

Research on Ideological and Political Teaching Evaluation of "Engineering Project Management and Practice" Based on Fuzzy Comprehensive Evaluation

Wei Zhang

School of Management Science and Engineering, Anhui University of Finance and Economics,
Bengbu, Anhui 233000, China

Abstract

The evaluation of the ideological and political teaching effectiveness is of great significance for promoting curriculum reform and enhancing teaching outcomes. This study, grounded in the student perspective, constructs a fuzzy comprehensive evaluation-based model for evaluating the ideological and political teaching effectiveness. Through the use of expert survey methods, the study determines the weights of the evaluation indicators for ideological and political teaching, thereby establishing an evaluation indicator system. This enables the quantitative processing of qualitative issues. Additionally, the scientific validity of the model is validated through empirical research.

Keywords

Fuzzy Analytic Hierarchy Process; Data analysis; Ideological and Political Education; Teaching Effectiveness Evaluation; Engineering Project Management and Practice.

1. Introduction

In the current educational environment, the integration of ideological and political elements into course teaching has become a crucial component of higher education in China. This is especially true in specialized courses such as Engineering Project Management, where effectively combining professional knowledge instruction with ideological and political education has emerged as a key point in educational reform. Therefore, the assessment of the effectiveness of this integrated teaching approach is particularly important, aimed at continuously improving teaching quality and students' comprehensive literacy. This study takes the "Engineering Project Management and Practice" course as an example to explore how to assess the ideological and political teaching effectiveness through the fuzzy comprehensive evaluation method.

The primary objective of this research is to construct a teaching effectiveness evaluation model based on fuzzy comprehensive evaluation. This model considers multi-dimensional teaching evaluation indicators, including teaching objectives, content, methods, and outcomes. The weights of these indicators were determined through expert survey methods, enabling a quantitative assessment of teaching effectiveness. The construction of this model is based on the student perspective, aiming to more accurately reflect teaching results while also providing guidance for course reform and the enhancement of teaching quality.

In terms of teaching practice, the course team integrates ideological and political education into classroom teaching through various methods, such as case studies, group discussions, and flipped classroom approaches, to enhance student participation and learning outcomes. Additionally, through post-class activities and practical projects, students' professional skills and sense of social responsibility are further strengthened.

Overall, this study not only proposes an innovative method for evaluating teaching effectiveness but also provides empirical support for the effective integration of professional teaching and ideological and political education. This is significant for driving the reform of higher education, particularly in achieving a deep integration of ideological and political education in professional courses like Engineering Project Management, both in theoretical and practical terms.

2. Ideological and Political Teaching Practice

To effectively achieve the ideological and political education goals, the course team has conducted rigorous and comprehensive planning at various stages of teaching. Before the class, the teaching team delves into the hidden ideological and political elements in the course content, which are professional treasures for addressing students' ideological issues. These elements are scattered in the ocean of knowledge. Through various channels such as classroom discussions and innovative practices, the team meticulously plans teaching cases aimed at getting closer to students' hearts, influencing their thoughts, and guiding them towards the right values. The case designs fully incorporate the dedicated spirit of a great nation's craftsmen, the spirit of seeking truth through scientific methods, and the craftsman spirit of innovation.

From the efforts of the teaching team to the perception and actions of the students, ideological and political education, like a gentle breeze and rain, silently changes the worldview, life outlook, and values of every participant.

In the teaching process, we have taken a series of measures to deeply integrate ideological and political elements into various aspects. Through field experiences, students can personally experience the charm and challenges of the industry, laying a solid foundation for theoretical learning in the classroom. Classroom discussions encourage students to express their opinions, sparking the sparks of thought in exchanges and deepening their understanding of the course content. Through a nuanced perspective, combined with knowledge points, professional characteristics, and students' practical experiences, we guide students to analyze the essence of problems, fostering their ability for independent thinking and problem-solving.

In the course, we immerse students in typical real-life examples and disciplinary cases, guiding them to see beyond appearances and face real-world problems with a rational and objective attitude. The application of diverse teaching methods, such as flipped classrooms and small group discussions, further enriches the forms of ideological and political education. Flipped classrooms enable students to grasp knowledge in pre-class preparation, allowing more time in class for in-depth discussions and reflections. Small group discussions promote interactive communication between teachers and students, ensuring that each student receives sufficient attention and guidance. In this teaching atmosphere, students can not only quickly understand the connotation of ideological and political elements but also cultivate critical thinking and teamwork skills through interaction.

In the ideological and political aspect of assignments, we pay special attention to guiding students' professional awareness and value orientation. In addition to traditional knowledge consolidation exercises, we assign readings and tasks related to cutting-edge technological achievements in the industry. By learning about the stories of outstanding figures in the field of engineering project management and real-life positive cases, students not only broaden their professional horizons but also draw spiritual strength, establishing the correct life outlook and values. To comprehensively assess students' mastery of ideological and political content, we include questions in the exams that analyze practical engineering problems. These questions require students not only to have a solid theoretical foundation but also to flexibly apply their knowledge to solve real-world problems. This is both an exercise of students' application skills and an examination of their comprehensive qualities.

In the post-class phase, we encourage students to actively participate in research projects related to energy utilization, virtual simulation experiments, and academic competitions. These activities not only help consolidate what they have learned in the classroom but also cultivate students' innovative spirit and practical abilities. Through such practical exercises, students have the opportunity to contribute their wisdom and strength to the sustainable development of the energy industry.

3. Evaluation of the Implementation Effectiveness

3.1. Factor Selection

In October 2023, in accordance with the requirements outlined in the Ministry of Education's "Notice on Conducting Qualified Assessment of Undergraduate Teaching in General Higher Education Institutions," consultations were held with relevant experts and scholars. Additionally, the implementation plans, construction standards, and classroom evaluation criteria formulated by well-known domestic universities such as Shanghai Jiao Tong University and Wuhan University were considered. Four primary indicators were determined, including teaching objectives, teaching content, teaching methods, and teaching effectiveness. The factors for evaluating the ideological and political education in the course are shown in Table 1.

Table 1. The factors for evaluating the effectiveness of ideological and political education in the curriculum.

No	Name	Keywords(Top 3)
1	Teaching Objectives	Align with curriculum standards and textbook requirements (A11) Tailor teaching to individual needs (A12) Reflect ideological and political education goals (A13)
2	Teaching Content	Structurally sound, highlighting key points and difficulties (A21) Effectively balance knowledge impartation and value guidance (A22) Seamless integration of ideological and political elements (A23) Enriched with diverse ideological and political examples (A24) Comprehensive use of information technology and digital resources (A31)
3	Teaching Methods	Emphasis on interactive teaching (A32) Implement heuristic and participatory teaching methods (A33) Integration of practical teaching and societal practices (A34)
4	Teaching Effectiveness	Strong teaching influence (A41) High level of student participation in class (A42) Intense impact of ideological and political education on students (A43)

3.2. Questionnaire Design

The survey employed a five-point Likert scale to evaluate the effectiveness of ideological and political education in the course. A total of 120 students from the Engineering Management and Engineering Cost majors, who were taking the elective course "Engineering Project Management and Practice," were selected. Questionnaires were distributed on-site to all 120 students, and 110 responses were collected. Out of these, 108 were deemed valid, resulting in a questionnaire validity rate of 90%.

4. Fuzzy Comprehensive Evaluation

4.1. Construction of Indicator Set

Since ideological and political education is primarily conducted in universities, with researchers and teaching practitioners relatively concentrated, this study adopts the method of

expert surveys to determine the weights of evaluation indicators for ideological and political education in the "Engineering Project Management and Practice" course. Questionnaires were distributed to 10 experts with senior professional titles who have been engaged in ideological and political work in universities for an extended period. Based on their years of experience, the experts were asked to assess the relative importance of the four primary indicators and 14 secondary indicators. Considering that there are no very clear differences in importance between the indicators, the experts assigned values of 4, 3, 2, and 1, corresponding to the scales of most important, important, average, and not important, respectively.

Taking the primary indicators as an example, the number of experts who assessed the indicator A_i ($i=1, 2, 3, 4$) with a score of i ($i=4, 3, 2, 1$) is recorded as K_{ij} . The score for each primary indicator is calculated as $B_i = \sum_{j=1}^4 i k_{ij}$, and the total score B_i for all 10 experts is calculated. Subsequently, the weight C_i for each primary indicator is calculated as $C_i = B_i / B$

Table 2. Indicator System and Weights

Theme	Code	Weight	Secondary Indicator	Code	Sub-weight	Total Weight
Teaching Objectives	A ₁	0.3	Compliance with course standards and textbook requirements	A ₁₁	0.32	0.096
			Tailoring teaching methods to individual students	A ₁₂	0.29	0.087
			Reflecting the objectives of ideological and political education	A ₁₃	0.39	0.117
Teaching Content	A ₂	0.25	Structurally sound, with emphasis on key points and difficulties	A ₂₁	0.2	0.05
			Properly handling the relationship between knowledge impartation and values guidance	A ₂₂	0.3	0.075
			Seamless integration of ideological and political elements	A ₂₃	0.3	0.075
			Rich ideological and political case studies	A ₂₄	0.2	0.05
Teaching Methods	A ₃	0.25	Comprehensive use of information technology and digital resources	A ₃₁	0.25	0.0625
			Emphasis on teaching interaction	A ₃₂	0.26	0.065
			Implementation of heuristic and participatory teaching	A ₃₃	0.27	0.0675
			Integration of practical teaching and social practices	A ₃₄	0.22	0.055
Teaching Effectiveness	A ₄	0.2	Strong teaching appeal	A ₄₂	0.3	0.06
			High enthusiasm of students' participation in class	A ₄₃	0.35	0.07
			Strong impact of ideological and political education on students	A ₄₄	0.45	0.09

4.2. Empirical Study and Analysis

Five experts (E1, E2, ..., E5) who served as activity judges and 20 university students (S1, S2, ..., S10) who participated in the activity were invited to evaluate the satisfaction with 14 secondary

indicators using a semantic scale with four levels: excellent, good, average, and poor. All 30 evaluation forms were collected, and the evaluation information was deemed valid. We assigned values to qualitative indicators to quantify them. The qualitative indicators are as shown in Table 2.

(1) Using the fuzzy comprehensive evaluation method for the ideological and political education evaluation in the course, both expert judges and university student evaluators reached a consensus, providing high evaluation scores. This indicates that the proposed evaluation method in this study can accurately reflect the achievements of ideological and political education in the course.

(2) During the evaluation process, university students naturally regarded themselves as the audience of the class, overlooking the role of evaluators. They tended to consider their intuitive feelings as the key factor in evaluation. In contrast, expert judges, relying on a profound theoretical foundation in ideological and political education and practical experience, could keenly observe the strengths and weaknesses of classroom teaching and provide appropriate amplification during scoring. Therefore, the scores from expert judges are more professional.

(3) Ideological and political education evaluation is a nonlinear qualitative problem, involving numerous fuzzy and uncertain concepts in evaluation methods and processes. Using the fuzzy comprehensive evaluation method can transform qualitative evaluation into quantitative evaluation, reducing the interference of subjective and artificial factors in the evaluation to a large extent.

The scores from the five expert judges were 0.897, and the scores from the ten university students were 0.93.

5. Conclusion

In conclusion, our study has successfully developed an evaluation model for assessing the effectiveness of ideological and political education in the course, employing a fuzzy comprehensive evaluation approach. The model, determined through expert surveys to establish indicator weights, showcased its scientific validity through empirical research.

Furthermore, in the realm of instructional design, the subtle infusion of ideological and political elements has demonstrated an implicit educational impact. Teachers are encouraged to explore the inherent ideological and political facets within professional courses, tailoring teaching strategies to accommodate the diverse characteristics of students across different majors and stages of their academic journey. This approach ensures a more cohesive integration with the overarching requirements of ideological and political education.

Moreover, when implementing ideological and political education in the curriculum, particular attention must be paid to students' receptiveness and psychological experiences. Teachers, taking on transformed roles, should analyze potential challenges students might face and select content that aligns with their learning needs. Overcoming obstacles related to solidified knowledge systems, teachers should incorporate contemporary and youthfully vibrant examples relevant to the times. Additionally, a focus on students' receptiveness, the use of online teaching methods, and prompt adjustment of teaching strategies based on comprehensive student feedback contribute to a more effective ideological and political education process.

Acknowledgments

This project is the mid-term research result of the Anhui Province Higher Education Quality Engineering Project (2022jyxm008), (2022xsxx003) and the Anhui University of Finance and Economics Quality Engineering Project (acszjyyb2202003).

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