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Application and Practice of Curriculum Ideological and Political Concepts in the Course "Municipal Road Engineering Construction"

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Abstract: Under the guidance of the spirit of the National Conference on Ideological and Political Work in Colleges and Universities, curriculum ideological and political education has become a key measure to implement the fundamental task of moral education. Taking the course "Municipal Road Engineering Construction" as the research object, this paper explores the path of in-depth integration of curriculum ideological and political concepts with professional teaching. By excavating ideological and political elements such as engineering ethics, craftsmanship spirit, green development, and cultural confidence contained in the course, a trinity teaching system of "knowledge transmission - ability training - value shaping" is constructed. Combined with specific teaching practice cases, the implementation effect of curriculum ideological and political education is analyzed. Research shows that the integration of curriculum, ideological and political education not only improves students' professional literacy but also strengthens their sense of social responsibility and professional identity, providing an effective paradigm for cultivating high-quality municipal engineering talents with "both moral and technical proficiency".

Keywords: Curriculum, ideological and political education; Municipal Road Engineering Construction; Engineering ethics; Craftsmanship spirit; Green development

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1. Introduction

1.1. Research background

It was emphasized at the National Conference on Ideological and Political Work in Colleges and Universities that "we must adhere to moral education as the central link, integrate ideological and political work into the entire process of education and teaching, and realize education for all, throughout the whole process, and in all courses." As an innovation in the talent training model of colleges and universities in the new era, curriculum ideological and political education requires professional courses to break through the limitations of traditional knowledge transmission, organically integrate ideological and political education elements into teaching content,

and form a great ideological and political pattern where "ideological and political courses" and "curriculum ideological and political education" go hand in hand.

"Municipal Road Engineering Construction" is a core course for majors such as Municipal Engineering Technology and Road and Bridge Engineering Technology in higher vocational colleges, featuring strong practicality, high correlation with people's livelihood, and rapid updates of technical standards. The course not only involves professional knowledge, such as road design, construction technology, and quality control, but also covers social issues, such as engineering safety, environmental protection, and professional norms. Integrating curriculum, ideological and political concepts into teaching can not only help students master professional skills but also guide them to establish correct values, professional views, and a sense of social responsibility, which meets the training requirements for "great power craftsmen" in the new era [1].

1.2. Research significance

From the perspective of talent training, practitioners in the municipal engineering field need to have solid technical capabilities and a high sense of social responsibility, road engineering is directly related to urban operation safety, residents' quality of life, and even the sustainable development of the ecological environment. Through curriculum ideological and political education, students can deeply understand the social value of engineering in the process of learning professional knowledge, cultivate a rigorous craftsmanship spirit, a green and low-carbon development concept, and a professional feeling of serving people's livelihood, delivering "morally and academically outstanding" qualified builders to the industry.

From the perspective of curriculum reform, the current course "Municipal Road Engineering Construction" still has problems, such as insufficient excavation of ideological and political elements and rigid integration methods. This study explores the integration path suitable for professional characteristics by systematically sorting out curriculum ideological and political elements, providing a reference paradigm for the ideological and political construction of similar courses [2].

2. Theoretical basis of curriculum, ideological and political education and analysis of course characteristics

2.1. Connotation and Goals of Curriculum Ideological and Political Education

Curriculum ideological and political education aims to build an all-staff, whole-process, and all-course great ideological and political education system. It emphasizes excavating ideological and political education resources in professional courses and realizing the educational effect of "moistening things silently" through the organic unity of knowledge transmission, ability training, and value shaping. Its core is to naturally integrate elements such as socialist core values, excellent traditional Chinese culture, and professional ethics into professional teaching, cultivating students' family and country feelings, sense of social responsibility, and innovative spirit [3].

2.2. Ideological and political education characteristics of the course "Municipal Road Engineering Construction"

2.2.1. A natural carrier of engineering ethics and social responsibility

Municipal road engineering involves people's livelihood issues, such as public safety, traffic organization, and residents' lives. In the construction process, it is necessary to balance technical feasibility and social impact. For example, when explaining "old road reconstruction projects," students can be guided to think about how

to reduce the impact on surrounding residents by optimizing construction plans, infiltrating the development thought of "people-centered."

2.2.2. An important platform for cultivating craftsmanship spirit

Links such as surveying and setting out, material proportioning, and process connection in road construction all require precision and meticulousness, allowing no carelessness. For example, in the teaching of "subgrade compaction," the impact of compaction degree control on road service life can be explained to emphasize the craftsmanship spirit of "details determine success or failure," and cultivate students' rigorous work attitude.

2.2.3. A practical field for green development concepts

With the advancement of the "dual carbon" goal, municipal road engineering is developing in the direction of ecologization and intelligence. The application of new technologies such as permeable pavement, recycled material utilization, and intelligent transportation systems can be deeply combined with the concept of "lucid waters and lush mountains are invaluable assets," guiding students to establish environmental awareness and innovative thinking.

2.2.4. A historical dimension for cultivating cultural confidence

China has made remarkable achievements in ancient road engineering, and in modern times, it has built world-class projects such as the Hong Kong-Zhuhai-Macao Bridge and the transportation hub of Beijing Daxing International Airport. Introducing these cases in teaching can stimulate students' national pride and enhance cultural confidence.

3. Excavation of curriculum, ideological and political elements and construction of the teaching system

3.1. Systematic sorting of curriculum ideological and political elements

According to the course content modules and combined with the goals of ideological and political education, the following core ideological and political elements are extracted (**Table 1**).

Table 1. Core ideological and political elements

Teaching Modules	Professional Knowledge Points	Ideological and Political Elements	Educational Goals
Road Engineering Introduction	Functions and classification of municipal roads	Connection between urban development and people's livelihood	Enhance professional identity and understand the people's livelihood value of engineering
	Development history of road engineering at home and abroad	Comparison of ancient and modern engineering achievements	Cultural confidence and awareness of technological innovation
Road Engineering Materials	Characteristics of asphalt, concrete, and other materials	Material performance and environmental protection requirements	Green development concept and circular economy awareness
	R&D and application of new materials	Independent innovation cases	Spirit of serving the country through science and technology, and craftsmanship spirit
Road Subgrade Construction	Selection of subgrade filling materials and compaction technology	Quality control and engineering safety	Sense of responsibility and rigorous scientific attitude

Table 1 (Continued)

Teaching Modules	Professional Knowledge Points	Ideological and Political Elements	Educational Goals
	Soft soil foundation treatment	Balance between the economy and the sociality of technical schemes	Engineering ethics and the purpose of serving people's livelihood
Pavement Engineering Construction	Construction technology of asphalt pavement	Standardization and refinement of construction processes	Craftsmanship spirit and standardized operation awareness
	Permeable pavement and sponge city technology	Ecological environmental protection and sustainable development	Green and low-carbon concept and innovative thinking
Construction Organization and Management	Construction period arrangement and resource allocation	Teamwork and cost awareness	Spirit of collaboration, awareness of conservation, and professional ethics
	Construction safety and civilized construction	Safety norms and social responsibility	Concept of life first and awareness of civilized construction

3.2. Construction of the "Trinity" teaching system

3.2.1. Theoretical teaching: Combination of implicit penetration and explicit guidance

When explaining professional knowledge, ideological and political elements are implicitly penetrated through case introduction and problem discussion. For example, in the chapter "History of Road Development", compare the "standardized construction" of the Qinzhi Road with the technological breakthroughs of modern expressways, guiding students to think about the continuity of Chinese civilization and the importance of technological innovation. In "Asphalt Pavement Construction," introduces China's independently developed rubber asphalt technology, explaining both technical principles and emphasizing its environmental benefits and circular economy value [4]. For content involving engineering ethics, an explicit guidance method is adopted, organizing students to analyze the responsibility issues behind accidents and discuss the professional principle of "safety first."

3.2.2. Practical teaching: Strengthening professional literacy in practical operation

Practical links are key scenarios for cultivating students' craftsmanship spirit and sense of responsibility. For example, in the training of "subgrade compaction degree detection," students are required to operate strictly in accordance with specifications and are not allowed to falsify or perfunctorily record data, cultivating the professional habit of "true data and standardized operation". In the "construction site simulation" project, a task of "civilized construction management" is set, requiring students to design dust control and noise monitoring schemes, strengthening environmental awareness and social responsibility [5].

3.2.3. Course assessment: Integrating ideological and political evaluation dimensions

Reform the traditional assessment method and include ideological and political performance into the evaluation system. For example: in group assignments, add scoring items such as "attitude towards teamwork" and "innovation of environmental protection schemes"; in the final exam, set open-ended questions such as "how to balance progress, quality and environmental protection requirements in road construction" to examine students' comprehensive values; evaluate students' sense of responsibility and professional literacy in practice through internship reports and project summaries [6].

4. Practical paths and cases of curriculum ideological and political education

4.1. Case teaching method: Taking "Sponge City Road Construction" as an example

4.1.1. Teaching goals

Professional goal: Master the construction key points of sponge city technologies such as permeable pavement and rain gardens; Ideological and political goal: Understand the importance of ecological civilization construction and cultivate green innovative thinking.

4.1.2. Teaching process

First, display a comparative video of the drainage effects of traditional roads and sponge roads, and ask: "Why promote sponge cities? What development concept does this reflect?" Guide students to discuss in combination with the content of "ecological civilization construction" in the 14th Five-Year Plan.

Second, analyze the material proportioning and construction technology of permeable concrete, emphasize its functional characteristics of "infiltration, retention, storage, purification, utilization, and drainage", introduce concepts such as "zero-waste city" and "circular economy", and explain the role of technological innovation in promoting environmental protection.

Third, introduce the sponge city road reconstruction project in Haicang District, Xiamen, showing its effects in reducing waterlogging and improving the ecological environment. At the same time, mention the technical difficulties encountered during construction (such as cost control and public cooperation), organize students to discuss solutions in groups, cultivating the ability of "discovering problems - analyzing problems - solving problems."

Fourth, assign after-class tasks: "Assuming you are the technical director of a sponge road project, how to explain the significance of the project to community residents and gain their support?" Guide students to shift from technical thinking to social communication, strengthening the service awareness of "people-centered."

4.1.3. Highlights of ideological and political integration

Through the combination of technology and policies, abstract concepts such as "green development" and "technological innovation" are transformed into perceptible engineering practices; using social contradictions in real cases, guide students to think about the social attributes of engineering, and cultivate communication skills and a sense of responsibility [7].

4.2. Project-based learning: Practice of "Campus Road Optimization Design"

4.2.1. Project background

Taking a section of damaged road on campus as the object, students are required to complete the whole process tasks of "detection and evaluation - scheme design - construction organization - cost accounting" in groups, while considering the characteristics of campus traffic and environmental protection requirements.

4.2.2. Key points of ideological and political integration

Teamwork and responsibility division: At the project initiation stage, guide students to clarify the roles and responsibilities of team leader, technical personnel, budget specialist, and presenter, emphasizing the importance of "each performing their duties and cooperating with each other", cultivating professional collaborative spirit; in the surveying link, require error control at the millimeter level, correcting the mentality of "close enough" through repeated practical operations, strengthening the rigorous attitude of excellence; in the scheme

presentation, set up a "simulated owner review" link, requiring students to explain professional schemes in plain language, focusing on explaining "how to reduce the impact of construction on teaching order", cultivating service awareness and communication skills; encourage groups to adopt schemes such as recycled aggregates and permeable pavement, and calculate their environmental benefits, transforming the "dual carbon" goal into specific actions [8].

4.2.3. Implementation effects

Through project practice, students not only mastered professional skills such as road detection, design, and construction organization but also improved in the following aspects: 92% of students believed that "they learned tolerance and responsibility in teamwork"; 85% of students said that "they paid more attention to environmental protection and people's livelihood factors when solving practical problems"; the project results were adopted by the school and used as practical teaching cases, enhancing students' sense of achievement and professional identity [9].

5. Effect analysis and reflection on curriculum ideological and political education

5.1. Effect analysis

5.1.1. Student feedback survey

Through a questionnaire survey (sample size: 200 people) and interviews, it was found that 89% of students recognized the integration method of curriculum ideological and political education, believing that "professional knowledge and ideological and political content are naturally combined without a sense of rigidity"; 78% of students said that "they have a deeper understanding of the social value of municipal engineering", and their professional identity was significantly improved; 65% of students actively paid attention to environmental protection and safety issues during construction during internships, reflecting the transfer effect of curriculum ideological and political education [10].

5.1.2. Reflection of teaching achievements

Students won the first prize in the "Municipal Engineering Construction Technology" competition in the provincial vocational skills competition, and the judges commented that their "scheme design has both technicality and social responsibility"; the "curriculum ideological and political case library for municipal road construction" developed by the course team was listed as a school-level high-quality resource for reference by other majors; relevant teaching reform achievements were exchanged at the national seminar on municipal engineering teaching in higher vocational colleges and were affirmed by peers [11].

5.2. Existing problems and improvement directions

5.2.1. Problem analysis

Insufficient depth in the excavation of ideological and political elements: Some teaching links still stay at the level of case enumeration, failing to fully combine the philosophical connotation of the course; professional teachers lack systematic mastery of ideological and political theories, and have a sense of difficulty when guiding students to discuss values; there is a lack of scientific tools for quantitative evaluation of ideological and political effects, making it difficult to accurately measure changes in students' values [12–14].

5.2.2. Improvement measures

Combine theories such as engineering philosophy and ethics to develop a special teaching module of "ethical dilemmas in municipal engineering", guiding students to think in depth through debates and role-playing; organize special training on curriculum ideological and political education, inviting ideological and political teachers and professional teachers to prepare lessons together to improve interdisciplinary teaching capabilities; introduce the "growth portfolio" evaluation method, track the development of ideological and political literacy through students' reflection logs, project summaries, and social service records, and explore a collaborative evaluation mechanism with ideological and political teachers [15].

6. Conclusion

The practice of curriculum ideological and political education in the course "Municipal Road Engineering Construction" shows that professional education and ideological and political education are not separated, but can achieve "knowledge transmission with temperature and value guidance with strength" through in-depth integration. By excavating elements such as engineering ethics, craftsmanship spirit, and green development contained in the course, combined with diversified methods such as case teaching and project practice, students' professional abilities and ideological realm can be effectively improved, cultivating high-quality talents with "understanding technology, having feelings, and daring to take responsibility" for the municipal engineering industry.

In the future, it is necessary to further explore the integration path of curriculum ideological and political education with information technology, strengthen school-enterprise-government cooperation, introduce real cases and professional standards from the front line of the industry into the classroom, making curriculum ideological and political education more timely and appealing. At the same time, a cross-curriculum ideological and political education system should be constructed to promote the formation of ideological and political education synergy between "municipal roads" and courses such as "engineering surveying" and "construction regulations," jointly building a professional ecology for all-round education.

Disclosure statement

The author declares no conflict of interest.

References

[1] Liu J, Zeng C, 2024, Analysis of Curriculum Ideological and Political Construction of the Course "Road Construction Organization and Budget Estimation" Under the Background of the Traffic Power Strategy. Anhui Architecture, 31(08): 101–102.

[2] Mo Z, Zhang S, Lu R, 2024, Exploration and Practice of Curriculum Ideological and Political Education in Professional Courses — Taking the Course "Road Survey and Design" as an Example. Education Teaching Forum, 2024(03): 97–100.

[3] Tao Q, Ma W, Wang Y, et al., 2024, Teaching Reform Practice of the School-Enterprise Cooperation Course "Construction Organization and Management" from the Perspective of Curriculum Ideological and Political Education. Vocational Technology, 23(02): 23–29.

[4] Yin Y, Zou C, Hu S, 2023, Teaching Exploration of "Road Engineering" Based on Curriculum Ideological and Political Education. Logistics Sci-Tech, 46(23): 175–177 + 181.

[5] Wang Y, Xu D, Zhou Z, et al., 2023, "Teaching Design" of Curriculum Ideological and Political Education for Municipal Engineering Measurement and Valuation. Chongqing Architecture, 22(06): 74–76.

[6] Zhang K, Sun P, Xie W, et al., 2023, Innovative Design and Practice of Teaching the Course "Road Engineering Materials" Under the Background of New Engineering. Journal of Hanjiang Normal University, 43(03): 87–92.

[7] Qi P, Lu P, 2022, Teaching Practice and Exploration of the Course "Road Engineering Drawing and Recognition" from the Perspective of Curriculum Ideological and Political Education. Journal of Anhui Vocational College of Electronics and Information Technology, 21(05): 46–49 + 54.

[8] Zhang Z, 2022, Implementation Path of Curriculum Ideological and Political Education for Higher Vocational Road Engineering Cost Majors. Transportation Enterprise Management, 37(05): 104–106.

[9] Lin K, 2022, Research on Teaching Reform of the Course "Road Engineering Surveying" Based on Curriculum Ideological and Political Education. Modern Vocational Education, 2022(18): 67–69.

[10] Dong Q, Chen X, Wang Q, et al., 2022, Research on Typical Cases of Curriculum Ideological and Political Education in the Course "Road Maintenance and Management." Journal of Higher Education, 8(07): 150–153 + 157.

[11] Wang S, Hou T, Li H, 2021, Methods and Paths of Integrating Curriculum Ideological and Political Education into "Road Engineering Drawing." Brick & Tile, 2021(09): 207–208.

[12] Li Z, Xu K, Wang J, et al., 2021, Design of Curriculum Ideological and Political Teaching Cases Based on Road Engineering Materials Experiments. Guangdong Chemical Industry, 48(16): 300–301.

[13] Huang J, Guo F, 2020, Practical Exploration of Integrating Ideological and Political Education into the Course "Road Engineering Detection." Journal of Wuxi Vocational Institute of Technology, 19(04): 19–23.

[14] Zhang L, 2019, Discussion on Carrying Out Ideological and Political Teaching in the Course "Road Engineering" in Colleges and Universities. Think Tank Era, 2019(48): 175–176.

[15] Zhang X, Zhai D, 2019, Practical Research on the Embedding of Ideological and Political Elements in Engineering Courses. Technology Wind, 2019(31): 25.