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Project-based Assessment Design and Ideological and Political Elements Mining of Hydraulic and Pneumatic Transmission Course

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Abstract: *How to design innovative assessment methods in professional courses, organically integrate ideological and political elements, and achieve the purpose of "teaching scientific knowledge and cultivating national spirit" is a hot topic in the research conducted by college teachers. Hydraulic and Pneumatic Transmission is a professional core course for mechanical engineering majors. To achieve the purpose of teaching scientific knowledge and cultivating national spirit without increasing class hours, the course content is reorganized, a new project-based assessment method is designed,andthe ideological and political elements in the teaching objectives are excavated according to the course positioning, teaching content, and requirements, aiming to constantly prompt the quality of teaching.*

Keywords: *Hydraulic and pneumatic transmission, Ideological and political elements, Projects*

1. Introduction

College teachers should "guide a section of the canal and plant a good responsibility field", so that the professional theoretical knowledge taught by college teachers, especially the mechanical professional courses and the ideological and political theory courses can develop in the same direction to form a synergistic effect[1].The teachers of the hydraulic and pneumatic transmission course group at Liupanshui Normal University redesigned the course assessment method and excavated and refined the ideological and political elements of the course. Based on the status, function, and characteristics of the course, they reorganized the course content, excavated the potential ideological and political elements contained in the course, refined the scientific spirit and value orientation of the course, and included them in the teaching objectives and teaching process, aiming tofirm students' ideals and beliefs, cultivate their socialist core values, dialectical thinking ability, scientific spirit, and social responsibility and sense of mission.

2. Status and Role of the Course

Hydraulic and pneumatic transmission is a professional basic course for students majoring in mechanical design and automation. By imparting the knowledge of hydraulic and pneumatic transmission, students can comprehend the structure, working principle, and application of various components in the system, and develop their capability of addressing the power transmission problem of various mechanical equipment by utilizing hydraulic and pneumatic technology. This course not only plays a connecting role in students' learning related to technical foundation and professional courses but also plays a part in enhancing their adaptability and improving their ability to develop and innovate in mechanical design and research in the future [2].

3. Teaching Content and Requirements

The teaching hours of hydraulic and pneumatic transmission at Liupanshui Normal University are 32 hours, with a total of 2 credits, and the course teaching is carried out in the first semester of the third grade[3]. The teaching objectives of the course are shown in Table 1.

In the traditional teaching process of hydraulic and pneumatic transmission, there is almost no teaching of complex electromechanical hydraulic systems. In the process of course informatization

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teaching, hydraulic and pneumatic related virtual simulation software is introduced, allowing students to select hydraulic and pneumatic components, build basic circuits, set working parameters, simulate scene debugging and operation through virtual software, enriching the content of course informatization teaching and improving students' practical abilities. In the teaching content design of this course, we have introduced project assessment based on FluidSim and Simulink. During the teaching process, we teach students how to use FluidSim to build hydraulic circuits, basic programming methods in Matlab, and basic operation methods in Simulink modules. Combining theory with practice, applying computer simulation technology to simulate the working conditions of hydraulic systems on the PC end, thereby deepening a thorough understanding of theoretical knowledge. This reflects our planning for project design. Currently, we have established a certain number of project-based teaching based on FluidSim and Simulink, gradually increasing the proportion of project assessment scores from the current 10% to 30% in teaching. Project based teaching is not simply the introduction of project-based assessment, but fully integrates the description of mathematical models in hydraulic control systems, analysis of dynamic and static characteristics, methods for judging stability, design of hydraulic control system calibration devices, research on intelligent hydraulic systems, and other content into course teaching[4].

Table 1: The teaching objectives of the course

Objective	Content
Objective 1	Able to understand and master the basic knowledge of hydraulic transmission, and comprehend the structural characteristics, working principle, performance and application of basic hydraulic components.
Objective 2	Comprehensively and systematically study the characteristics and application of hydraulic pneumatic technology, the characteristics and basic theory of transmission medium, the structural principle, working characteristics, and selection method of hydraulic pump and hydraulic motor, the structural principle, working characteristics, and basic design calculation selection method of hydraulic pneumatic actuator, control element, and system auxiliary element.
Objective 3	Able to reasonably design the hydraulic system of general mechanical equipment, have preliminary design and calculation ability, and reasonably select hydraulic components.
Objective 4	With the new teaching method, students have a deeper understanding of hydraulic components and hydraulic transmission systems, and understand the working principle, system composition, and performance characteristics of hydraulic servo systems. Let students have the practical ability to solve the problems of analysis and design of the necessary hydraulic system in mechanical engineering.
Among them, objectives 1 and 4 meet graduation requirement index 2.2 of the mechanical and electronic engineering major of Liupanshui Normal University; objectives 2 and 3 meet graduation requirement index 3.2; objective 4 meets the graduation requirement index point 4.3.	

The application of computer software Matlab, ANSYS, FluidSIM, and AMESim can effectively enhance students' interest in learning and cultivate their practical engineering application abilities[5]. The course team combines software applications with course content to design simulation projects based on various software. When students complete such projects, they are given random questions, which can be completed independently or in groups. For example, when working in groups of three, student A is responsible for writing design specifications, B is responsible for creating a presentation PPT, while C is responsible for project reporting and answering questions raised by the teacher. By doing so, the challenge and higher-order of the course can be enhanced. On the other hand, the course team continuously optimizes and updates the content of the project library and project evaluation system based on online surveys of students, including whether the project difficulty is appropriate, whether the content is meaningful, and whether it is in line with industry development. The design content of combining course computer software with course projects in SPOC modin Figure 1.

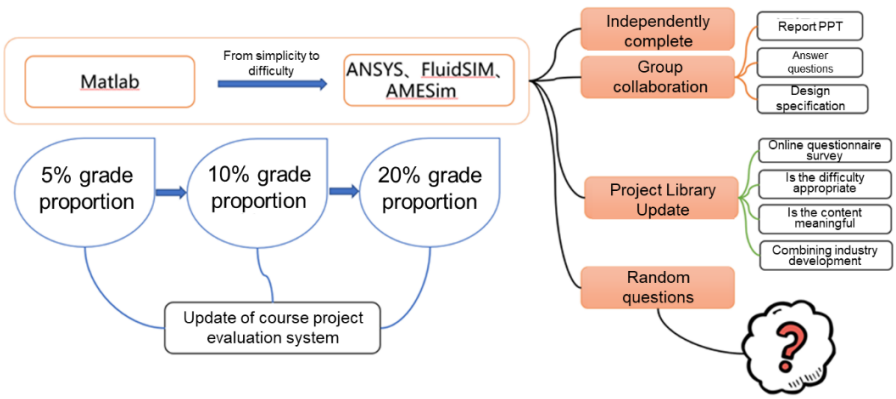

Figure 1 Course projects in SPOC

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4. Project-based Assessment Design

The purpose of constructing a hybrid course of hydraulic and pneumatic transmission under OBE is to be student-centered, result oriented, based on the knowledge system and characteristics of the course, deeply integrate engineering education with information technology, stimulate students' enthusiasm and interest in learning, and cultivate their engineering thinking ability. To achieve good teaching results, with the cultivation of engineering thinking and engineering literacy as the core, carefully designing course content is the key to achieving efficient teaching. Teachers create teaching videos based on the integrated course content, and enrich the teaching platform by selecting and sharing existing high-quality teaching resources. The teaching resource platform not only includes high-quality teaching videos, but also a large number of exercises, courseware, and animated video materials related to knowledge points, facilitating students to learn independently and achieve knowledge extension and expansion. The course content is designed according to the idea of "pre class preview+in-depth analysis of key and difficult points+knowledge extension and expansion+interaction (discussion, questioning, answering)+homework+project assessment+testing to consolidate knowledge", and timely integration of ideological and political elements into the course.

The complex electromechanical hydraulic systems are scarcely taught in the process of traditional hydraulic and pneumatic transmission teaching. In the process of course information teaching, the virtual simulation software related to hydraulic pneumatic is introduced to let studentsselect hydraulic pneumatic component models, construct basic circuits, set working parameters, and debug scene simulation through virtual software, thereby enriching the information teaching content of the course and improving students' practical ability.In the teaching content design of this course, the project assessment based on FluidSim and Simulink is introduced. In the teaching process, students are taught to use FluidSim to build hydraulic circuits and master basic programming methods of Matlab and basic operation methods of the Simulink module. Meanwhile, students can combine theory with practice, apply computer simulation technology, and simulate the working conditions of hydraulic systems at the PC end, so as to deepen the thorough understanding of theoretical knowledge, which reflects our planning for project design. Currently, we have established a certain number of project-based teaching modes based on FluidSim and Simulink, and gradually increased the proportion of project assessment results from the current 10% to 30%.Project-based teaching doesn't simply introduce project-based assessment, but integrates the description of mathematical models in hydraulic control systems, the analysis of dynamic and static characteristics, the method of judging stability, the design of hydraulic control system correction devices, and the research of intelligent hydraulic systems into the teaching of the course.

5. Excavation of Ideological and Political Elements

Through the course teaching, students can understand the function of hydraulic and pneumatic transmission systems, master the characteristics of hydraulic and pneumatic transmission, comprehend the main manufacturers of hydraulic and pneumatic components and systems at home and abroad, understand the development status of hydraulic and pneumatic transmission components and technologies, know the use of literature search tools and other search methods to obtain the latest progress of related research and technology development and comprehend the competition and integration between hydraulic and pneumatic transmission technology and other mechanical and electrical transmission technologies. In this paper, by quoting classics and tracing back the history of discipline development, the development and application of hydraulic and pneumatic transmission are developed and the achievements of China in hydraulic and pneumatic transmission in the new era are described, aiming to stimulate students' patriotic feelings.Hydraulic and pneumatic transmission, as a way to provide power for systems, has been widely used in various fields. It strengthens students' love for school and professional education and enhances their enthusiasm for active learning. Meanwhile, it shows students the latest technology of well-known construction machinery manufacturers, China'ssuperengineering, etc., so that students can understand the latest technology and enhance their cultural self-confidence; Finally, the advantages and disadvantages of mechanical, electronic, hydraulic, and pneumatic transmission are described, so that students can establish correct values, treat others with all-around views, and learn from each other.

Through learning control components, power components, auxiliary components, and executive components, students can comprehend that each part has different functions. Society is an organic whole, in which people only have different divisions of labor, but there is no distinction between high

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and low, so they must respect each other and abide by the principles of freedom, equality, integrity, friendship, and justice. Without this foundation, there will be no harmony between people; Only when people unite and cooperate to build a harmonious society can the country's "prosperity, democracy, civilization, and harmony"be realized and everyone make due contributions.

If ahydraulic circuit or system wants to complete the work, it must depend on the cooperation of various components, so the team's cooperation is very important. Collaboration is an indispensable part of any team, and it can cultivate students' selfless spirit of utter devotion based on mutual trust. As long as team members complement and help each other, students' teamwork spirit and consciousness can be developed. In the teaching process, we should encourage students to participate in teachers' scientific research projects or apply for college students' innovation projects, so that they can truly understand the teaching objectives of the course, their ability to improve the use of technical materials such as standards, norms, and manuals can be cultivated, their innovative ability can be exercised, and their active learning interest can be stimulated.Through participating in practical projects, students can better comprehend the status and application of hydraulic and pneumatic technology in engineering, improve their recognition of rejuvenating and strengthening the countrywithscience and technology, realize their responsibility and responsibility as college students in the new era, and truly shoulder the important task of building the motherland. On the other hand, teachers should extract a large number of hydraulic and pneumatic transmission systems that are widely recognized and widely contacted by students from production practice and life, or represent modern advanced technology, from which they separate problems of course teaching content or causing students to think as a typical case to be integrated into the teaching process.Besides, the scientific research projectsof the teachers in the course groupcan be used to enlighten students to raise questions.Through students' access to a large number of documents or reference materials, the problems are discussed and summarized in groups, and the professional knowledge is closely combined with the ideological and political education of the course, so as to cultivate students' sense of teamwork and ability to solve practical engineering problems, and enhance their feelings of loving their profession, loving their work, and loving their motherland.

We use SPOC blended learning to enhance the advanced nature of the curriculum and increase its challenge; Compared to the MOOC model, the SPOC model has lower costs and is easier to achieve sustainable development; Introducing ideological and political elements appropriately, appropriately, and accurately to help students establish correct values and worldviews; The application of diverse assessment methods in the curriculum enhances students' ability to handle and respond to practical engineering problems.

6. Conclusion

The curriculum is the most direct, significant, and core carrier for students to benefit from university learning, and its efficient development is the core element of talent training. As a basic core course for students majoring in mechanical and electronic engineering, the course "Hydraulic and Pneumatic Transmission" plays an important role in connecting the preceding and the following and broadening the vision in the curriculum system. In the teachingprocess, taking the cultivation of advanced application talents as the starting point, this course deeply excavates the ideological and political elements, explores and practices the teaching methods and teaching contents, and continuously optimizes the assessment methods.The implementation effect reveals that students have obtained a strong sense of acquisition in course learning, their interest in learning has been significantly improved, their mastery of knowledge points has increased, and they have had a certain ability to comprehensively utilize the knowledge they have learned to analyze and solve problems, highlightingthe "application-oriented and application-oriented"professional characteristics of mechanical and electronic engineering at Liupanshui Normal University. On the other hand, aiming at the actual needs of contemporary college students, ideological problems, value theory, etc., it accurately carries out ideological and political education and provides high-quality teachers and practical carriers for colleges and universities to train new talents in the era.In this study, the problems existing in the current professional course teaching are analyzed. Based on the national demand for professional scientific and technological talents in the new era, and combined with the teaching content of hydraulic and pneumatic transmission, a closed-loop teaching reform under the ideological and political mode of the course is proposed, which can not only improve the teaching effectiveness of professional courses but also accurately excavate the elements of ideological and political education from professional courses, aiming to achieve the educational effect of combining education and talent cultivation.

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