. This approach reduces the amount of time students spend calculating quantities and enables them to complete the task with quality in a limited amount of time.

Companies such as Glodon, Luban and Sware have already introduced marking software for rebar calculations, marking software for civil calculations and marking software for project pricing. With the help of these software, problems in students' assignments can be quickly detected by teachers and sent directly to students for revision. Such a method firstly improves the efficiency of teachers in correcting students' course design, and secondly allows students to find their own weaknesses from the feedback questions, which is obviously a beneficial teaching method for both parties.

3.2. Mapping Points for Civic Elements of BIM Technology

To achieve a better combination of BIM technology and curriculum ideology and politics, one of the first tasks is to explore the content of ideology and politics education contained in the curriculum itself, and then practice it in the classroom according to the requirements of curriculum ideology and politics reform.

At the initial stage of the teaching of BIM technology applied to the course of Engineering Valuation, it is necessary for students to have a preliminary understanding of BIM technology, and the main teaching contents involved include the basic concepts of BIM technology and the practical significance of BIM technology for engineering construction. At this stage, teachers can provide students with ideological education from the perspectives of patriotism, craftsmanship, scientific pursuit and cultural self-confidence, in order to achieve the students' understanding that solid technology can make a great contribution to socialist construction, so as to stimulate students' learning sentiments, and make them feel confident about the future development of their motherland. In the stage of learning to the need for the comprehensive use of BIM technology, students are conveyed the spirit of professionalism, innovation, cooperation, honesty and trustworthiness, hard work, enhance the students' life values of hard work and endurance, the courage to strive for the first, the pursuit of excellence, and inspire students to take advantage of scientific and technological change to generate interest in the constant pursuit of new science. Finally, in the practical stage, students are allowed to target practice as the only criterion for testing the truth, to enhance their understanding of the relationship between theory and practice,

to shape the thinking, habits and spiritual qualities of professionals, to understand the preciousness of cultivating the spirit of cooperation, exploration and dedication, and to clarify the importance of disciplinary norms (Yang, Cui, & Chen, 2020).

3.3. Application of BIM Technology in Case Study Teaching of Engineering Valuation Course

Compared with traditional teaching, case teaching has many advantages, which can greatly make up for the shortcomings of traditional education, so that the teaching efficiency can be improved. In the case teaching process, students are able to gradually discover, analyze and solve potential problems, which stimulates their curiosity and enables them to actively participate in the course, as well as enhances participation through common sharing and discussion, and student-teacher interaction (Shi et al., 2020). At the same time, it is also convenient for teachers to know the students' mastery of knowledge, so that they can find out their deficiencies in teaching and make timely corrections. Therefore, the use of case-based teaching techniques in the course can develop students' ability to apply knowledge comprehensively, analyze and solve problems with concrete practical ability, so as to achieve the integration of "education, learning and practice".

Generally speaking, the traditional working mode of estimating and pricing has problems of high difficulty, large amount of work and long time, so there is a large potential risk in carrying out the actual work and projects of estimating and pricing. The use of BIM technology facilitates a more accurate reflection of the amount of valuation and billing at a specific time and interval, as well as the ability to know the size of the work volume and the use of the money for the work at all stages of the project. Pedagogically, the combination of cases and BIM technology makes it easier to design, build, and other related aspects of the project, allowing for 3D inspection to be utilized to cross-check the project as a whole as a way to reduce the element of uncertainty. In the process of learning and applying BIM technology, students can make full use of the integrated library of engineering information to realize the grasp and control of the project estimation on the whole. For example, by learning the Morningstar series of software based on the RE-VIT platform, students will be able to turn over molds, set items and take out quantities on the course, and will be able to output all the analyzed data in real time. At the same time, students can use software such as Glodon, Luban and Sware to realize the control of the whole process of costing by importing the progress plan and emulating animating the construction status on site (Lu, 2019).

Typically, in a hands-on course in BIM technology, all project examples come from actual projects. Therefore, when choosing cases, you can go to a price assessment company or a BIM company to collect cases and adjust and modify them according to the syllabus and teaching objectives. It is very difficult for students to complete complex project cases individually, so it is recommended here

to adopt the learning method in small groups to make full use of the information synergy of BIM technology, so that the communication within the group as well as the communication between the group and the group can be strengthened, and such a practice can effectively improve the efficiency of the assessment of the student's tasks (Shi et al., 2020). Project cases will be sent to individual students in advance so that they can have time to analyze them independently before participating in group discussions, dividing up the work among themselves to complete their assignments, and then presenting the results in class, where the teacher and the rest of the class will share and evaluate them. Throughout the process, students will be led to actively think and express their opinions, culminating in the students submitting their results to the instructor.

4. Conclusion and Discussion

This paper takes the series of courses of Engineering Valuation as an example, starts from the characteristics and existing problems of the courses, proposes a solution to the problems of curriculum design based on BIM technology, and at the same time, excavates the mapping point of BIM technology's civic elements, and integrates them into the teaching cases for the study, in order to inspire the students' perception and understanding of the teaching content, achieve the integration of the series of courses' teaching, and push forward the standardization of the reform of the ideology and politics of the practice class courses.

In the process of the research on the construction of teaching cases of curriculum Civics and Politics, it is crucial to make adjustments for different teaching backgrounds or disciplinary fields. First of all, the application scenarios and teaching objectives of BIM technology in different disciplines should be clarified, and the teaching content should be customized with professional characteristics. For example, in architecture, the focus can be on the application of BIM in architectural design, construction and management; while in civil engineering, attention can be paid to the role of BIM in the modeling and analysis of infrastructure such as bridges and roads. At the same time, technical thresholds, teachers' abilities, and teaching resources may become constraints. To solve these problems, on the one hand, we can improve teachers' ability to apply BIM technology through training, and on the other hand, we can integrate internal and external resources, build a BIM teaching platform, and share high-quality teaching resources. Scalability and adaptability challenges are also problems that need to be faced in the subject research. With the continuous development of technology, BIM technology is also constantly updated and iterative. Therefore, the construction of course cases should be forward-looking and reserve space for expansion so that the teaching content can be updated at any time. In addition, it should also focus on the flexibility of teaching methods to adapt to the learning needs of different students.

In the future research, it is necessary to fully consider the deficiencies of BIM technology in integrating into the teaching of Civics and Politics in courses, and

to deeply explore the ways to improve and perfect it. At present, although the application of BIM technology in professional courses has been gradually popularized, it is still weak in the integration with the teaching of Civics and Politics. To address this problem, we can improve the following aspects: firstly, innovate the teaching methods, adopt case study, role play and other diversified teaching means, so that students can feel the application value of BIM technology in simulating the real work scene, and experience the social responsibility and professional ethics in it. Secondly, we should also pay attention to the sustainable development of BIM technology in Civics teaching. With the continuous updating of technology, we need to constantly update the teaching content and teaching methods to ensure that the close combination of BIM technology and Civic Teaching can continue to play a role in promoting the in-depth integration of BIM technology and Civic Teaching, and contributing to the cultivation of high-caliber talents with a sense of social responsibility and the spirit of innovation.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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