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Integrating Ideological and Political Education into the Traffic Information Engineering Course: An OBE-Based Approach

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Abstract: The paper adheres to the organic integration of value orientation with the process of knowledge delivery, blending ideological and political education goals such as confidence in the socialist path, patriotism, social responsibility, knowledge innovation, and a people-centered approach with theoretical knowledge from disciplines such as transportation engineering, information technology, operations research, and computer science. Through the construction of a comprehensive ideological and political education framework, the excavation and reconstruction of ideological elements, and the incorporation of these teaching goals into the entire process of transportation information engineering system design, the course aims to enhance students' interdisciplinary thinking skills. It guides students to consider national engineering needs and their social responsibilities from historical, contemporary, and future perspectives, fulfilling the fundamental task of moral education, and cultivating compound talents in the field of transportation engineering with a sense of patriotism and historical responsibility.

1. Introduction

The construction of curriculum-based ideological and political education is a crucial task in comprehensively improving the quality of talent cultivation. The Traffic Engineering major at Xihua University is recognized as a province-level first-class major in Sichuan, known for its strong reputation in the province's transportation industry and traffic police systems. The major has actively embraced the Outcome-Based Education (OBE) concept, which is student-centered, outcome-oriented, and committed to continuous improvement, in its curriculum design and teaching processes.

"Traffic Information Engineering" is a required course in the Traffic Engineering major. This course systematically introduces the design principles, technical platforms, and management methods of transportation information systems. By cultivating students' cognitive abilities, problem analysis skills, professional communication and expression capabilities, solution design/solving

abilities, innovation awareness, and comprehensive qualities, the course aims to achieve its goals across the three dimensions of "knowledge—ability—quality," laying a solid foundation for students to gain a deep understanding of intelligent transportation technologies.

Implementing "curriculum ideological and political education" within professional courses is a key measure for advancing the nation's strategy of rejuvenation through science and education. It is also an essential pathway for cultivating talents for the country. Under the Outcome-Based Education (OBE) concept, the ideological and political teaching in professional courses must weave various elements and stages into a student-centered relational network, where each element or stage functions as a link in the system, collectively supporting the overall teaching framework.

This paper, based on the practice of integrating ideological and political education within the "Traffic Information Engineering" course for third-year undergraduate students majoring in Traffic Engineering (Class of 2021), clarifies the goals of ideological and political teaching. It thoroughly explores the elements of ideological and political education and interweaves them with professional knowledge, creating a cohesive network that enhances both educational objectives.

2. The Overall Framework for the Curriculum Ideological and Political Education

"Traffic Information Engineering" is a mandatory professional course designed to serve the development of outstanding engineers. Through theoretical instruction and case analysis, the course aims to equip students with a solid understanding of the fundamental concepts, principles, and methods of Traffic Information Engineering. Students will learn to proficiently apply these foundational theories and methods to propose and design solutions in areas such as road traffic operations, traffic management policy formulation, and traffic signal control. Additionally, the course emphasizes developing students' comprehensive ability and systematic thinking required to tackle complex engineering problems in the field of Traffic Information Engineering.

2.1. Course Professional Objectives

The course aims to equip students with the ability to apply the fundamental concepts, processes, principles, and methods of Traffic Information Engineering to the planning, design, and optimization of complex engineering problems in the field. Students will learn to address issues related to road traffic operations, traffic management policy formulation, and traffic signal control. They will also be able to integrate and utilize theories and knowledge from multiple disciplines, including transportation engineering, information technology, operations research, and computer science, to analyze, forecast, evaluate, and optimize complex engineering problems in Traffic Information Engineering related to planning, design, and decision-making.

2.2. Ideological and Political Education Objectives

Rooted in the fundamental mission of fostering virtue and talent, this course emphasizes value-driven education[1]. It aims to cultivate students with a broad international perspective and a strong sense of teamwork. The course encourages students to develop an awareness of the importance of building a strong transportation nation, fostering patriotism, dedication to their profession, and a sense of innovation and social responsibility. It also aims to instill the professional ethics of a transportation engineer, ensuring that students are well-prepared to meet the demands of the new era of socialist modernization and the development of the transportation industry.

2.3. Framework

Based on the main content of the "Traffic Information Engineering" course, the ideological and political education goals are integrated with ideological materials and embedded into the specific teaching content of the course. Ideological materials need to be continuously enriched and updated annually, reflecting the historical and recent developments in the nation, society, and transportation, to closely align with the social realities of university students and enhance the relevance of the ideological content[2-4]. This forms the basis for constructing the tree diagram for ideological and political education in the curriculum, as shown in Figure 1.

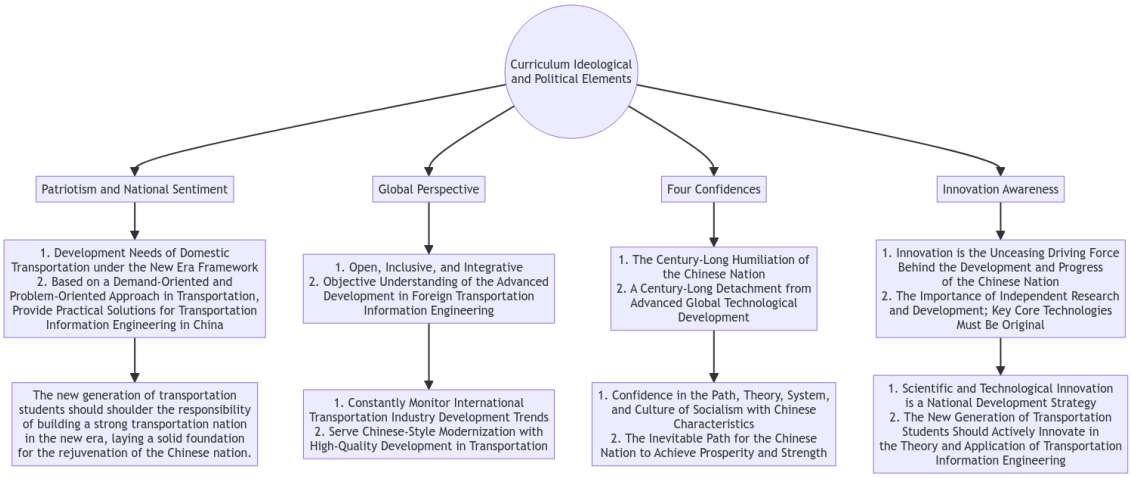

Figure 1: A tree diagram for ideological and political education in the curriculum.

3. Mining Ideological and Political Elements Based on the OBE Concept

The Outcome-Based Education (OBE) concept is an educational model centered on learning outcomes, first proposed by American scholar Spady[5]. In the OBE framework, all teaching activities are student-centered, requiring educators to focus on the skills and competencies that students should attain by the time they graduate and in their subsequent careers. To ensure that students meet these expected outcomes, educators must design corresponding educational resources, teaching methods, instructional tools, and evaluation systems. This approach guarantees that students achieve the desired educational goals and are well-prepared for their professional futures.

Putting education first is a fundamental requirement of higher education and a necessary demand of modern societal development. Gagne[6] stated that instructional design must aim to support the learning process rather than the teaching process. It should focus on purposeful learning rather than incidental learning. To achieve the transition from passive to active learning, classrooms must be student-centered, and instructional design must align with students' learning pathways. Since students progress from a state of unawareness to awareness, instructional design that follows students' learning pathways requires educators to first consider the ultimate learning objectives and the evidence that will demonstrate these objectives have been met before planning teaching and learning activities.

Based on this, the implementation of curriculum ideological and political education must also be outcome-oriented, starting with a clear understanding of the ultimate learning goals—essentially employing a backward design approach. The design method proposed in this article aligns with the OBE concept followed by engineering education accreditation. It begins by clarifying the competencies and abilities that students need to develop, as outlined in the professional training objectives. From these, the curriculum's ideological and political education goals are derived, and

based on these goals, the curriculum ideological and political teaching plan is designed.

Focusing on the specific distribution of course content, attention is given to extracting ideological and political elements closely related to the key knowledge points of each chapter, as shown in Table 1. These ideological elements are integrated into the main points of professional knowledge, reconstructing the concepts, principles, key technologies, and system applications of the course content. This integration is woven throughout all aspects of the course teaching, continuously improving the ideological content of the course and enhancing the subtle yet impactful teaching and educational outcomes.

Table 1: Integrating the main knowledge points of Traffic Information Engineering course with ideological and political elements

Lecture Topic	**Ideological and Political Integration**	**Teaching Content Design**	**Teaching Methods**
Introduction	(1) Serving Chinese-style modernization through high-quality transportation development (2) Responsibility and mission in the new era	(1) "Building a Strong Transportation Nation" (2) China as a globally influential transportation power	Documentary analysis, group discussion
Geographic Information Systems	(1) Rapid development of China's transportation geographic information systems (2) Technological innovation and a strong nation in technology	(1) Digital transformation in highway construction project management (2) 51Sim digital twin spatial simulation technology	Case analysis, heuristic analysis
Data Communication Systems	(1) Importance of China's independent research and development in data communication systems (2) Green transportation, cultural spirit	(1) Development stages of China's mobile communication industry: "1G gap, 2G follow-up, 3G breakthrough, 4G parallel, 5G leadership" (2) 5G vehicle-road collaborative service platform system	Case analysis, comparative analysis, group discussion
Spatial Positioning Systems	(1) Success of China's Beidou satellite positioning system network (2) Enduring hardships and forging ahead	(1) GPS prominence—Gulf War (2) Beidou Navigation System's global service by the end of 2018	Documentary analysis, group discussion
Internet of Things Technology	(1) Current state of IoT technology development in China (2) Historical mission of the Chinese Dream	(1) South-to-North Water Diversion Project (2) Huawei's IoT middleware HUAWEI LiteOS	Model demonstration, hands-on practice, group discussion
Sensor Network Technology	(1) Application prospects of sensor network technology (2) The necessity of original core technologies	(1) Application case of grating array sensing fiber optic cable on smart highways (2) US chip supply restriction to Huawei	Model demonstration, hands-on practice, group discussion

4. Curriculum Ideological and Political Education Teaching Reform Methods

4.1. Enhancing Teachers' Ideological and Political Education Capabilities

Strengthen Ideological and Political Training for Teachers: To improve teachers' capabilities in integrating ideological and political education, it is crucial to actively organize their participation in ideological and political training, seminars, special reports, and educational practices. This helps teachers deepen their understanding and practical abilities in ideological education, ensuring that the concept of curriculum-based ideological and political education becomes ingrained in their teaching practice. Teachers should also align their thoughts with the national education policies of cultivating virtue and talent, regularly update their educational philosophies, enhance their political sensitivity, and develop a conscious awareness of ideological education.

Integrate Ideological and Political Elements into Course Content: Teachers should strive to identify and integrate ideological and political elements within the course content. By aligning the ideological and political education with the course's knowledge structure, teachers can make the integration more relevant and effective, enhancing the specificity and impact of ideological education in the course.

Strengthen Professional Ethics and Conduct: Teachers should use their personal charisma and value orientation to influence and guide students in both teaching and daily life. This includes enhancing their ability to address student queries and guide their development, helping students establish correct worldviews and values. Regularly organizing competitions focused on curriculum-based ideological and political education can also facilitate the sharing of successful experiences and practices, creating an effective mechanism to improve teachers' comprehensive capabilities in this area.

4.2. Strengthening Students' Central Role in Ideological and Political Education

Promote Autonomous Learning: Autonomous learning is crucial for improving students' comprehensive application of professional knowledge and the effectiveness of ideological education. Teachers should focus on developing students' autonomous learning abilities through methods such as flipped classrooms, extracurricular reading, and social practice. This helps students better access ideological case studies related to the course content and establish a habit and awareness of ideological learning.

Integrate Professional Knowledge and Ideological Education: By effectively integrating professional knowledge with ideological education, students' interest and motivation in the course can be enhanced, making the implementation of ideological and political teaching more engaging and efficient.

4.3. Facilitating Joint Exploration of Ideological and Political Elements by Teachers and Students

Employ Case Analysis and Discussion Methods: We use case analysis and discussion methods to increase interactive elements between teachers and students in the course. For instance, in the "Positioning Systems" section, introduce real-world applications of GPS and Beidou systems to make the course content more practical and engaging. During case analysis, teachers should consciously guide students to consider the importance of positioning systems for national economic and security development, integrating patriotic sentiments into the teaching.

Enhance Student Participation: Through classroom group discussions and summary sessions, we encourage students to express their views, fostering their communication skills and teamwork spirit.

This approach not only improves the teaching environment and increases interaction but also allows for mutual sharing of teaching and learning insights, establishing a positive teaching-learning mechanism. Teachers should align course content with current social development trends, making the classroom a strong platform for ideological education.

4.4. Constructing an Evaluation System for Professional Course Ideological and Political Education

Establish Comprehensive Evaluation System: The evaluation system for ideological and political education in transportation information technology courses is essential for improving teaching effectiveness. This involves increasing the weight of moral education assessment in coursework, final exams, and term papers to subtly integrate ideological elements into these evaluations.

Enhance Teaching Evaluations: It is important to include teachers' ideological and political education abilities in the criteria for teaching excellence and promotion systems. A comprehensive evaluation system for every class should be established, including expert assessments, student evaluations, and self-evaluations. This system focuses on the ability to apply ideological elements and their impact on student learning outcomes.

Enhance Peer Teaching Competitions: The ideological and political teaching ability is added as one of the evaluation criteria in peer teaching competitions, emphasizing the ability to integrate ideological elements with course content and their effectiveness in guiding students' value formation.

5. Conclusions

This paper, integrating the student-centered and outcome-oriented educational concept of Outcome-Based Education (OBE) for engineering education accreditation, establishes an overall framework for the ideological and political education in the "Traffic Information Engineering" course. It outlines the methods for identifying and weaving ideological and political elements into the course and constructs a tree diagram of these elements, achieving an organic integration with professional knowledge.

The work in ideological and political education requires not only that teachers deepen their professional knowledge but also that they enhance their political literacy and moral standards. In practical educational activities, it is essential to strengthen the construction of teaching teams, gather diverse insights, and continuously innovate teaching methods. By closely adhering to the spirit of the General Secretary's directives on ideological education in higher education institutions, and integrating the Party's latest theoretical achievements and social development materials, this approach aims to provide students with a theoretically sound and vibrant ideological education.

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