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Ideological and Political Teaching Practice of Additive Manufacturing Technology Course Based on OBE Concept

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Abstract

The training teaching OBE concept is implemented in additive manufacturing technology course. Combined with the social development needs of the new era and the cognition rules of students' learning, the additive manufacturing technology as a new functional manufacturing technology, it has been widely concerned in aerospace, food processing and medical fields. According to the characteristics of the course, the ideological and political elements are deeply explored in theoretical teaching and practice. The knowledge, ability and curriculum ideological and political integration of teaching objectives are constructed. A systematic content system integrating knowledge, ability and curriculum ideology and politics is formed. At the same time, the teaching model is reformed. The application of "flipped classroom" can imperceptibly impart knowledge and cultivate students' ability. The ideological and political goals of the curriculum can realize.

Keywords

Ladditive manufacturing; Curriculum construction; Ideological and political education; OBE teaching system.

1. Introduction

3D printing technology is a new additive manufacturing method, which can increase materials digitally[1-3]. The establishment of additive manufacturing courses is in line with the basic needs of national strategic development. In order to implement the ideological and political theory of collaborative education of the Ministry of Education, The ideological and political teaching of 3D printing course is realized through the guidance of the whole process of education. The organic combination of 3D printing technology and the existing university teaching system can effectively improve the quality of students' schooling, and it is also an important practical teaching content. Based on the OBE teaching concept, the ideological and political teaching design of the course is carried out around the teaching objectives, teaching contents and teaching methods of 3D printing. The ideological and political elements of the course into the course is organically integrated, and which can make it an important part in the 3D printing course[4].The integration of ideological and political elements not only enables students to have a new understanding of additive manufacturing technology, but also enables students to understand the development status of advanced manufacturing technology in China.

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It can help students establish correct values and outlook on life. In addition, 3D printing technology is needed to realize the integration of multi-disciplines in the curriculum and improve the enthusiasm of students.

2. Development Status and Problems of Additive Manufacturing Technology Courses

Additive manufacturing technology engineering has been listed in the《Notice of the Ministry of Education on The Announcement of The Record and Approval Results of Undergraduate Majors in Colleges and Universities》. As can be seen from the national policy orientation, additive manufacturing technology has received extensive attention in curriculum teaching. Most of the courses of additive manufacturing technology carry out teaching activities centering on advanced manufacturing technology, development status and product application, and it can meet the cognitive and operational needs of students. However, the current additive manufacturing courses involve relatively few OBE concepts, and ideological and political elements have not received enough attention.

2.1. There Is Too Much Scientific Content and No Systematic Teaching System

The FDM additive manufacturing printer is taken as an example. Additive manufacturing is a new technology based on grinding powder to melt, Objects are processed by digitally stacking materials, It is characterized by the ability to manufacture complex parts of different shapes and improve the utilization rate of materials[5]. Through the course of additive manufacturing technology, students can preliminarily understand the quality of engineering practice and the understanding of advanced manufacturing technology in engineering training. In practice, education and values should be integrated into the teaching process to realize the role of value guidance and strengthen the spirit of craftsmen[6-7]. But some explanations remain superficial and have not been thoroughly studied. Meanwhile, the teaching concept of OBE has not been widely concerned, and the dominant identity of students has not been clearly reflected[8-10]. It is urgent to establish a team of teachers with strong professional ability and outstanding technology teaching ability.

2.2. The Teaching Content Is Relatively Simple and Fixed

In additive manufacturing, the actual operation of additive manufacturing 3D printer is particularly important. The practical operation of 3D printing technology can promote students' hands-on activities and improve their practical operation ability. However, due to the limitation of equipment quantity and variety, most of these courses remain at the theoretical level, and the practical ability has not been well stimulated. The theoretical course is single, the deeper exploration is difficult to continue, and the teaching quality cannot be effectively guaranteed. Some students even just to collect credits, which cannot stimulate their interest, so the quality of class urgently needs to be improved.

2.3. Ideological and Political Elements Are Not Organically Integrated

Additive manufacturing technology is an important part of advanced manufacturing technology, which can be matched with reverse engineering to achieve intelligent manufacturing. However, in the course of additive manufacturing technology, a systematic teaching system cannot be formed for multiple majors, and the effect of cross-disciplines is not obvious. At the same time, ideological and political elements are not paid enough attention, which makes students' understanding of professional ability unclear and classroom efficiency cannot be guaranteed. Some students may not be able to concentrate on the class, listen carefully, resulting in learning nothing, learning no use of the phenomenon, the quality of teaching has not been better guaranteed.

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3. Teaching Exploration of Additive Manufacturing Course

3.1. Teaching Mode Design Based on Obe Teaching Concept

《Additive Manufacturing Technology》 is one of the important courses of the School of Engineering Training and Innovation, which focuses on the teaching philosophy of OBE to teach students reverse thinking[11]. Not only should we go deeply into the enterprise to understand the technological frontier, but also we combine the professional characteristics of school students with clarifing the teaching objectives and sorting out the knowledge. The course is mainly divided into several parts: 1. Master basic modeling methods 2. Master the operating software of 3D printer 3. Master the basic operation of 3D printing 4. Master the post-processing of 3D printing, so that students can fully master the knowledge of 3D printing.

3.2. Integration of Ideological and Political Education Concept Into Teaching Mode

In the teaching of OBE teaching concept, ideological and political elements are integrated into the course of additive manufacturing technology. Moral education is the soul of engineering course and the core problem of course content. Strengthening students' moral education goal is an important part of the curriculum. In teaching, the craftsman and revolutionary spirit of the great powers are the ultimate goal that the students are constantly exploring. The students' positive energy spirit in ideological and political elements are fully excavated. Students can have strong innovation and entrepreneurship ability and team spirit. Improving students' comprehensive quality and ability is an important goal of teaching.

3.3. Course Content and Practice Arrangement

Based on OBE teaching ideas, ideological and political elements are incorporated. The teaching content is integrated into the project carrier through flipped classroom. The knowledge of additive manufacturing is disparately integrated into a specific project. Students are motivated by goals, and the stimulating passion for learning is keeping. The traditional inefficient teaching method of step-by-step instruction is replaced. At the same time, it also makes up for the students' lack of practical experience and improves their practical ability. The main objectives of the course are:

Objective 1. (Basic knowledge of 3D printing) To make students understand the historical background, application area and 3D printing structure. The status of 3D printing in China's processing is understood. Basic principles and safety measures of 3D printers are familiarly mastered.

Objective 2. (The basic principle of 3D printing) Students understand the basic working principles of metal and non-metal 3D printers. The working principle of different kinds of 3D printers are understood such as laser sintering powder, light curing and melt deposition modeling. According to different parts processing, different types of 3D printers are selected for processing.

Objective 3. (Technical analysis) Proficient in FDM 3D printer application software. For parts of different sizes and models, the design and research of layered and filling structures are carried out. The students' cognitive ability of FDM printer is improved. Students can fully understand the processing process of 3D printing through the actual operation.

Objective 4. (Comprehensive Ability) Students' comprehensive application of professional knowledge is developed and the application of 3D printer is mastered. The students' comprehensive hands-on ability is improved through initializing, heating and other steps. The students' processing ability of advanced manufacturing technology is improved. The sense of teamwork is cultivated. The ability to communicate with others is strengthened. The students' comprehensive processing ability is improved.

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Objective 5. (Curriculum Policy and Lifelong Learning goals)The important role of 3D printing technology is understood in advanced manufacturing process. The 3D printing processing technology is popularized, and it can enhance the comprehensive strength of China's processing and manufacturing. It is also able to help students with team and social responsibilities, which make them have the awareness and ability of independent learning and lifelong learning. The ideological and political elements are incorporated. Based on the OBE concept, the teaching goal of integrating knowledge, skills and curriculum with ideology and politics are realized through the top-level teaching design starting from students' learning outcomes.

4. Practice of the Reform of Ideological and Political Integration Teaching Mode of Additive Manufacturing Course Based on OBE Concept

Combined with the relevant curriculum design of advanced manufacturing technology, according to the school's own situation, the characteristics of interdisciplinary, integrated with ideological and political elements are focused. The additive manufacturing course is conducted.

4.1. Characteristics of Multi-disciplinary Cross

Additive manufacturing technology has the characteristics of interdisciplinary, including materials, machinery, information and other disciplines, which can be applied to multi-professional courses. At present, the teachers need to face students of different majors. Additive manufacturing technology can effectively solve the problems of relevant courses. The teaching model is tailored to students' major. In the form of flipped classroom, students' teaching content is innovatively designed to constantly improve their innovation ability, so that students have a good enthusiasm for exploration. The students to explore the content of learning more actively is guided.

4.2. Integration of Ideological and Political Elements

Additive manufacturing technology is very different from traditional processing methods due to the particularity of its molding. Courses around the country into the policy guidance to carry out the ideological elements, list some made in China under the State Council 2025 related documents, Ministry of Science and Technology, Ministry of Education on additive manufacturing technology. The students to teach ideological and political elements around the party emblem, south Lake red boat and other materials are guided. The students can feel the organic integration of ideological and political science and professional courses, and understand the power of science and technology in our country.

4.3. OBE Teaching System

The teaching philosophy of OBE is to emphasize students as the main body. According to the differences between students to determine the content of the course, accurately grasp the learning status of students. The teaching strategies for students of different majors is developed. The teachers should care and help students, arrange in-class questions, final design, etc. The students' creative thinking ability, analytical and comprehensive ability and thinking and inquiry ability are improved. Combined with social hot spots, science and technology frontier deep integration to achieve the goal of talent training.

5. Conclusion

Based on OBE course system, the integration of ideological and political elements of additive manufacturing technology course, it can effectively improve the teaching objectives and content of the course. It is conducive to promoting students' innovative thinking and improving students' hands-on skills. It can effectively cultivate innovative talents and contribute to China's practical talents training.

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References

[1] R. Noorani. 3D Printing: Technology, Applications, and Selection, MRS Bulletin, vol. 43(2018) :462.

[2] D. Mitsouras and P.C. Liacouras. 3D Printing Technologies, 3D Printing in Medicine,vol.5(2017):22.

[3] W.Z. Wu, Z.J. Zhao and S.K. Zhang et al. 3D printing technology in percutaneous nephrolithotomy: babyhood but will be promising, World Journal of Urology, vol.38(2020):3303.

[4] J.G.Yan, D. Wu and S. Liu Search and Discussion on Education of the Public Practical Course of "3D Printing Technology", Journal of Shanghai Polytechnic University, vol.35(2018):303-306.

[5] W.X. Zhang and L.M. Yang. Study on Properties of Polymer Materials Based on 3D Printing Technology, Advances in 3D Image and Graphics Representation, Analysis, Computing and Information Technology, vol.266(2020):103–107.

[6] We.W. Mao. Exploration of ideological and political teaching of CAD 3D modeling Course, Journal of Higher Education,vol.26(2019):168-171.

[7] X.F. Liu Present and future of "Internet + Ideological and Political Course Teaching" in universities, Practice and Theory of Sezs, vol.5(2018):125-128.

[8] K. Zhang and J. Liu. Thoughts on the construction of course system of additive manufacturing specialty in higher education, University, vol.(5) 2022: 45-48.

[9] J.H. Meng, Y.X.Wu and Z.P.Shi et al. Ideological and Political Course Teaching Practice of Mechanical 3D Modeling Design Course Based on OBE Concept, Automobile Applied Technology, vol.22(2022): 75-76.

[10] A.Q Zhang Implement "two platforms, three practical training" ideological and political course practice teaching mode,]. China Higher Education,vol.6(2014):29-31.

[11] Z.N. Wang, P. Zhou and S.Y. Xing et al.The Undergraduate Practical Engineering Exploration and Research based on the New Engineering Background, .Scientific Journal Of Humanities and Social Sciences, vol.4, (2022):225-229.