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The Design and Practice of the Integration of Curriculum-based Ideological and Political Education and Innovative Education

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Abstract: Aiming at the insufficient integration of "curriculum-based ideological and political education" and "innovative education" in higher education, which leads to the failure of ideological and political education to cover all aspects, this research carries out teaching reform based on biogas-related courses and practical innovation activities. In course teaching, we deeply explore cases of the integration of ideological and political education and innovation, innovate teaching methods; in innovative practical activities, we excavate ideological and political elements, guide method innovation, and optimize evaluation methods, so as to realize the deep integration of "ideological and political education - innovation". Through teaching reform, we comprehensively expand the value-leading role of ideological and political education, and provide support for cultivating engineering talents with both morality and ability.

Keywords: Curriculum-based Ideological and Political Education, Innovative Education, Integrated Practice.

1. Introduction

Higher education is an important link in talent training, undertaking the important responsibility of cultivating innovative talents with both morality and ability, and should deeply integrate moral education and talent cultivation [1]. Professional courses are the main positions for talent training, which can simultaneously take into account the cultivation of innovative thinking and value guidance [2]. Biogas Preparation and Utilization Engineering is one of the four core professional courses of the major of New Energy Science and Engineering, focusing on the role of knowledge imparting, ability training and value shaping in talent training. In terms of knowledge imparting, a theoretical system of "basic theory → engineering foundation → biogas engineering" progressing from theory to engineering layer by layer has been formed. In terms of ability training, attention is paid to students' abilities in solving theoretical and engineering problems, design and calculation, and searching for standards and specifications. In terms of value shaping, combined with the course content of biogas engineering, a course value system focusing on craftsman spirit, engineering thinking, patriotic spirit, environmental protection concept, safety awareness, etc., has been formed [3]. Based on the cutting-edge and developmental nature of the course content, teachers lead students to participate in rich internal and external innovative practical activities such as college students' innovation and entrepreneurship projects, discipline competitions, and graduation design, forming an innovative talent training mode of "in-class - after-class" linkage. At present, curriculum-based ideological and political education has been widely integrated into various courses, but its penetration in innovative practical activities is still insufficient. How to organically combine curriculum-based ideological and political education with innovative activities is still worthy of in-depth discussion. Based on biogas-related courses and innovative activities, this paper carries out the integration practice of curriculum-based ideological and political education and innovative education.

2. Problems in the Integration of Curriculum-based Ideological and Political Education and Innovative Education in Biogas-related Courses

Cultivating students' innovative awareness and capabilities is a core component of higher education in fulfilling its fundamental task of fostering virtue through education and serving the national innovation-driven development strategy [4]. In the process of integrating ideological and political education with innovation, the following problems have been found:

1) Innovative practices tend to ignore value orientation. Innovative practical activities focus on technological realization and competitive success, and easily ignore the social responsibility orientation of innovation, the ethical risks of technological application, and the humanistic care of engineering decision-making, which urgently need to be corrected through curriculum-based ideological and political education.

2) The depth and breadth of curriculum-based ideological and political education are insufficient. The main battlefield of curriculum-based ideological and political education is classroom teaching, with insufficient settings in practice and evaluation links; the content of ideological and political education is monotonous and repetitive, and the integration of new ideas is insufficient.

3) Curriculum-based ideological and political education and innovative education are "two separate aspects". There is a lack of effective carriers, means and materials in classroom teaching to integrate ideological and political elements with innovative thinking and innovative ethics.

In response to the above problems, this paper conducts two-way excavation from "ideological and political education → innovation" and "innovation → ideological and political education", combines new ideas and new technologies, covers all teaching links such as classroom teaching, practical activities, and assessment and evaluation, screens out

elements with both "ideological and political - innovative" attributes, reconstructs the case system of "ideological and political - innovative" integration, and forms a new mode of integration of curriculum-based ideological and political education and innovative education through the organic combination of teaching methods. Teaching practice and achievement analysis are carried out to verify the application effect of the new mode.

3. Reconstructing the Two-way Integration Case System of "Ideological and Political - Innovation"

3.1. Integration of Ideological and Political Education and Innovation in Course Teaching

Cases with both "ideological and political - innovative" attributes are extensively and in-depth screened to form a case system: ① Excavate innovative thinking and innovative ability from existing ideological and political elements; ② Excavate ideological and political elements from existing teaching activities such as cases of integrating scientific research into teaching, engineering design cases, and experimental design cases; ③ Integrate "ideological and political - innovative" thinking and concepts into assessment and evaluation, experimental teaching and other links. Through systematic sorting and classified integration of these case resources, a case database covering multiple dimensions such as basic theory, professional integration, the spirit of the times, and practical application is constructed, forming a hierarchical and rich "ideological and political - innovative" case system, which provides strong support for cultivating innovative talents with both morality and ability. The construction of this system can not only focus on theoretical depth, but also highlight practical orientation; it can not only inherit excellent traditions, but also highlight the characteristics of the times; it can not only emphasize value guidance, but also stimulate innovation vitality, and finally realize the organic unity and mutual promotion of ideological and political education and innovative education.

Table 1. Cases of Integration of Ideological and Political Education and Innovation in Biogas-related Courses

Case formation method	Course structure	Typical cases
Innovative thinking that explores existing ideological and political elements	Basic Theory Section	1.The discovery of methanoarchaea was a fusion of the innovative thinking in the 16S RNA biological classification method discovered by Calwoods and the spirit of ten years of arduous exploration. 2.In the history of biogas development, the promotion of biogas technology in a campaign-like manner, with unreasonable pool types and substandard materials, has led farmers to generally no longer be optimistic about biogas technology. It is necessary to guide students to recognize the crucial role of technological innovation and progress in the promotion and application of technology.
Integrate scientific research into teaching	Engineering Foundation Part	1.Integrate teachers' research achievements into teaching, and combine the problems encountered in the research process with innovative ideas for solving them. 2. Integrate the tortuous and developmental historical materialist thinking of obtaining cutting-edge scientific and technological achievements with innovative results and significance, such as the discovery of interspecific hydrogen transfer.
The "ideological and political - innovation" element of new ideas	Biogas project section	1.The innovative manifestation of the ecological civilization thought, green development concept and green productivity concept in the new ideology in the biogas field - the "breeding - biogas - planting" three-in-one ecological agricultural model; 2. Integrate the "bottom-line thinking" with the sense of rules in engineering projects and the normative awareness of academic ethics to cultivate engineering and technical talents with a sense of responsibility.
Experimental teaching link	Course experiment Section	In the course experiments, the ideological and political concept of integrating knowledge with action is emphasized. Open-ended and guiding questions are set up to enable students to deeply understand the connection between the experimental principles and operational techniques.
Assessment stage	Course assignments and assessment section	In the assessment method, the innovation and standardization of the design plan are evaluated, integrating innovation education with ideological and political education on abiding by discipline and regulations.

3.2. Integration of Ideological and Political Education and Innovation in Innovative Practical Activities

At present, biogas-related innovative practical activities include college students' innovation and entrepreneurship projects, discipline competitions, course design, graduation design and other practical links. These activities are important carriers for universities to cultivate compound talents with both social responsibility and innovative spirit. As special educational activities for innovation training, these practical links can deepen the connotative development of higher education and realize the organic unity of knowledge imparting and value guidance by integrating ideological and political elements. In the innovative practice of biogas technology, guide students to pay attention to the national "dual carbon" goals, rural revitalization strategy and ecological civilization construction, and closely combine their personal professional development with major national needs. For example, in the design of biogas engineering

projects, combined with the practical needs of rural energy revolution and environmental pollution control, cultivate students' family and country feelings of serving "agriculture, rural areas and farmers"; in biogas equipment innovation competitions, set themes such as energy conservation and emission reduction, circular economy, and strengthen students' awareness of ecological environmental protection and social responsibility. Through the integration of innovative practice and value shaping, students can be effectively guided to integrate their personal development into the overall situation of national development, avoid innovative practices deviating from the correct direction, prevent the cultivation of college students who "emphasize skills over literacy" and "emphasize interests over responsibilities", avoid technological tendencies, and effectively improve the quality and level of talent training. This integrated education mode not only improves students' professional practical ability, but also cultivates their sense of social responsibility and family and country feelings, providing an effective path for cultivating innovative talents in the new era with both morality and ability. After research, the key ideological and political elements integrated into various innovative practical activities are shown in Table 2.

Table 2. Ideological and Political Elements Integrated into Various Innovative Practical Activities

Innovative Practical Activities	Ideological and Political Elements
College students' innovation and entrepreneurship projects	Spirit of unity and cooperation, spirit of scientific innovation, academic morality
Discipline competitions	Spirit of unity and contribution, spirit of pioneering and innovation, rule awareness, feelings of patriotism, love for agriculture and love for the school
Course design	Spirit of unity, engineering thinking, standard awareness, sense of social responsibility
Graduation design	Engineering thinking, standard awareness, sense of social responsibility, feelings of patriotism, love for agriculture and love for the school
Graduation thesis	Awareness of experimental safety responsibility, academic morality, innovative spirit

4. Teaching Methods for Integrating Ideological and Political Education with Innovative Education

4.1. Teaching Methods for Integrating "Ideological and Political Education-Innovation" in Course Instruction

Exploring teaching methods that integrate "ideological and political education-innovation" helps address the issue of disconnect between innovative education and ideological and political education, cultivating versatile engineering talents with innovative spirit, engineering ethics, and craftsmanship, aligning with the requirements of "new engineering" construction. Achieving the integration of "ideological and political education-innovation" in course instruction requires the use of diverse teaching methods, organically combining ideological and political elements, innovative education, and teaching content to build an immersive educational ecosystem. This approach should engage students with novelty and interest, avoiding superficial content and achieving subtle yet profound influence. Main methods include: case-embedded teaching (Table 1), project-driven practice (small thematic design topics), open-ended innovative Q&A, and heuristic classroom questioning [5]. These are combined with blended online and offline teaching, flipped classrooms, and group discussions to activate the classroom atmosphere, stimulate student interest, and create a diverse teaching environment for "ideological and political education-innovation" integration, thereby promoting the achievement of teaching objectives.

4.2. Teaching Methods for Integrating "Ideological and Political Education-Innovation" in Practical Activities

In practical activities, teachers achieve the educational goals of ideological and political education by guiding students, organizing student practices, and engaging in communication with students. In terms of topic selection, elements such as national major technological needs, urgent technical issues in economic, social, and ecological development, and technological innovation in agricultural activities are incorporated to subtly integrate ideological and political elements such as social responsibility and patriotism, love for agriculture, and love for the institution. This gradually enhances students' awareness of contributing to the nation through their studies.

Regarding teamwork spirit and contribution indicators, teachers guide teams to establish organizational structures, assign collaborative roles based on each student's skills, set timelines to review project progress, organize periodic meetings to evaluate outcomes and adjust plans, and establish a systematic project management approach. In terms of scientific innovation spirit, students who propose innovative ideas or solve key problems are praised, inspiring enthusiasm among peers to tackle challenges.

In areas such as rule awareness, responsibility, academic ethics, and safety awareness, teachers use case-based warning education, such as "laboratory explosion incidents in certain universities," implement a "rotating safety officer system" requiring daily equipment inspections and safety logs, and establish academic integrity records. These methods guide students to develop a "bottom-line thinking" in engineering projects and scientific research. Through both verbal instruction and exemplary cases, students develop a sense of reverence for engineering rules and academic ethics. In this process, teachers serve not only as technical mentors, enhancing students' engineering practical abilities through "learning by doing," but also as life mentors, cultivating new engineering talents who understand technological innovation and possess a sense of national responsibility through their rigorous academic attitude and commitment to social responsibility in technological assistance.

4.3. Integration of Ideological and Political Education and Innovation in Assessment

In practical activities, a tiered assessment method is established based on students' task completion. Students who contribute nothing to the project are subject to an elimination mechanism and removed from the innovation team. Through teacher-student consultation, participating students are evaluated based on their contributions, with the results used for authorship attribution in project outcomes. Students who violate basic rules or academic ethics in practical activities are subject to strict criticism and guidance to correct their short-sighted mindset, laying a solid foundation for professional ethics.

5. Dynamic Evaluation and Feedback on "Ideological and Political Education-Innovation" Integration

Taking students from the 2022 cohort of the New Energy Science and Engineering program as the teaching subjects, teaching practices were conducted, including the implementation of a teaching case database and innovative teaching methods. Student feedback was collected, and based on the results, the teaching documents, content, and methods of the "Biogas Production and Utilization Engineering" course were dynamically revised. Feedback on classroom teaching effectiveness was gathered through surveys and discussions, with students generally finding the "cases novel" and "inspiring." Some students proactively expressed interest in participating in scientific research and innovative activities, demonstrating the positive impact of integrating "ideological and political education-innovation" in course instruction.

The effectiveness of integrating ideological and political elements in practical activities was evaluated through discussions and student interviews. The participants included members of the 2025 College Student Innovation and Entrepreneurship Program, teams from the third "Energy Conservation and Emission Reduction" competition, and 2025 graduates of the New Energy Science and Engineering program. During innovative practical activities, communication between students and instructors became more frequent, allowing for targeted ideological and political education. Teachers promptly addressed instances of inappropriate attitudes, lack of enthusiasm in task completion, or violations of academic norms through criticism and guidance. Relevant students reported significant benefits, achieving the educational goal of fostering virtue through education.

6. Conclusion

This paper, based on biogas-related courses and practical activities, achieves the integration of ideological and political education and innovative education through the establishment of a case integration system, innovative teaching methods, and dynamic evaluation and feedback. This teaching reform promotes the organic unity of knowledge transmission and value cultivation in biogas technology-related courses and innovative practical activities, providing support for cultivating engineering talents with both moral integrity and professional competence.

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