Exploration on the Teaching Reform of Digital Image Processing Course Under the Guidance of Ideological and Political Education

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Abstract. This paper conducts an exploration on the teaching reform of the Digital Image Processing course under the guidance of ideological and political education, expounds on the necessity and current situation of the integration of ideological and political education into this course, and analyzes the existing problems in teaching, such as the superficial integration of ideological and political elements, outdated ideological and political content, insufficient educational awareness and capabilities of teachers, and inadequate guarantee in the assessment mechanism. It puts forward reform paths including curriculum innovation, faculty development and assessment system optimization, which provides a reference for cultivating compound talents with both solid technical capabilities and profound feelings of home and country.

Keywords: Digital Image Processing, Image enhancement, Ideological and political education, Teaching reform.

1 Introduction

In May 2020, the Ministry of Education issued the Guidelines for the construction of curriculum ideological and political education in Higher Education Institutions, which clearly stated that the construction of curriculum ideological and political education must be effectively promoted to address the disconnection between professional education and ideological and political education[1, 2]. As an important postgraduate course for engineering majors such as Computer Science and Electronic Information, Digital Image Processing features both abstract theories and strong applicability, and its application technologies are widely used in important fields including aerospace exploration, medical and health care, cultural inheritance, and image retrieval[3, 4]. However, the traditional teaching mode of Digital Image Processing has hindered the development of image technologies and the cultivation of innovative talents[5] . Therefore, optimizing

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the traditional teaching mode and deeply integrating the concepts of ideological and political education into the entire teaching process of Digital Image Processing is not only a fulfillment of the requirements for the construction of curriculum ideological and political education, but also an inherent demand for the high-quality development of the course itself.

2 Current Situation of the Integration of Ideological and Political Education into the Digital Image Processing Course

2.1 Innovation and Upgrading of Teaching Modes with Blended Teaching as the Mainstream

Teachers in some universities have constructed a blended teaching model of Pre-class Guidance - In-class Discussion - Post-class Consolidation. Before class, students are guided to learn by releasing materials such as the course development history and the achievements of China in the field of Digital Image Processing; in class, cases of scientific and technological ethics are introduced to encourage students to conduct active discussions; after class, assignments are assigned to help students consolidate the knowledge learned in class. This blended teaching method can organically integrate ideological and political elements such as the feelings of dedicating science and technology to the motherland, data ethics norms and the awareness of cross-cultural collaboration while imparting course knowledge, thus realizing the trinity of knowledge impartation, ability cultivation and value shaping. For example, in the practice of blended teaching, Wuhan University of Technology supplements extended content such as research hotspots of relevant technologies and China's scientific and technological achievements in related fields through online resources, enabling students to intuitively perceive the exploratory spirit of scientists and the course of national scientific and technological progress, thereby enhancing their national pride[6].

2.2 Diverse Forms of Ideological and Political Integration with Emphasis on Implicit Penetration

In the ideological and political integration of the postgraduate course Digital Image Processing, the diversified integration forms and implementation paths of implicit penetration can effectively avoid the drawback of separation between ideological and political indoctrination and professional teaching, and thus realizing the trinity of knowledge impartation, ability cultivation and value shaping. For example, when explaining image enhancement technology, cases of land fertility image classification for early control are introduced to infiltrate the concept of empowering agriculture through science and technology[7]; when analyzing the application of image segmentation, engineering application cases such as target recognition in the field of intelligent transportation and defect detection of flaw detection images are used to cultivate students' awareness of serving society with science and technology[8].

2.3 Multiple Universities Actively Explore and Form Diverse Construction Paths

Faced with the common problems such as insufficient resources and inadequate teacher competence in the construction of curriculum ideological and political education, different universities have formed differentiated exploration paths in light of their own school-running orientations and professional characteristics, presenting a systematic reform trend of Goal Restructuring - Content Optimization - Model Innovation - Evaluation Improvement. For example, guided by the OBE concept, Nanjing University of Posts and Telecommunications has constructed a trinity curriculum ideological and political education system of Value - Competence - Knowledge, realizing the whole-chain reform from four dimensions of goals, content, models and evaluation[9].

3 Problems in the Integration of Ideological and Political Education into the Digital Image Processing Course

3.1 Prominent Problems at the Teaching Level

3.1.1 Lack of Linkage Between Professional Education and Ideological and Political Education, and Superficial Integration.

In the process of integrating ideological and political education into the postgraduate course Digital Image Processing, the rigid insertion of ideological and political elements and the failure to implement ideological and political education throughout the entire teaching process have rendered it a mere formality, which is likely to arouse students' resentment[10]. For instance, abruptly inserting patriotic slogans when explaining image filtering algorithms, or simply mentioning "independent innovation" in the chapter on image compression without combining it with specific technical cases, leads to the disconnection between ideological and political education and professional teaching, resulting in a phenomenon where the teaching of professional knowledge and ideological and political education are isolated from each other, and the coordinated advancement of "knowledge impartment - ability cultivation - value shaping" fails to be achieved.

3.1.2 Ideological and Political Content Being Overly Macro and Outdated, Disconnected from Professional Frontiers.

Ideological and political teaching materials mostly revolve around classical theories and policies, lacking integration with cutting-edge technologies and industrial practices in the field of Digital Image Processing, and there exists a notable gap between ideological and political topics and students' professional cognitive level. For instance, when discussing professional ethics such as "craftsman spirit" and "pursuit of excellence", outdated examples like artisans polishing precision parts are still used, failing to incorporate specialized scenarios in image algorithms - such as iterative parameter tuning and extensive experimental validation of model performance; discussions focus solely on macro-level ideological content like "adhering to professional ethics and the

standardized application of technology" without exploring ethical issues such as user biometric data leaks in facial recognition applications; mentions of "serving the nation through technology" fail to connect to relevant professional achievements like the application of the domestically developed Yaxin-Tiantu chip or image deduplication technology[11].

3.2 Core Problems at the Teacher Level

3.2.1 Deviated Understanding of Ideological and Political Connotations and Weak Educational Awareness.

Some professional course teachers regard curriculum ideological and political education as an additional burden, fail to recognize the diverse ideological and political connotations such as engineering ethics, the scientific spirit, and team collaboration contained in the course, and lack the awareness to proactively explore ideological and political elements and design their integration into teaching. This results in the superficial and narrow integration of ideological and political education, and the neglect of the value guidance and educational functions behind technological learning[9].

3.2.2 Inadequate Capacity for Ideological and Political Teaching and Single Integration Method.

At present, most teachers still teach based on traditional lesson plans and fail to fully explore the integration points between professional course knowledge and ideological and political education[12]. For example, it is difficult for them to refine the spirit of independent innovation from image acquisition technology. Integration methods are limited to the accumulation of cases and verbal mentions, lacking innovative design, which results in the rigid and inflexible integration of ideological and political education and makes it difficult to achieve the effect of ideological and political education for moral cultivation.

3.3 Inadequate Guarantee at the Mechanism Level

3.3.1 Single Evaluation Method and Neglect of Comprehensive Quality Assessment.

Traditional evaluation methods fail to fully reflect students' comprehensive abilities at different learning stages and lack the whole-process evaluation[13], with insufficient attention paid to the ideological and political-related comprehensive qualities of students such as values and ethical literacy. There is a lack of special evaluation indicators for ideological and political performance, and the value judgments in classroom discussions, collaborative responsibilities in team cooperation and other such aspects are not included in the evaluation scope, making it difficult to fully reflect the effectiveness of ideological and political education for moral cultivation.

3.3.2 Inadequate Assessment Criteria and Weakened Ideological and Political Orientation.

At present, no specific criteria have been formulated for the assessment of curriculum ideological and political education, and there are still many deficiencies in assessment methods and content to a certain extent, which results in insufficient attention paid to curriculum ideological and political education by some students[14]. Ideological and political assessment lacks clear quantitative criteria, and basic requirements such as classroom attendance and no disciplinary violations are mostly used as a substitute. No hierarchical evaluation rules have been formulated for core ideological and political literacy including patriotism, the scientific spirit and engineering ethics, leading to the formalization of ideological and political assessment.

4 Exploration of the Integration Path of Ideological and Political Education into the Digital Image Processing Course

The integration of ideological and political theory into the Digital Image Processing course must be grounded in the Guidelines for the Construction of Curriculum Ideological and Political Education in Higher Education Institutions. This requires establishing an integration framework centered on value guidance, underpinned by professional knowledge, and oriented toward ability cultivation, thereby clarifying the core principles of education.

4.1 Deepen Curriculum Innovation: Achieve the In-Depth Integration of Professional Knowledge and Ideological and Political Education

4.1.1 Innovate the Teaching Content of "Professional Knowledge + Ideological and Political Education".

Taking the core knowledge points of the course as anchors, we construct a trinity teaching content system of "Technical Principles - Ideological and Political Connotations - Application Scenarios". In theoretical teaching, we explore exclusive ideological and political integration points for each chapter. For example, the chapter on image restoration is combined with the case of digital protection of Dunhuang Murals to integrate the connotation of cultural inheritance; the chapter on image compression and coding introduces the R&D story of the domestic Yaxin-Tiantu chip to convey the belief of dedicating science and technology to the motherland. The content of some chapters and their corresponding ideological and political content are shown in Table 1.

4.1.2 Integrating Cutting-Edge Technologies of Ideological and Political Scenarios into Teaching Content.

Keep up with the technological development trends in the field of digital image processing, integrate cutting-edge technological cases containing ideological and political values into teaching, and enhance the timeliness and appeal of ideological and political

education. For example, introduce the "Guanjun Xiaoice" AI referee system at the Winter Olympics, explain the application of image action recognition technology in international events, and the feelings of dedicating science and technology to the motherland[15]; introduce cases of ethical disputes related to Deepfake technology, guide students to explore the risks and boundaries of technological abuse, and strengthen their awareness of the rule of law and professional ethical literacy.

Table 1. Comparison table of the integration of chapter content and ideological and political education content.

Chapter name	Chapter content	Ideological and political content
Color image processing and compression coding	The color image processing section covers the primary color model, pseudo-color enhancement, and true color enhancement technologies; the image compression coding section introduces entropy coding, DCT transform coding, as well as the JPEG standard and its applications.	(1) Expound the R&D process of the domestic Yaxin-Tiantu image compression chip, emphasizing the strategic significance of independent innovation; (2) Combine the ISO/IEC 23053 standard for the framework of artificial intelligence systems using machine learning, discuss cultural sovereignty in the formulation of technical standards, and foster an international perspective.
Image frequency domain transformation and filtering technology	Presents the mathematical principles and engineering implementation of Fourier Transform, Discrete Cosine Transform and Wavelet Transform; analyzes the algorithmic logic of frequency domain filtering, and compares the applicable scenarios and effect differences of different filters.	(1) Tracing the research journeys of scientists such as Fourier and Shannon, and conveying the innovative spirit of daring to break through traditional boundaries and explore the unknown; (2) Combining the frequency domain processing technology of domestic remote sensing satellite images, introducing China's independent R&D achievements in the field of signal processing, so as to strengthen students' feelings of home and country.
Image enhancement and restoration technology	The image enhancement section covers the technical principles and practical applications of point operations, spatial domain filtering, and frequency domain filtering; the image restoration section includes the applications of degradation model construction, algebraic restoration methods, and frequency domain restoration methods.	(1) Drawing on cases such as the digital restoration of cultural relics and the protection of Dunhuang Murals, to cultivate the awareness of cultural heritage protection and the sense of responsibility for cultural inheritance; (2) Introducing the 4K/8K restoration cases of precious historical images from Shanghai Jiao Tong University, to instill the concepts of technology for good and cultural self-confidence.

Image segmentation and feature extraction	Presents the core algorithms of threshold segmentation, regional segmentation and edge detection; introduces the principles and applications of image feature extraction operators.	(1) Introducing cases such as China's gait recognition technology and domestic medical image segmentation systems, to foster national pride and independent technological self-confidence; (2) Combining the application of medical image segmentation in disease diagnosis, to strengthen students' social responsibility of applying technology to serve people's livelihood.
Morphological processing and applications	Covers the basic operations of binary morphology and gray-scale morphology; presents the technical logic of morphological filtering.	(1) Introducing the intelligent mosaic system for ceramic fragments based on morphology, to cultivate students' sense of mission and responsibility for cultural inheritance; (2) Combining the application of morphology in ecological remote sensing monitoring, to guide students to establish the awareness that science and technology empowers the construction of ecological civilization.
Image recognition and ethical norms	Presents the feature-based image recognition process and target matching algorithms; introduces the engineering applications of biometric recognition technologies such as face recognition and fingerprint recognition; focuses on ethical issues such as privacy protection and prevention of image tampering in technical applications.	(1) Introducing the "Vision Rebirth" family-finding system based on face recognition developed by Huazhong University of Science and Technology, to emphasize the social value of technology serving the society; (2) Focusing on the compliant use of biometric data, conducting ethical debates, to strengthen the awareness of the rule of law and professional ethical literacy.

4.2 Strengthening Faculty Construction: Improving Teachers' Literacy in Integrating Ideological and Political Education

4.2.1 Carrying Out Specialized Training on Ideological and Political Theoretical Literacy.

Establish a normalized faculty training mechanism, focusing on the improvement of core competencies in curriculum ideological and political education. Organize teachers to study ideological and political theories and policy documents; through continuous learning and accumulation, teachers strive to enhance their awareness and capabilities in ideological and political education[16]. Set up special research workshops on ideological and political theories, covering the Marxist view of science and technology, technical ethical norms, excellent traditional Chinese culture and other content, so as to

make up for the deficiencies in ideological and political theories among professional course teachers.

4.2.2 Organizing Interdisciplinary Faculty Exchange Meetings.

Organize interdisciplinary exchange meetings between ideological and political course teachers and teachers of the postgraduate course Digital Image Processing, establish a normalized joint lesson preparation mechanism. Wherein, ideological and political course teachers interpret the contemporary connotation of serving the country through science and technology and the core essence of engineering ethics from a theoretical perspective, while professional course teachers conduct analysis combined with practical scenarios such as image algorithm optimization and technical tackling cases. Promote the "ideological and political + professional" joint teaching model to achieve the organic unity of theoretical depth and practical vitality.

4.3 Optimizing the Assessment System: Establishing a Collaborative Evaluation Mechanism of Ideological and Political Education and Professional Competence

4.3.1 Constructing a Two-Dimensional Evaluation System of "Professional Competence + Ideological and Political Literacy".

Break away from the evaluation orientation dominated by course paper scores, and form a comprehensive evaluation method covering all links of the course. In class, require students to learn and master the professional knowledge and technical principles of the postgraduate course "Digital Image Processing". After class, focus on assessing students' literature reading ability and teamwork and execution ability, requiring predivided group members to read literature from top-tier journals and conferences, make PPTs and present them in class. At the end of the term, require students to independently write a course paper, and at the same time encourage them to put forward innovative technical improvement schemes or cross-field application ideas combined with course knowledge, so as to fully demonstrate the professional research literacy that postgraduates should possess. In the dimension of ideological and political literacy, three core indicators are added: values, ethical literacy, and behavioral performance. Through the above three newly added core indicators, students' performance in the three stages of in-class, after-class and final periods is assessed, ensuring that students can imperceptibly improve their own ideological and political literacy in the learning process.

4.3.2 Adjusting the Weight of Ideological and Political Assessment and Clarifying Its Proportion.

Optimize the composition of the course total evaluation scores, increase the proportion of ideological and political performance to 30%, and highlight the important position of ideological and political education. Take course papers as the core assessment carrier to assess whether students have integrated ideological and political elements into their course papers, such as the topic "A Review of Research on Domestic Digital Content Copyright Protection Technology Based on Image Hash Algorithm"[17, 18]. At

the same time, formulate quantitative evaluation standards and clarify the grading rules for each dimension. If ideological and political connotations are not reflected or there are deviations in ethical cognition, deduct points as appropriate to ensure the fairness and guidance of ideological and political assessment. In this way, course papers can not only assess students' ability to apply professional knowledge, but also evaluate their degree of understanding of ideological and political connotations.

5 Conclusions

This paper explores the teaching reform of the course "Digital Image Processing" under the guidance of ideological and political education. Firstly, it elaborates on the necessity and importance of integrating ideological and political education into the postgraduate course "Digital Image Processing". By analyzing the current situation of the integration of ideological and political education into this course, it explores the existing problems, and then explores the path of teaching reform of "Digital Image Processing" under the guidance of ideological and political education from three aspects. It provides a referable course teaching reform method for cultivating high-level compound talents with solid technical capabilities and feelings of serving the country through science and technology.

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