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Exploring Pathways for Integrating Moral Education into Computer Science Courses Empowered by Container Cloud Technology

Zhiwei Song[1,*]
[1]*Guangzhou Vocational University of Science and Technology, China*

Abstract: Against the backdrop of the digital transformation wave and the comprehensive advancement of moral education in courses, the teaching of computer science majors urgently needs to innovate moral education models. Container cloud technology, with its characteristics of efficient deployment and flexible resource allocation, provides new opportunities and technical support for the in-depth integration of professional courses and moral education. This study focuses on the integration of container cloud technology and moral education in computer science courses. It analyzes the characteristics of container cloud technology and the moral education needs of the courses, and explores innovative pathways for container cloud technology to empower moral education in computer science courses. Strategies for integration are proposed from aspects such as the development of teaching resources and the innovation of teaching models, with the aim of achieving an organic unity of professional knowledge transmission and value guidance. This study provides new ideas and practical references for the construction of moral education in computer science courses.

Keywords: container cloud technology, computer science major, moral education in courses, integration pathways, teaching reform

1. Introduction

As a technology-intensive discipline, computer science is not only tasked with equipping students with robust professional skills but also with fostering a correct set of values and a sense of mission among them. Container cloud technology, an emerging type of cloud computing technology, offers new opportunities for transforming computer science education with its advantages of efficient deployment and flexible management. The application of container cloud technology in the moral education construction of computer science courses is conducive to innovating teaching methods, optimizing teaching resources, and promoting the in-depth integration of professional education and moral education.

2. Overview of Container Cloud Technology

Container cloud technology, as an important branch in the field of cloud computing, centers on the encapsulation, deployment, and operation of applications through containerization techniques, and integrates the elastic scheduling capabilities of cloud platforms to construct an efficient and flexible application deployment and management system. Containers, as lightweight virtualization units, can package applications and their dependent environments into a standardized image to ensure that applications maintain a consistent runtime status across various computing environments. This effectively addresses the deployment difficulties caused by the "inconsistency of environments" in traditional software development processes. The container cloud platform integrates container orchestration, resource scheduling, and service

Corresponding Author: Zhiwei Song
Guangzhou Vocational University of Science and Technology, China

discovery, and manages the lifecycle of containers with the aid of automation tools (Wang, 2025). Among them, container orchestration tools are responsible for container creation, start-up and shutdown, scaling, and load balancing, and dynamically adjust resource allocation based on application load to ensure the stability and availability of services. Resource scheduling strategies adjust the layout of containers on cluster nodes based on the utilization efficiency of hardware resources and application requirements, thereby improving resource utilization. This architecture unifies development, testing, and production environments, reducing the cycle of application development and deployment, and supports rapid iteration and continuous integration. In terms of technical characteristics, container cloud technology has the advantages of being lightweight, efficient, portable, and scalable. Compared with traditional virtual machines, containers do not need to simulate a complete operating system, but only contain the libraries and dependencies required for application execution. They feature fast startup speeds and low resource consumption, allowing more application instances to be deployed on limited hardware resources. The standardized image format supports cross-platform portability, enabling applications to work seamlessly in various environments, including private clouds, public clouds, and hybrid clouds, thereby enhancing deployment flexibility.

3. The Value of Integrating Moral Education into Computer Science Courses Empowered by Container Cloud Technology

3.1 Enhancing the effectiveness and quality of moral education

Container cloud technology promotes the efficient and high-quality integration of moral education into courses by optimizing the allocation of teaching resources and the management of the teaching process. This ensures that value guidance in computer science teaching is more accurate and in-depth. Its core function is to break through resource barriers and spatial-temporal limitations, creating an intensive and personalized moral education environment. Moral education elements are naturally integrated into technical teaching, avoiding the aversion caused by forced insertion. In terms of resource integration, the container cloud platform can standardize and centrally manage fragmented moral education materials, packaging them into containerized teaching modules that students can access and study on the platform at any time (He, 2025). These resources are categorized and linked according to technical themes and moral education goals. For example, in a "Distributed Systems" course, while explaining container orchestration technology, the case of "self-reliant and controllable" domestic technology is simultaneously introduced. This allows students to understand the principles of load balancing while realizing the importance of core technology innovation. The platform supports rapid updating and sharing of resources, enabling different teachers to contribute high-quality cases and form a dynamically growing moral education resource repository. This solves the traditional teaching problems of outdated cases and difficulty in sharing. During the teaching process, the automation and intelligence features of container cloud technology reduce the repetitive workload of teachers, allowing them to focus more on moral guidance. For example, the platform can automatically deploy programming practice environments, provide instant feedback on the running results and quality scores when students submit code, and eliminate the need for teachers to allocate environments and grade basic assignments. Instead, teachers can focus on the team collaboration attitudes, problem-solving approaches, and understanding of technical ethics demonstrated by students during project development, and provide targeted value guidance.

3.2 Technology-driven innovation in educational models

The integration of moral education into computer science courses driven by container cloud technology shifts the educational model from "teacher-centered" to "learner-centered." By

empowering teaching with technology, immersive, interactive, and inquiry-based teaching scenarios are constructed, enriching the forms of moral education and increasing student participation. This innovation is supported by the elastic architecture and collaborative capabilities of container cloud technology, enabling students to experience, perceive, and recognize the connotations of moral education through technical practice, thus achieving a transformation from cognition to practice. In terms of teaching organization, the container cloud platform supports cross-temporal collaborative learning and project development, providing a new carrier for moral education (Jiang, 2025). Teachers can design development projects based on real-world scenarios. For example, in a project aimed at building an information management system for rural revitalization, students can form virtual teams on the container cloud platform to collaboratively complete tasks such as requirement analysis, architecture design, code development, testing and deployment. During the project, teachers guide students to consider how technology can serve agricultural modernization and how to ensure data security to protect farmers' rights. By solving problems such as "technical adaptation to rural network environments" and "simplifying user interfaces for farmers' convenience," students' sense of social responsibility and service awareness are cultivated. The communication, coordination, and conflict resolution in team collaboration also provide opportunities to develop students' team spirit and sense of responsibility. The virtual simulation environment supported by technology allows moral education to cover scenarios that are difficult to reach in traditional teaching. For example, in a "Cloud Security" course, a simulated network attack and defense scenario can be built on the container cloud platform, with students acting as both attackers and defenders in a practical exercise. Teachers guide students to discuss the legal consequences and ethical boundaries of network attacks in the confrontation, analyze the essential differences between "white-hat hackers" and "black-hat hackers," and enhance their awareness of cybersecurity, legal consciousness, and professional ethics. This immersive experience provides students with a vivid understanding of the harm caused by the misuse of technology, which is more impactful than simple theoretical lectures and helps to form a deeper level of value recognition.

4. Methods of Integrating Moral Education into Computer Science Courses Empowered by Container Cloud Technology

4.1 Synergistic design of teaching objectives

Synergistic design of teaching objectives serves as the entry point for empowering the integration of moral education into courses through container cloud technology. By organically integrating moral education objectives with knowledge and skill objectives, a "trinity" teaching objective system is constructed to ensure that value guidance is consistently embedded throughout the teaching process. This process should be based on the technical characteristics of computer science courses, uncovering the moral education elements hidden behind the knowledge points and concretizing the moral education objectives to make them highly operational, avoiding vagueness (Liu et al., 2025). During the objective-setting phase, teachers need to systematically organize the course content and identify entry points for integrating moral education. For instance, in the "Operating Systems" course, while explaining process scheduling algorithms, the moral education objective can be designed in conjunction with the concepts of "fairness and efficiency," guiding students to understand the value choices embedded in technical solutions. In the "Database Principles" course, with data integrity and security as the core, the educational objectives of "integrity awareness" and "sense of responsibility" are clarified, aiming to deepen students' understanding of the professional obligations of data accuracy and privacy protection. The course map function provided by the container cloud platform can link knowledge points with moral education

objectives and form a visualized objective system, facilitating teachers' grasp of the integration key points.

4.2 Dynamic update of case libraries

The dynamic update of case libraries is a crucial approach to ensuring that the content of moral education in courses is vivid and efficient. The case library supported by container cloud technology can continuously absorb moral education materials from industry frontiers, social hotspots, and technological developments, keeping the case content up-to-date and closely related to the profession, thereby enhancing students' interest and guidance (Lin, 2025). This dynamism is not only reflected in the continuous supplementation of individual cases but also in the optimization, iteration, and precise recommendation of these cases. The case collection requires a multi-channel sourcing mechanism, covering three aspects: technological development, industry practice, and social events. Teachers can identify instances of independent innovation from technology news, such as the development and application outcomes of domestic container cloud platforms, highlighting the patriotic sentiments of technology workers. From the perspective of enterprises, they can collect examples that reflect professional ethics, such as a company's response measures and sense of responsibility in the event of data leakage, guiding students to reflect on the ethical bottom line of technology application. They can also explore examples of the connection between technological development and social progress from historical events, such as the use of computer technology in major projects to promote national development and cultivate a sense of historical mission. After these cases are organized and processed, they are categorized and labeled according to technical themes, moral elements, and teaching objectives to form structured case entries. The container cloud platform provides technical support for dynamic case management, enabling rapid uploading, categorized searching, and version control (Luo & Zhang, 2025). When teachers upload new cases on the platform, the system automatically extracts keywords and links them to relevant knowledge points. For example, it can link the case of "container security vulnerability patching" with the knowledge point of "Cybersecurity Law," facilitating its use in teaching. The case library implements a version management mechanism. As the technical standards or policies and regulations involved in the cases are continuously updated, teachers can modify the case content while retaining historical versions for students to compare and analyze the reasons behind the changes. The platform also supports user feedback, allowing students to evaluate the applicability of cases and teachers to optimize case descriptions and discussion questions based on feedback, thereby improving case quality.

4.3 Development of practical projects

The development of practical projects serves as an important medium for integrating moral education into courses. With the assistance of container cloud technology, practical project design can incorporate both professional skill training and value cultivation into real development scenarios, enabling students to perceive the connotations of moral education while solving practical problems, achieving the principle of "learning by doing and understanding through learning" (Zhang, 2025). Project design should be based on technical application scenarios, uncovering their moral education elements so that project objectives include both technical and value indicators. Project topics should be closely related to social needs and national strategies, guiding students to understand the social value of technology. For example, a community-based elderly care information management system supported by container cloud can be designed. Students need to consider the protection of elderly people's data privacy and the cultivation of data security awareness while developing the user information module. When optimizing the system interface, they should pay attention to the operational habits of the elderly and strengthen the people-oriented design philosophy. Projects that support industrial upgrading can also be designed, such as a cloud platform for manufacturing equipment monitoring, which uses containerized

deployment to monitor equipment status in real-time. During the development process, students will be exposed to industrial data acquisition and analysis, recognizing the empowerment of information technology in the real economy and enhancing their understanding of serving industries. During the project implementation, the collaborative environment and tool support provided by the container cloud platform create conditions for the integration of moral education elements. In the team development process, the platform records each member's code submission, task allocation, and communication records. Teachers can use this information to guide students to work clearly, take responsibility, and develop a spirit of teamwork, allowing students to naturally receive valuable guidance through technical practice.

4.4 Optimization of tiered teaching strategies

Optimizing tiered teaching strategies is an important way to conduct precise moral education based on individual student differences. Under the support of container cloud technology, tiered teaching can be designed according to students' technical foundations, cognitive characteristics, and developmental needs, providing differentiated teaching content and moral guidance plans so that every student can gain knowledge improvement and value guidance at an appropriate level. This tiering is not a simple ability classification but is designed to achieve more accurate and efficient moral education outcomes. For student stratification, the container cloud platform conducts entrance tests and analyzes students' learning behaviors to build student profiles and determine the characteristics and needs of different groups (Yu, 2025). Students are divided into three levels: basic, intermediate, and advanced. Basic-level students focus on mastering technical knowledge and cultivating learning interest, with moral guidance emphasizing perseverance in technical learning and awareness of norms. Intermediate-level students focus on technical application abilities, with moral elements focusing on responsibility in team collaboration and problem-solving. Advanced-level students focus on technological innovation and system design, with moral guidance strengthening national sentiment and reflection on technical ethics. This stratification is dynamically adjusted based on data, allowing students to move across levels as they progress, stimulating their continuous improvement. The teaching content should be matched with the acceptance ability of students at different levels, integrating moral education elements into technical teaching at each level. For the basic level, examples are more concrete and close to everyday life, such as using a simple container deployment example to illustrate the importance of standardized operations. For the intermediate level, the selected cases are more complex and closer to industry practices, such as discussing communication skills in team collaboration through the development of distributed systems. For the advanced level, more cutting-edge and challenging cases are provided, such as discussing the ethical boundaries of technological development in the context of the integration of artificial intelligence and container cloud applications. The container cloud platform has resource management capabilities, supporting the delivery of corresponding teaching materials, practical tasks, and moral education cases to students at different levels, ensuring precise content matching.

4.5 Construction of intelligent interaction models

The intelligent interaction model leverages container cloud technology to empower interactive tools and scenarios, breaking through the traditional one-way teaching model and creating a multi-directional interactive moral education ecosystem among teachers and students and among students themselves. This allows value guidance to occur naturally through communication and interaction, enhancing students' participation and sense of identification. This interaction model integrates the convenience of the technical platform with the artistry of educational guidance, making moral education more lifelike and situational. In terms of teacher-student interaction, the container cloud platform provides diverse channels for student communication, making moral guidance more timely

and personalized. Teachers can use the platform's real-time chat function to answer technical questions and pay attention to students' emotional states when they encounter difficulties, helping them develop perseverance. The platform's assignment annotation function can be used to correct and encode students' programming styles and document completeness, highlighting the professional quality of rigor and meticulousness. Teachers can also initiate discussions on technical ethics in the online discussion area, such as "The security risks of misusing container technology," guiding students to express their views and correcting misconceptions in a timely manner. This interaction breaks the limitations of classroom time, integrating moral education into every aspect of daily learning. In student-student interaction, the container cloud platform's collaborative tools, supported by team cooperation, cultivate a sense of collectivism and tolerance. The platform supports multi-person online code editing, shared documents, and synchronous discussion functions. When students collaborate on a project, they need to discuss technical solutions together, resolve differences, and share responsibilities. In this process, they learn to listen to different opinions, respect others' efforts, and take on team responsibilities.

Conclusion

Container cloud technology represents an innovative technical means and implementation pathway for integrating moral education into computer science courses. Through theoretical analysis, current situation research, and exploration of integration pathways, it has been demonstrated that the application of container cloud technology can effectively enhance the flexibility, interactivity, and effectiveness of moral education in courses. This technology not only advances the integration of moral education into computer science curricula but also ensures the coordinated progress of knowledge transmission, skill development, and value shaping. Ultimately, container cloud technology lays a solid foundation for cultivating computer professionals who are both morally upright and professionally competent.

Conflict of interest

The author declares that he has no conflicts of interest in this work.

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