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Exploration and Practice of Ideological and Political Education in Engineering Courses Based on the OBE Concept—Taking the 3D Modeling Course as an Example

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Abstract: *In higher education, combining ideological and political education with engineering courses has become one of the hotspots of current curriculum reform. This article takes the 3D modeling course as an example to explore the exploration and practice of ideological and political education in engineering courses based on the OBE concept. Through the analysis of the OBE concept, this paper analyzes how to implement these ideological and political education goals in curriculum design, teaching methods, evaluation methods, and other aspects. The research found that the ideological and political education of engineering courses based on the concept of OBE can improve students' innovative consciousness, social responsibility and Lifelong learning ability, and help to cultivate engineering and technical talents with innovative spirit and practical ability.*

Keywords: *OBE Concept; Engineering Courses; Ideological and Political Education; 3D Modeling*

1. The connotation of OBE concept

The OBE concept refers to the educational philosophy of "zero foundation, career orientation, practice driven, industry school integration, full participation, and distinct characteristics". The connotation of this concept covers multiple aspects, aiming to promote innovation and development in education.

The 'zero foundation' emphasizes the universality and inclusiveness of education. It means that education should provide fair opportunities for every student, regardless of their starting point, to receive a good education. This concept seeks to eliminate innate differences and emphasizes that education should pay attention to the individual differences and potential of each student, providing them with adaptable and personalized learning environments and teaching methods.

Career orientation emphasizes the close connection between education and career needs. It means that education should aim to cultivate students' professional abilities and job competitiveness, and combine teaching content with actual professional needs. This concept requires education to not only cultivate students' professional literacy, but also focus on cultivating their professional, practical, and innovative abilities, so that they can adapt to the needs of modern career development.

Practice driven "emphasizes that education should focus on students' practical abilities and accumulation of practical experience. It emphasizes transforming students from passive recipients to active participants through practical activities, experimental courses, and internships, allowing them to learn and master knowledge and skills in practical operations. This concept aims to enable students to discover and solve problems in practice, cultivate their hands-on ability, innovative awareness, and ability to solve practical problems.

The integration of industry and education emphasizes the close connection and interactive cooperation between education and industry. It seeks to combine education with industrial needs, closely integrating students' learning and practice with actual industrial needs through industry university cooperation, internship employment, and other means. This concept aims to enhance students' professional competitiveness and employment opportunities, and promote the common development of education and industrial innovation[1].

Full participation emphasizes the active participation and cooperation of all participants in the education process. It means that schools, teachers, students, enterprises, and other parties should jointly

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participate in the planning, implementation, and evaluation process of education. This concept pursues the establishment of an open, collaborative, and shared educational environment, fully leveraging the main roles of all parties, and promoting the comprehensive development of education.

The "distinctive features" emphasize the personalization and differentiation of education. It aims to cultivate students' personalities and strengths through the school's distinctive positioning and curriculum, and provide diverse educational choices and development paths. This concept aims to stimulate students' creativity and innovative potential, and cultivate talents with distinctive and competitive abilities.

2. The specific practice of OBE concept in the teaching of 3D modeling course

2.1 Project-based learning

The OBE concept encourages the adoption of project-based learning methods, introducing practical projects into 3D modeling courses, enabling students to apply their knowledge and skills to practical scenarios. Before the course begins, students will choose a specific project and engage in learning around it throughout the entire learning process[2]. This practical method not only enables students to have a comprehensive understanding of the practical applications of 3D modeling, but also cultivates their problem-solving and teamwork abilities. At the beginning of the project, students will conduct project requirements analysis and planning, including determining project goals, resource requirements, and time plans. Then, students will learn the basic knowledge and skills of 3D modeling, such as the use of modeling tools, modeling technology and Texture mapping. Through self-directed learning and guidance, students gradually complete different stages of the project, including conceptual design, modeling, mapping, and rendering[3].

2.2 Interdisciplinary integration

The OBE concept emphasizes the integration of knowledge and skills from different disciplines, enabling students to acquire a wider range of knowledge in 3D modeling courses. In the course of 3D modeling, teachers will introduce relevant subject knowledge, such as art design, physics and computer graphics, to promote students' comprehensive understanding of 3D modeling. For example, in the modeling process, students need to consider factors such as the proportion, structure, and material of objects. This involves knowledge of mechanical principles in physics and materials science. Teachers can guide students to learn these related knowledge and apply them to practical modeling projects. This interdisciplinary integration not only enhances students' interest in learning, but also cultivates their comprehensive thinking and problem-solving abilities.

2.3 Practice and reflection

The OBE concept advocates that students improve their skills through practice and deepen their understanding of the knowledge they have learned through reflection. In 3D modeling courses, practice is a very important part. Students need to master modeling tools and techniques through extensive practice, while applying the knowledge they have learned to practical projects. In the process of practice, students need to constantly reflect and summarize. They can evaluate their work, identify shortcomings, and try to improve. Teachers can also organize experience sharing and discussion among students, promoting mutual learning and growth among students. Through a cycle of practice and reflection, students can gradually improve their modeling skills and deepen their understanding of the principles and techniques of 3D modeling.

2.4 Personalized learning

The OBE concept encourages personalized learning and teaching based on students' different needs and interests. In 3D modeling courses, students' interests and career goals may vary, so personalized learning is crucial for stimulating students' learning motivation and development potential. Teachers can provide different learning resources and project choices based on students' needs and interests. Students can choose projects that interest them and engage in in-depth learning and practice on them. Teachers can also provide personalized guidance and support based on students' learning progress and abilities, helping them overcome difficulties and make progress. Through personalized learning, students can better develop their potential and prepare for future career development[4].

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2.5 Evaluation and feedback

The OBE concept emphasizes the evaluation and timely feedback of students' learning process to promote their learning and progress. In 3D modeling courses, evaluation can be conducted in various ways, including project outcome evaluation, skill testing, and learning notes. After completing the project, students can evaluate their modeling abilities and project outcomes through presentations and demonstrations. In addition, skill tests can be conducted to verify students' mastery of modeling tools and techniques. At the same time, students can take learning notes, summarize and reflect on their learning process, and improve their learning effectiveness through feedback from teachers. Teachers should provide timely feedback to students during the evaluation process, point out their strengths and improvements, and provide specific suggestions and guidance. Through evaluation and feedback, students can understand their learning progress, continuously improve and enhance their modeling skills.

2.6 Practical Cases and Industry Cooperation

The OBE concept encourages the introduction of practical cases and opportunities for industry collaboration in 3D modeling courses to enhance students' practical experience and job competitiveness. Students can apply their knowledge and skills by solving practical cases to understand the application of 3D modeling in practical projects. Teachers can choose some real modeling projects as case studies for students to practice modeling in simulated real work environments. In addition, schools can collaborate with relevant industries and invite industry experts to explain industry applications and share experiences with students. Industry cooperation can also provide students with internship and employment opportunities, allowing them to apply their learned skills in a real work environment, and to communicate and collaborate with industry professionals. Through practical cases and industry cooperation, students can better understand the practical applications and industry needs of 3D modeling, and enhance their employment competitiveness.

3. Specific strategies for integrating the OBE concept into the ideological and political education of 3D modeling courses

3.1 Project-driven learning

In the 3D modeling course, teachers can introduce practical engineering projects, allowing students to choose a project related to their engineering major, and engage in learning around the project throughout the entire learning process. Before the project starts, students need to have a deep understanding of the background and significance of the project, analyze the social and ethical issues involved, as well as the feasibility and sustainability of the project. Through project-driven learning, students are not only able to learn and apply engineering technology knowledge, but also able to think and explore the ideological and political values behind the project. In practical engineering projects, students need to consider many social and ethical issues, such as environmental protection and resource utilization, which are closely related to ideological and political education. Through the study of practical engineering projects, students can better understand the practical application of engineering technology, promote the improvement of their creative thinking and practical abilities.

3.2 Case analysis

Case analysis is a beneficial strategy for ideological and political education in engineering courses based on the OBE concept, and it also has important significance in 3D modeling courses. Teachers can select some classic cases related to 3D modeling, guide students to participate in analysis and discussion, think about ethical, social responsibility, and other issues involved, and deepen their understanding of them. Taking a 3D modeling safety accident as an example, teachers can guide students to gain a deeper understanding of the event, including its time, location, casualties, etc., while also exploring the reasons and impacts that led to the accident. Students will delve into the details of the accident, including design plans, technical parameters, operational specifications, and other aspects. At the same time, it is also necessary to analyze and reflect on the ideological and political issues that exist in the accident, such as the professional ethics of engineers and corporate social responsibility. In the analysis, teachers need to guide students to think from multiple perspectives, comprehensively analyze the various relationships and impacts behind the case, improve students' analytical and

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judgment abilities, and deepen their understanding of engineering ethics and social responsibility. Through case analysis, students can deeply experience the power of ideology and politics and their importance in the field of engineering from specific events. Teachers can use group discussions, personal reports, and other forms of case analysis to better promote students' thinking and communication. In the process of curriculum implementation, teachers can also combine specific operations of engineering technology to guide students to further think about how to carefully consider safety, environmental protection and other issues in the design process, so as to obtain more comprehensive technical knowledge and improve ideological and political qualities during the learning process.

3.3 Discussion and debate

By organizing discussions and debates among students, teachers can provide an open platform for students to exchange and reflect on ideological and political issues in the field of engineering. Teachers can choose controversial topics, encourage students to express their opinions, and engage in debates with others. During discussions and debates, students will face different perspectives and opinions, need to listen to others' perspectives, and learn to respect and understand others' positions. At the same time, students also need to analyze and dialectically think about problems, and develop their own thinking ability and Critical thinking. Through discussion and debate, students can enhance their expression and critical thinking abilities. They need to express their views clearly and support their arguments with facts and reasons. At the same time, they also need to learn logical and dialectical thinking to confront the questioning and challenge of the other party's viewpoint. Discussion and debate can also cultivate students' teamwork and collaboration abilities. Students can engage in discussions and debates in groups or teams, explore issues together, and reach consensus. In the process of cooperation, students need to learn to listen to and respect the opinions of others, coordinate different perspectives, and cultivate team awareness and collaborative spirit.

3.4 Social practice

Social practice is an effective strategy for ideological and political education in engineering courses based on the OBE concept, and also plays an important role in 3D modeling courses. In this course, teachers can organize students to participate in social welfare activities, volunteer services, and other methods, allowing students to personally experience and experience the diversity and complexity of society, and deepen their understanding of ideological and political issues. For example, teachers can organize students to participate in social public welfare activities such as Environmental remediation and cultural protection in some cities. Through practice, students will gain a deeper understanding of various problems in real society and explore how to solve them. At the same time, students will also face various ideological and political challenges, and in the process of practice, they need to consider factors such as fairness and justice, social public interests, etc., in order to further cultivate a sense of social responsibility and civic awareness. In the process of curriculum implementation, teachers can also guide students to pay attention to the impact of scientific and technological development on society, such as artificial intelligence, Big data and other aspects, and use practical opportunities to deeply explore the ideological and political implications behind its application. By participating in real-life social practice activities, students will better understand the relationship between practice and theory, deepen their understanding of engineering ethics and social responsibility issues, and thus enhance their professional abilities while also possessing broader social literacy.

3.5 Personalized learning

The core of personalized learning is to understand students' interests and needs, and design personalized learning plans based on their individual differences. In the 3D modeling course, teachers can communicate and interact with students to understand their background, career goals, and interest in ideological and political knowledge. According to the characteristics of students, teachers can provide different learning resources and project choices to stimulate students' learning motivation. For example, for students interested in engineering ethics, teachers can guide them to choose modeling projects related to ethical issues, such as the design and optimization of green energy. For students who pay attention to social responsibility, teachers can provide Case study related to social responsibility, and guide them to analyze and discuss. In personalized learning, evaluation methods also need to be adjusted based on individual differences among students. Teachers can adopt diverse evaluation methods, such as project presentations, personal reports, and group discussions, to fully tap into

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students' potential and advantages. Personalized learning can not only stimulate students' interest in learning, but also cultivate their independent thinking and innovation abilities. In the process of personalized learning, students can choose their own learning content, actively explore and research problems of interest, cultivate problem-solving abilities and innovative thinking. Through personalized learning, students can better apply ideological and political knowledge to practical modeling projects, improving their learning effectiveness and quality.

3.6 Interdisciplinary integration

The isolation phenomenon between ideological and political education in engineering courses and other disciplines does exist, but interdisciplinary integration is a beneficial strategy that can combine ideological and political education with practical engineering projects to improve students' comprehensive quality. In the course of 3D modeling, knowledge in the fields of humanities and social sciences, such as philosophy, sociology, ethics, etc., can be introduced for interdisciplinary integration with engineering technology knowledge. By exploring ideological and political issues in the field of engineering, students can think and analyze from multiple disciplinary perspectives, and provide diverse methods and approaches to solve these problems. Through interdisciplinary integration, students can broaden their thinking breadth and enhance their understanding of ideological and political issues in the field of engineering. They will learn to combine engineering technology with humanities and social sciences knowledge, in order to better grasp the social background and ethical impact of engineering practice. Cross disciplinary integration can also promote communication and cooperation between different disciplines. Students can collaborate in teams to solve ideological and political problems in engineering projects, and by listening and learning from each other, integrate knowledge and skills from different disciplines to improve team collaboration and innovation capabilities.

3.7 Industry mentor guidance

Introducing industry mentors as mentors in 3D modeling courses can closely connect students with industry practice. Industry mentors are usually experienced industry engineers, industry experts, or representatives of relevant organizations. They have rich practical experience and successful cases, and can provide valuable guidance and assistance to students. In terms of ideological and political education, industry mentors can share their ideological and political experiences and practical cases with students in the industry. They can guide students to analyze and explore the ideological and political issues involved in engineering projects, and share methods and strategies to solve these problems. Through practical case discussions, students can gain a deeper understanding and application of ideological and political knowledge, as well as an understanding of ethical norms and social responsibilities in the industry. Interaction and guidance with industry mentors can also promote students' thinking and reflection. Students can ask questions to their supervisors, share their viewpoints, and have in-depth discussions with them. Such interaction can cultivate students' Critical thinking and analytical ability, so that they can think and express their views more independently and confidently.

4. Conclusion

In summary, the exploration and practice of ideological and political education in engineering courses based on the OBE concept in 3D modeling courses have positive significance. Through reasonably designed practical strategies, it can promote the development of students' ideological and political literacy and comprehensive abilities, cultivate their sense of social responsibility and innovative spirit. This study provides useful reference and inspiration for teachers and educational managers for future engineering education reform and curriculum design. I hope that this study can provide some reference and guidance for the practice and research of ideological and political education in engineering courses based on the OBE concept.

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