

Exploration on the Ideological and Political Construction Path of the “Probability Theory and Mathematical Statistics” Course

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Abstract: This paper focuses on the ideological and political construction of the course “Probability Theory and Mathematical Statistics.” Aiming at the current situation in teaching where emphasis is placed on knowledge imparting while value guidance is neglected, and combined with the requirements of ideological and political education policies in the new era, this paper explores the integration path between professional courses and ideological and political education. Through literature analysis, case comparison, and empirical research, the study proposes a systematic implementation plan covering the design of teaching objectives, the reconstruction of teaching content, and the optimization of the evaluation system. The purpose is to cultivate students’ sense of social responsibility and innovative awareness by excavating the ideological and political elements in mathematics. The research results provide practical reference for colleges and universities to deepen the reform of ideological and political education in courses, and promote the implementation of the fundamental task of fostering virtue through education in STEM education.

Keywords: Probability theory; Mathematical statistics; Ideological and political education in courses; Fostering virtue through education; Construction path

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1. Introduction

In December 2016, the General Secretary emphasized at the National Conference on Ideological and Political Work that it is necessary to adhere to moral education and cultivate people as the central link to create a new situation for the development of higher education in China. In July 2021, the Central Committee of the Communist Party of China and the State Council issued the document *Opinions on Strengthening and Improving Ideological and Political Work in the New Era*, adhering to the opening of ideological and political courses, strengthening problem awareness, highlighting practical orientation, giving full play to the strength and resources of the whole society, and building a national teaching and research system for ideological and political courses in colleges and universities. In May 2024, the Ministry of Education and other ten departments

issued the *Work Plan for Comprehensively Promoting the Construction of “Grand Ideological and Political Courses,”* and to comprehensively promote the construction of “Grand Ideological and Political Courses,” it is necessary to adhere to the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era and focus on the fundamental task of moral education and cultivating people. Curriculum-based ideological and political education refers to a comprehensive educational concept that forms a synergy by making various courses and ideological and political theory courses move in the same direction and in tandem in the form of building a pattern of educating people throughout the whole process, by all staff and in all courses, and takes “moral education and cultivating people” as the fundamental task of education.

Probability Theory and Mathematical Statistics is an important branch of the mathematics discipline, and it is also an indispensable foundation in applied mathematics and statistics^[1]. By introducing curriculum-based ideological and political education into the teaching of Probability Theory and Mathematical Statistics, while teaching professional knowledge, it can cultivate students’ correct humanistic spirit and social values, and make them have stronger social responsibility and innovative consciousness. Secondly, at present, the reform and development of higher education in China are in a stage of comprehensive deepening. Strengthening the research and practice of curriculum-based ideological and political education is of great significance for promoting the connotative construction of higher education and improving the quality of education. By exploring how to effectively integrate ideological and political education into the course of Probability Theory and Mathematical Statistics, the connotation of the course can be enriched, so as to better meet the social demand for high-quality professional talents.

In order to solve the problems in the teaching process of the Probability Theory and Mathematical Statistics course: (1) Teachers often only focus on the teaching of basic knowledge, basic theories and basic methods, while ignoring the introduction of curriculum-based ideological and political education; (2) Students only focus on theory while ignoring practice, only master basic methods but lack the sublimation of thinking, resulting in students’ low learning enthusiasm and general learning effect. This project carries out curriculum construction from many aspects such as teaching objectives, curriculum design, teaching content, curriculum evaluation, and teaching team building, so that teachers can introduce ideological and political elements in the teaching process and realize the perfect combination of teaching and educating people.

2. Analysis of the current status of domestic research

In practical teaching, probability and mathematical statistics courses often prioritize the imparting of knowledge while neglecting ideological and political education. Additionally, the abstract and complex nature of mathematical knowledge makes course teaching dull and uninteresting, dampening students’ enthusiasm for learning. A large number of scholars have conducted research and exploration on ideological and political education in courses based on their own teaching practices.

Zhang *et al.*^[2] organically integrated the concept of ideological and political education in courses with the Probability and Mathematical Statistics course, and designed cases from the perspectives of cultural confidence, humanistic spirit, and scientific spirit. Based on the OBE concept, Wang *et al.*^[3] applied the case-based ideological and political teaching method, deeply explored ideological and political elements, and reconstructed the teaching content. Wang *et al.*^[4] discussed how to carry out ideological and political education in the teaching of this course to achieve the educational goal of fostering virtue through education. From the HPM perspective, Yang^[5] demonstrated the humanistic value of the Probability and Mathematical Statistics course.

Xu *et al.* ^[6] expounded on how to base on the course teaching content, closely align with the course teaching objectives, excavate ideological and political elements in the course, and achieve the goal of “fostering virtue through education.” Wang *et al.* ^[7] proposed a teaching reform concept that centers on students, is problem-oriented, and aims to improve students’ comprehensive literacy and innovative ability. Relying on the OBE concept and the China University MOOC platform, Tian *et al.* ^[8] carried out teaching reforms and practices suitable for mathematics professional courses, integrating offline and online teaching, teaching and scientific research, knowledge impartment and value guidance, as well as theory and practice.

The above-mentioned literature has conducted research and exploration from multiple aspects, providing valuable experience and innovative ideas for the construction of ideological and political education in the Probability and Mathematical Statistics course. The existing research results are mainly reflected in the following aspects: (1) In terms of the excavation of ideological and political elements, scholars have explored the combination points between ideological and political education and professional knowledge from the perspectives of cultural confidence and scientific spirit; (2) In the innovation of teaching methods, models such as case-based teaching and the HPM perspective have effectively improved the teaching effect; (3) In terms of technological empowerment, the integration of the OBE concept and online platforms has provided new ideas for ideological and political education in courses. Despite the abundant achievements, there are still the following limitations: (1) Insufficient systematicity: Most of the existing studies focus on a single ideological and political element or teaching method, lacking an overall design framework; (2) Lack of evaluation: There are few quantitative evaluations on the effect of ideological and political education in courses, making it difficult to scientifically measure the effectiveness of moral education; (3) Detachment from practice: Some cases are not closely combined with the core professional knowledge, resulting in a phenomenon of “labeling.”

3. Research objectives, content, and hypotheses

3.1. Research objectives

Guided by the fundamental task of “fostering virtue through education,” this study aims to establish a two-way channel for knowledge impartation and value guidance. Through the ideological and political reform of the Probability Theory and Mathematical Statistics course, it seeks to cultivate talents for the new era who possess both scientific literacy and a sense of national belonging. The specific research objectives are as follows:

- (1) Explore how to integrate ideological and political education into the Probability Theory and Mathematical Statistics course to enhance students’ ideological and moral qualities as well as their comprehensive abilities.
- (2) Analyze the implementation strategies and effects of ideological and political education in the teaching of Probability Theory and Mathematical Statistics, so as to provide feasible suggestions for the practice of ideological and political education in college courses.

3.2. Research content

Focusing on the characteristics of mathematics and the laws of ideological and political education, this study systematically explores the practical path of collaborative education between professional courses and ideological and political education, covering the construction of a theoretical framework, the excavation of typical cases, and the verification of effectiveness. The specific research content is as follows:

- (1) Analyze the characteristics and teaching content of the Probability Theory and Mathematical Statistics course, and explore ways to integrate elements of ideological and political education while imparting

professional knowledge.

- (2) Investigate the theoretical frameworks and practical experiences of ideological and political education in related courses at home and abroad, and summarize successful cases and teaching models.
- (3) Collect students' and teachers' perceptions of ideological and political education in courses and its actual effects through questionnaires, interviews, and other methods, and analyze the impact of such education on the improvement of students' comprehensive quality.
- (4) Propose implementation strategies and paths for ideological and political education in the Probability Theory and Mathematical Statistics course, and explore how to guide students to establish correct outlooks on life, values, and social responsibility in the teaching process.

3.3. Research hypotheses

Based on the dialectical materialist methodology, this study puts forward the hypothesis that the integration of ideological and political elements can strengthen students' sense of social responsibility, emphasizing the dialectical unity of teachers' leading role and students' subjective initiative.

- (1) Integrating ideological and political education into the Probability Theory and Mathematical Statistics course can improve students' ideological and moral qualities, and enhance their sense of social responsibility and innovative awareness.
- (2) The implementation of ideological and political education in courses requires teachers to have certain theoretical knowledge of ideological and political education and teaching capabilities, while also needing the active participation and cooperation of students.
- (3) The implementation of ideological and political education in courses must be combined with professional teaching, with emphasis on practical teaching effects and the improvement of students' disciplinary abilities.

4. Research ideas, methods, and implementation

4.1. Research ideas

Following the three-stage research logic of theoretical construction–case analysis–practical verification, this study takes the HPM (History and Pedagogy of Mathematics) perspective as a bridge to realize a cross-temporal dialogue between mathematical historical facts and contemporary values.

- (1) Theoretical discussion and framework construction: First, gain an in-depth understanding of the concept and connotation of ideological and political education in the course Probability Theory and Mathematical Statistics, and construct a theoretical framework for ideological and political education in courses. Explore the relationship between professional courses and ideological and political education, and clarify the research objectives and significance.
- (2) Case analysis and comparative study: Through the analysis and comparative study of relevant domestic and foreign cases, understand the practical experience of other schools or institutions in ideological and political education of professional courses, so as to provide references for this study.
- (3) Field research and questionnaire survey: Conduct field research to gain an in-depth understanding of students' and teachers' perceptions and expectations of ideological and political education in courses. At the same time, design a questionnaire survey to collect students' evaluations and feedback on the effectiveness of ideological and political education in courses, so as to provide objective data support for the research.

4.2. Research methods

This study adopts a multi-dimensional analytical framework combining bibliometrics and empirical research, and complements quantitative data with qualitative research to ensure the scientificity and universality of the conclusions. The specific research methods used in the research process include:

- (1) Literature research: Sort out relevant literature, including academic papers, teaching cases, policy documents, etc., to gain a comprehensive understanding of the theoretical basis and practical experience of ideological and political education in courses.
- (2) Empirical research: Adopt empirical research methods such as questionnaire surveys, interviews, and observations to collect quantitative and qualitative data, and analyze students' and teachers' perceptions and actual effects of ideological and political education in courses.
- (3) Case analysis: Select representative cases for in-depth analysis, explore successful experiences and lessons, and provide practical references for this study.
- (4) Expert interviews: Invite experts, scholars, and educational practitioners in the field of ideological and political education to conduct interviews and obtain their insights and suggestions on ideological and political education in courses.

4.3. Implementation steps

In accordance with the PDCA (Plan-Do-Check-Act) cycle quality management concept, the construction of ideological and political education in courses is decomposed into a closed-loop implementation process of Plan-Execute-Check-Improve, highlighting the feature of continuous optimization. The specific implementation process is as follows:

- (1) Determine the research scope and objectives: Clarify the research scope and research objectives of the subject, and establish the focus and direction of the research.
- (2) Literature review and theoretical construction: Sort out relevant literature materials, establish a theoretical framework for ideological and political education in courses, and determine research methods and research paths.
- (3) Field research and data collection: Conduct field research and questionnaire surveys to collect students' and teachers' opinions and feedback on ideological and political education in courses.
- (4) Data analysis and research results: Analyze and organize the collected data, summarize the research results, and extract research conclusions and suggestions.

5. Research conclusions and innovations of curriculum ideological and political education

5.1. Research conclusions

By combining theory with practice, this study systematically explores the effective paths for the construction of ideological and political education in the course Probability Theory and Mathematical Statistics. The research results show that:

- (1) From the perspective of integration feasibility, the mathematics discipline contains abundant ideological and political elements (such as dialectical thinking in probability theory and scientific ethics in statistics). Through case-based teaching and the reconstruction of teaching content based on the OBE (outcome-based education) concept, the organic integration of professional knowledge and value education can be achieved.

- (2) From the perspective of implementation effect, the humanistic value exploration based on the HPM perspective and the problem-oriented teaching model have significantly improved students' classroom participation and sense of social responsibility. Questionnaire surveys show that more than 85% of students recognize the role of ideological and political elements in promoting the understanding of the essence of the discipline.
- (3) From the perspective of research achievements and demonstration, the proposed “goal-content-evaluation” trinity implementation framework provides a replicable model for the reform of curriculum ideological and political education in STEM (Science, Technology, Engineering, and Mathematics) education in colleges and universities, and is of exemplary significance, especially in the aspect of interdisciplinary collaborative education ^[9,10].

5.2. Innovations

- (1) In-depth integration of disciplines and ideological and political education: Professional courses and ideological and political education are often regarded as two independent teaching fields. This study innovatively explores how to achieve in-depth integration of the two in the course of Probability Theory and Mathematical Statistics, while fulfilling both the goals of course teaching and ideological and political education for talent cultivation.
- (2) Through carefully designed teaching content and methods, this study not only imparts professional knowledge, but also guides students to think about and explore social, ideological, political and value issues related to professional content through case analysis, ideological and political discussions and other means, and establishes an integrated training model of “knowledge points–ideological and political elements–ideological and political cases–ideological and political key points.”

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