

Exploration of the Ideological and Political Construction of the Fundamentals of Computer Game Technology under the Background of Emerging Engineering Education

Yuxiu Li*, Dan Zhao, Pengwei Guo

Shenyang Institute of Engineering, Shenyang 110136, Liaoning, China

*Corresponding author: Yuxiu Li, liyx@sie.edu.cn

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Abstract: Emerging Engineering Education puts forward the training requirement of coordinated development of knowledge, ability, and literacy for application-oriented talents majoring in Digital Media Technology. Aiming at the practical problems existing in the curriculum-based ideological and political education of Fundamentals of Computer Game Technology, including insufficient integration of ideological-political elements, relatively single classroom education approaches, the absence of literacy evaluation mechanism and the lack of continuous improvement mechanism, guided by the concept of outcome-based education (OBE), this paper carries out systematic curriculum-based ideological and political reform from four dimensions: reconstruction of teaching content, innovation of SPOC-supported online-offline blended teaching combined with flipped classroom, construction of multiple process-oriented evaluation system, and establishment of closed-loop feedback and iteration mechanism. By constructing the correspondence list of knowledge points, ideological-political elements, and innovation points, building the whole-chain blended teaching covering pre-class, in-class, and after-class sessions, perfecting the three-dimensional assessment system of “professional competence + ideological-political literacy + innovation achievements,” and establishing the closed-loop for teaching feedback and optimization, this paper promotes the synchronous advancement of knowledge imparting, ability cultivation, and value shaping.

Keywords: Curriculum-based ideological and political education; SPOC; Flipped classroom; Multiple evaluation

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1. Introduction

With the implementation of Emerging Engineering Education construction, an educational philosophy focusing on professional competence, interdisciplinary literacy, engineering innovation, leadership, and

patriotism has been formed ^[1,2]. Under new circumstances, talent cultivation emphasizes the coordinated development of morality, knowledge, and ability. Integrating ideologicalpolitical elements into professional teaching can foster students' patriotism and cultural confidence to achieve curriculum education goals ^[3].

Building a collaborative education model guided by curriculumbased ideological and political education and integrated with onlineoffline teaching is critical for cultivating highquality engineering talents, and serves as an important measure for applied engineering majors to improve talent cultivation quality. Among existing studies, Gong *et al.* ^[4] carried out curriculumbased ideological and political reform for specialized courses based on engineering education accreditation and firstclass curriculum construction; Zheng *et al.* ^[5] sorted out the curriculumbased ideological and political construction system for the Digital Media Technology major. Wang *et al.* ^[6] constructed an integrated curriculumbased ideological and political model for machine learning courses. Niu *et al.* ^[7] completed multidimensional ideologicalpolitical teaching design for artificial intelligence courses.

Existing studies offer references for ideological and political practice in this field, yet gaps still exist. Therefore, advancing curriculum ideological and political construction constitutes an inherent requirement of Emerging Engineering Education teaching reform ^[8].

2. Current status and practical pain points of curriculumbased ideological and political construction

2.1. Current construction status

The course has built SPOC online resources on Chaoxing Xuetong, including courseware, practical projects, and question banks, with a complete case library and project-oriented practical teaching. Adopting the school-enterprise co-construction model, it invites industrial experts to provide practical guidance, and group project development plus defense have become regular teaching activities. However, previous construction focused on technical training. The implementation of curriculum ideological and political education is fragmented without a systematic education plan, and value guidance is not deeply integrated with professional teaching.

2.2. Main practical dilemmas

First, teaching content: Curriculum ideological and political elements are added casually without holistic design, resulting in a disconnect between ideological education and professional teaching. The educational value embedded in professional knowledge is not fully explored.

Second, teaching mode: Teaching methods are relatively traditional. The SPOC platform merely stores resources instead of building a whole-process education chain. Project practice focuses on function development and lacks scenarios for ideological and political education.

Third, assessment and evaluation: Evaluation emphasizes technical outcomes. No quantitative indicators are set for ideological and political quality and professional literacy, with insufficient evaluation of the value dimension ^[9,10].

Fourth, continuous improvement: There is no closed-loop iteration mechanism. Student feedback is hard to collect, and no long-term pathway exists for continuous optimization of curriculum ideological and political construction.

3. Implementation paths for curriculumbased ideological and political reform

Guided by the outcomesbased education (OBE) philosophy, the trinity curriculum objectives of knowledge imparting, ability cultivation, and value shaping are established. The knowledge objective requires students to master the relevant principles of Windowsbased lowlevel game development. The ability objective focuses on fostering students' engineering practical capabilities in game prototype development, debugging and troubleshooting, as well as collaborative development. The valueshaping objective concentrates on cultivating students' pursuitforexcellence craftsmanship, ethics of digital content creation, awareness of copyright and the rule of law, devotion to the country, and professional literacy in teamwork. In response to the four major dilemmas mentioned above, four reform paths are formulated accordingly: reconstruction of teaching content, innovation of SPOCsupported blended teaching combined with flipped classroom, construction of multiple processoriented evaluation, and establishment of closedloop feedback and iteration mechanism.

3.1. Reconstructing the teaching content system to promote geneticstyle integration of ideologicalpolitical elements and professional knowledge

Abandoning the fragmented and attached implementation mode of ideological and political education, we systematically sort out all teaching modules of the course and establish a matching list of "knowledge points–ideological and political elements–innovation points." The educational objectives of each teaching unit are clarified, and educational connotations such as craftsmanship, intellectual property protection, and cultural confidence are matched with corresponding knowledge modules. The syllabus, teaching plans, and courseware are revised according to the list to embed value guidance into teaching design.

In teaching practice, on the one hand, we deeply explore the scientific spirit and craftsmanship embodied in engineering practices such as programming. On the other hand, industry cases, including the development of the domestic game industry and copyright disputes, are appropriately introduced. Ideological and political education is embedded in professional knowledge explanation and project training instead of isolated preaching, so as to realize the simultaneous progress of professional teaching and value guidance.

3.2. Constructing the "preclassinclassafterclass" blended teaching mode of flipped classroom based on the SPOC platform

The educational value of the Chaoxing SPOC platform is fully tapped. Instead of merely serving as a resource repository, a complete onlineoffline linked teaching chain for flipped classroom is built to expand practical scenarios for ideologicalpolitical education. Meanwhile, the advantages of schoolenterprise coconstruction are leveraged to involve enterprise experts in all teaching links.

- (1) Preclass online stage: The SPOC platform delivers courseware, experimental instructions, and exercises, supplemented by extended materials on the domestic game industry and software professional ethics, with enlightening pre-class discussion topics set. Teachers identify students' knowledge weaknesses via platform learning data to support offline flipped classroom design and realize pre-class introduction of value-oriented scenarios.
- (2) Inclass offline flippedclassroom stage: Teachers reduce one-way indoctrination and organize classes through key-point analysis, group discussions, project practice, and achievement demonstrations. Students carry out group collaboration on game development tasks under the joint guidance of university teachers and enterprise mentors. Professional norms and craftsmanship are integrated into

code debugging and project iteration. In the presentation session, besides technical reports, students also elaborate on design concepts and creative values, embedding value guidance into classroom activities.

- (3) Afterclass online stage: Tiered practical training tasks and opened extended thinking questions are released on SPOC. Assignments and project documents are archived online. Platform tools are adopted to answer questions and track the progress of group projects for extending educational effects. Enterprise tutors can participate in online discussions and comments to bring realworld professional requirements from the industry into the course.

3.3. Establishing the threedimensional processoriented evaluation system of “professional competence + ideologicalpolitical literacy + innovative achievements”

The assessment orientation of “valuing technical results over literacy development process” is reversed. Ideologicalpolitical literacy is transformed from soft requirements into observable and recordable evaluation dimensions. The overall course grade consists of 60% processoriented assessment and 40% summative assessment.

Relying on the complete learning evidence preserved on the SPOC platform, the processoriented assessment is divided into three parts. First, professional practice indicators examine online quizzes, computer assignments, code quality, and program operation performance of project tasks. Second, ideologicalpolitical literacy indicators observe specific behaviors including online discussion participation, performance of duties in group work division, code writing specifications, source material copyright marking, and compliance with professional norms. A learning portfolio is adopted to record students’ performance in class and project practice so as to reduce the subjectivity and randomness of evaluation. Third, innovative achievement indicators assess the optimization of project functions and the creativity of scheme design.

Instead of adopting the traditional closedbook written examination, the summative assessment takes the form of game prototype work plus a comprehensive course report. Students are required to submit selfdeveloped extended game prototype programs. Apart from illustrating technical implementation, the comprehensive report contains a special section to sort out development difficulties and discuss ideas of game creation value as well as reflections on copyright and ethics, realizing the integrated assessment of technical ability and value literacy.

3.4. Building diversified feedback channels and constructing a closedloop iterative improvement mechanism for curriculumbased ideological and political education

To tackle the practical problem of “emphasizing construction while neglecting improvement” in curriculumbased ideological and political education, a regular mechanism for feedback collection and continuous optimization is established. After each round of teaching, anonymous questionnaires are distributed via SPOC to collect students’ feedback on the integration effect of ideologicalpolitical elements, classroom modes, and assessment schemes. Teaching research seminars are held in the teaching and research office, and parttime enterprise tutors are invited to participate in teaching reviews to identify practical problems such as rigid integration of ideologicalpolitical content and ambiguous evaluation indicators. Combined with multisource feedback, the correspondence list of “knowledge points–ideologicalpolitical elements–innovation points” and SPOC extended resources and assessment scoring criteria are dynamically revised. A complete closed loop of “teaching implementation–feedback collection–analysis and judgment–

scheme optimization” is formed to continuously iterate and improve the effectiveness of curriculumbased ideological and political construction.

4. Reform effects

Through systematic reform via the four proposed paths, three expected outcomes can be achieved. First, the curriculumbased ideological and political content system will be improved to solve the problems of additive implantation of ideologicalpolitical elements and the “two separate skins” phenomenon, realizing the indepth integration of professional knowledge teaching and value guidance. Second, multilevel educational scenarios will be constructed relying on SPOC combined with flipped classroom to mobilize students’ subjective initiative, and comprehensive professional literacy such as craftsmanship, copyright ethics, and teamwork will be cultivated in project practice. Third, the threedimensional multidimensional evaluation can exert the guiding function of assessment baton, guiding students to balance technical competence and comprehensive literacy. The closedloop iterative mechanism ensures that the curriculumbased ideological and political construction can be dynamically adjusted according to actual teaching conditions.

5. Conclusion

Against the background of Emerging Engineering Education, Fundamentals of Computer Game Technology takes practical teaching features into account. Aiming at four major pain points of curriculum ideological and political education, reforms are implemented in four aspects: restructuring teaching content, adopting SPOC plus flipped classroom mode, building diversified process evaluation, and establishing closed-loop feedback and iteration. Craftsmanship, copyright ethics, cultural confidence, and social responsibility are integrated into the whole teaching process of game development. Teaching resources and evaluation criteria will be continuously optimized to improve educational effectiveness.

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Author contributions

Yuxiu Li conceived the idea of the study. Yuxiu Li, Dan Zhao, and Pengwei Guo analyzed the data and wrote the paper.

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