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Research on the Ideological and Political System Construction in the Engineering Statistics Course

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Abstract: Engineering Statistics is a core professional course offered to undergraduate students majoring in Industrial Engineering, playing a crucial role in the development of "New Liberal Arts" data-driven engineering talent. Traditional knowledge-based curriculum framework of the Engineering Statistics course has become insufficient to meet the comprehensive demands of modern society for data-driven engineering talent. It is imperative to integrate ideological and political education into the curriculum, cultivating students' sense of social responsibility and ethical values. By analyzing the Engineering Statistics current predicaments in ideological and political education in Engineering Statistics courses, the direction and connotation for the ideological and political construction of the Engineering Statistics course are proposed. By adhering to the "Three Focuses" principle of ideological and political education construction, designing "Three Implementations" of ideological and political education teaching content, and implementing a "Unity of Thought and Reason" evaluation system, a comprehensive ideological and political education teaching system for Engineering Statistics is established, providing a reference for the ideological and political education reform of Engineering Statistics courses.

Keywords: Engineering Statistics; Course Ideological and Political Education; Teaching System; Construction Connotation; Characteristic Innovation

1. Introduction

With the rapid development of technology and the diversified demands of society for engineering talent, engineering education faces new challenges. Engineering Statistics, as an important interdisciplinary subject, not only provides effective data analysis tools and decision-making support but also plays a key role in engineering project management, quality control, and risk assessment [1]. However, the mere transmission of technical knowledge is no longer sufficient to meet the comprehensive requirements of modern society for engineers. How to effectively integrate ideological and political elements into the Engineering Statistics course to cultivate high-quality industrial engineering professionals with both statistical skills and a sense of social responsibility has become a significant issue in the reform of ideological and political education in Engineering Statistics.

The importance of ideological and political education in cultivating students' socialist core values, innovative spirit, and social responsibility is increasingly prominent [2]. In recent years, the educational community has gradually recognized that ideological and political education should permeate various professional courses, including Engineering Statistics. Against this backdrop, more researchers have begun to explore the application of ideological and political education in engineering courses, aiming to enhance the synergistic development of students' value systems and professional capabilities [3]. Existing research shows that the integration of ideological and political education can effectively enhance students' sense of social responsibility, scientific values, and ethical awareness, as well as their ability to pay attention to and reflect on social issues [4].

2. Challenges in Ideological and Political Education in Engineering Statistics

Although existing practices provide theoretical support and case studies for ideological and political education in Engineering Statistics,

integrating ideological and political education into the course still faces multiple challenges, as outlined below.

2.1 Difficulty in Integrating Ideological and Political Education into the Curriculum

Engineering Statistics is a subject primarily focused on technology and data analysis. Integrating ideological and political education requires effective alignment with the course content. However, how to appropriately introduce ideological and political content while maintaining the rigor of professional knowledge remains a pressing issue.

2.2 Students' Limited Understanding of Ideological and Political Education

Some students do not place sufficient importance on ideological and political education, often viewing it as supplementary rather than core to the discipline [5]. This limited understanding significantly reduces the effectiveness of ideological and political education, making it difficult to stimulate students' active participation and deep thinking [6].

2.3 Inadequate Evaluation of Ideological and Political Education Outcomes

Current evaluations of the effectiveness of ideological and political education in Engineering Statistics primarily focus on improvements in course grades, lacking a multidimensional system and feedback mechanism to measure the impact of ideological and political education. This makes it difficult to assess and improve teaching effectiveness, hindering timely adjustments to teaching strategies to enhance the practical outcomes of ideological and political education.

2.4 Changing Social and Industry Demands

As society's demands for engineering talent become increasingly diverse, the requirements for the Engineering Statistics course are also evolving. In this context, how to flexibly adjust the content and form of ideological and political education to adapt to external changes poses a significant challenge.

In summary, the current ideological and political education in Engineering Statistics faces multiple challenges, including content integration, teacher quality, student understanding, evaluation systems, and changing industry demands. To promote the effective implementation of ideological and political education, in-depth research and exploration are needed at both theoretical and practical levels to seek feasible solutions. This study aims to explore effective strategies for ideological and political construction in the Engineering Statistics course, examining how to enhance students' scientific literacy and social responsibility by combining statistical theory with ideological and political education and statistical practice. Through literature review and empirical research, this paper summarizes existing research findings, identifies their shortcomings, and proposes practical teaching models and implementation strategies, hoping to provide new ideas and references for the innovation and development of engineering education. The value of this research lies not only in providing theoretical support for improving the teaching quality of Engineering Statistics but also in offering practical evidence for constructing an engineering talent training system with a sense of social responsibility and scientific literacy, promoting students' comprehensive development, and meeting society's demand for high-quality innovative talent.

3. Direction and Connotation of Ideological and Political Construction in Engineering Statistics

3.1 Direction of Ideological and Political Construction

Engineering Statistics is a foundational core course for Industrial Engineering majors, with a teaching focus on mastering the basic processes of statistics, enhancing students' skills in scientific decision-making in industrial engineering practice and on-site management, and enabling them to systematically analyze economic management issues using data and analytical methods, providing a basis for macro and micro decision-making and forecasting. By combining data science with engineering practice, this course aims to improve students' ability to solve complex engineering problems while cultivating engineering talent with an international perspective, innovative capabilities, and a sense of social responsibility. It emphasizes the integration of theory and practice and focuses on enhancing students'

comprehensive qualities. This provides a solid foundation for applying statistical knowledge to real-world engineering problems and lays a good groundwork for integrating ideological and political education.

The direction of ideological and political construction in Engineering Statistics is to follow the overall requirements of cultivating values, enhancing social responsibility awareness, improving humanistic literacy, and promoting comprehensive quality. Ideological and political education should permeate the entire teaching process, using statistical data, methods, and grouping cases to deeply explore the ideological and political elements and cases embedded in the course system that reflect socialist core values, scientifically broadening the ideological and political dimensions of the course. In statistical case analysis, traditional Chinese culture should be integrated, using classic statistical cases to inspire students' sense of responsibility and mission to contribute to the nation's technological development, fostering cultural confidence, enhancing national pride, and strengthening patriotic spirit.

3.2 Connotation of Ideological and Political Construction

(1) Shaping Values through Ideological and Political Construction

In terms of social responsibility, case analysis and discussion should guide students to pay attention to the role of statistical data in social decision-making, cultivating their sensitivity and responsibility towards social issues. Additionally, content related to society, the environment, and ethics should be integrated into the course, encouraging students to think about the impact behind data and establish correct values [7].

In terms of ethical awareness, discussions on the ethical issues behind data use, such as privacy protection and data manipulation, should help students understand the ethical standards of professional behavior. Role-playing and simulated scenarios can allow students to experience and understand the importance of ethical decision-making in practice.

In terms of teamwork spirit, project-based learning should emphasize the importance of collaboration, cultivating students' collective consciousness and cooperative abilities. Group activities should be designed to encourage students to solve problems together, enhancing their communication and collaboration skills [8].

(2) Imparting Knowledge through Ideological and Political Construction

In terms of theoretical knowledge, the basic concepts, principles, and methods of Engineering Statistics should be systematically taught, including data collection, analysis, and interpretation skills. Through lectures and demonstrations, students should establish a solid foundation in statistics, laying a good groundwork for subsequent applications.

In terms of applied knowledge, real-world cases should be used to explain the specific applications of statistical methods in the engineering field, allowing students to see the integration of knowledge and practice. Students should be guided to analyze real data, mastering data processing and interpretation methods, and enhancing their ability to apply knowledge.

In terms of interdisciplinary knowledge integration, the cross-application of statistics with other disciplines (such as engineering, economics, and sociology) should be introduced, broadening students' knowledge horizons. Special attention should be paid to cultivating the ability to apply theoretical knowledge to solve practical problems, achieving the integration and intersection of knowledge systems [9].

(3) Cultivating Abilities through Ideological and Political Construction

Through the study of basic statistical theories, students' abilities in data analysis, application, innovation, and self-directed learning should be cultivated. By teaching statistical theories and methods, students should flexibly apply statistical data analysis methods to analyze the patterns of socio-economic phenomena, further deepening their understanding of basic statistical theories. Students should be encouraged to propose their own insights and solutions in case discussions, improving their innovative abilities.

In terms of cultivating critical thinking skills, in-depth data analysis and discussion should help students develop critical thinking, enabling them to question and verify the authenticity of information. Students should be encouraged to debate statistical results, enhancing their logical thinking and analytical

abilities [10].

In terms of cultivating communication and expression skills, group discussions and project presentations should help students develop oral and written communication skills. Students should be encouraged to clearly express the results and conclusions of data analysis in presentations, enhancing their expressive abilities and confidence.

4. Construction of the Ideological and Political System in Engineering Statistics

4.1 Adhering to the "Three Focuses" Principle of Ideological and Political Construction

First, a questionnaire survey should be conducted to understand students' perceptions and expectations of integrating ideological and political education into Engineering Statistics, identifying the shortcomings of the current ideological and political education in the course. Second, successful cases and experiences of ideological and political construction in Engineering Statistics both domestically and internationally should be analyzed. Based on this, the "Three Focuses" principle of ideological and political construction should be determined, focusing on the main theme of moral education, the main battlefield of course construction, and the main melody of classroom teaching.

4.2 Designing "Three Implementations" of Ideological and Political Teaching Content

The course syllabus should be reorganized to organically integrate ideological and political education content with Engineering Statistics knowledge, ensuring that ideological and political elements permeate the teaching objectives, teaching links, and teaching direction of Engineering Statistics, fulfilling the fundamental task of moral education. At the same time, course content should be updated by selecting real-world Engineering Statistics cases related to social responsibility and ethical issues, integrating ideological and political education into the syllabus, teaching content, and teaching cases, and implementing the educational characteristics of ideological and political education. Additionally, diverse teaching methods, including project-driven learning, case teaching, and flipped classrooms, should be adopted to stimulate students'

interest in learning and comprehensively implement innovative classroom teaching models.

When designing teaching content, the "student-centered, teacher-assisted" flipped classroom model should be implemented. Teachers should mainly introduce ideological and political teaching content by releasing pre-class resources and course tasks, explaining course principles and addressing difficult questions, evaluating and summarizing students' task training, and conducting extracurricular extensions. Students should be the main body of classroom teaching, and the design of ideological and political content should fully leverage their subjective initiative. Through ideological and political case analysis, on-stage presentations, problem exercises, and content extensions, the teaching objectives of integrating ideological and political education and moral education should be comprehensively achieved.

4.3 Implementing the "Unity of Thought and Reason" Evaluation System for Ideological and Political Education

(1) Evaluation of Teaching Recognition in Ideological and Political Education

The evaluation of teaching recognition in ideological and political education mainly assesses students' recognition and satisfaction with the integration of ideological and political construction into the Engineering Statistics course from the perspectives of value cultivation, enhanced social responsibility awareness, improved humanistic literacy, and comprehensive quality enhancement. Evaluation methods include thematic discussions and ideological and political questionnaires, primarily assessing students' understanding and expression of ideological and political content, as well as their degree of understanding and identification with ideological and political themes, collecting feedback for improvement.

(2) Teaching Process Evaluation

The teaching process evaluation system includes classroom online quizzes and comprehensive statistical practice assignments. Classroom online quizzes mainly use online education platforms, in-class exercises, and post-class tests to assess students' mastery of the basic theories and skills of Engineering Statistics, allowing for timely adjustments to

teaching progress and content. Comprehensive statistical practice assignments mainly assess students' mastery of knowledge points by assigning different real-world statistical survey and data analysis cases, requiring students to conduct group research on relevant statistical data and materials, and assessing their ability to collect, organize, and analyze engineering statistical data. Through flipped classroom group presentations, students' active participation is encouraged, and the application and memorization of relevant knowledge points are reinforced.

(3) Final Course Evaluation

The final course evaluation should comprehensively assess students' understanding and mastery of basic concepts and principles, as well as their ability to flexibly apply the knowledge they have learned to engineering statistical analysis and design. Evaluation methods include final exams and project reports. On the one hand, comprehensive test papers should be designed to assess students' overall understanding and application ability of course content; on the other hand, project reports should be used to evaluate students' performance in project-based learning, including reading classical statistical literature and exploring cutting-edge statistical theories.

5. Characteristics and Innovations of the Ideological and Political System in Engineering Statistics

5.1 Creating an "Immersive" Teaching Experience

When designing teaching links for Engineering Statistics, practical statistical cases with ideological and political elements should be introduced to cultivate students' ability to analyze and solve practical engineering statistical problems with a dialectical materialist and scientifically rigorous attitude. Students' cultural confidence and global perspective should be enhanced. By introducing foreign statistical cases for comparative teaching, students should be encouraged to think about China's position in the global data science and statistics field, learn to respect facts, laws, and ethics, and enhance their national pride and international competitiveness.

5.2 Emphasizing the Cultivation of Social Responsibility and a Sense of Duty

When explaining the basic concepts and methods of obtaining statistical data, social issues such as environmental protection, public safety, and social management should be integrated into the course to explore how to correctly and objectively reflect social phenomena through statistical data collection and survey methods. Through case analysis, students should be encouraged to think about the social responsibility behind data, recognizing the important role of Engineering Statistics in promoting sustainable social development.

When introducing the practical application of statistical analysis results, real-world cases should be used to allow students to analyze the data basis of government policies, explore how statistical results affect social development and people's livelihoods, and emphasize the importance of statistical analysis in government decision-making. Specific social phenomena should be given for students to conduct on-site statistics, mastering the entire statistical workflow, cultivating their social practice ability, and enhancing their sense of duty.

5.3 Building a "Flipped Classroom" Collaborative Teaching Model

When explaining data collection and organization, content on data ethics and relevant laws and regulations should be introduced, emphasizing the necessity and morality of data integrity. Discussions and role-playing should be organized to allow students to simulate ethical decision-making in data processing, enhancing their integrity awareness and moral judgment ability, and appreciating the spirit of dedication to science, rigorous reasoning, and the pursuit of truth. This will significantly improve students' practical ability, sense of social responsibility, humanistic literacy, and professional skills, aligning with the goals of ideological and political construction in Engineering Statistics and achieving the harmonious development of value shaping, knowledge impartation, and ability cultivation.

By implementing the ideological and political reform in the Engineering Statistics course, using questionnaire surveys and on-site interviews, combined with the evaluation

system of ideological and political construction, students are allowed to independently organize and analyze statistical data to evaluate the effectiveness of integrating ideological and political education. Statistical results show that after introducing ideological and political education, students' learning motivation has significantly improved, with a recognition rate of 96.2%, an accuracy rate of 98.1% in classroom tests, and a participation rate of 100% in on-site surveys and other social practices. The final pass rate exceeded 90.8%.

6. Conclusion

Faced with the diverse demands of modern society for engineering talent, the mere transmission of technical knowledge is no longer sufficient to meet the goal of cultivating high-quality engineers. Effectively integrating ideological and political education into the teaching of Engineering Statistics can significantly enhance students' sense of social responsibility, scientific spirit, and innovative ability. Through demand analysis, course content design, teaching strategy formulation, and the implementation of ideological and political education, this study constructs a practical framework for ideological and political construction. By introducing case teaching and project-driven learning, and carefully designing course content with ideological and political elements, along with a scientific evaluation system, students' learning motivation and ideological and political literacy are significantly improved. Practical results show that the ideological and political construction of the Engineering Statistics course has achieved positive outcomes, with students' professional knowledge, social responsibility, and humanistic literacy significantly enhanced. This provides valuable experience for cultivating well-rounded engineering talent in the new era and offers useful references for the ideological and political construction of other engineering courses.

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