

Original Research Article

Integrating curriculum ideology with computer science education: A service-oriented pathway for regional strategic bases in Inner Mongolia

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Abstract: The two major bases in Inner Mongolia (the national important energy and strategic resource base, and the national important agricultural and livestock product production base) are the core strategic pivots for ensuring national energy and food security, and place new demands on computer talents who must combine technical capability with patriotism and national responsibility. Currently, there is a structural mismatch between computer science education and regional needs, and an apparent separation between ideological-political education and professional technical training. Based on the theory of serving regional strategies, this study constructs an analytical framework of 'strategic anchoring – curriculum reconstruction – practice transformation' and designs an integrated path of 'strategy – curriculum – project – competition'. Empirical evidence shows that transforming macro strategies such as energy security and rural revitalization into teaching cases and practical projects can achieve precise alignment between industry needs and educational goals, thereby enhancing students' technical skills and social responsibility awareness.

Keywords: curriculum-based ideological and political education; computer science major; two major bases; integration path; serving education

1. Introduction

Under the national regional coordinated development strategy, the construction of Inner Mongolia's "two major bases" has become a dual task in both economic and political terms. Its intelligent upgrading relies heavily on technologies such as big data and artificial intelligence. However, university computer education tends to focus on general technologies and lacks integration with regional industry scenarios, leading to a disconnect between talent cultivation and strategic needs. In this context, curriculum-based ideological and political education is not only about values education, but also an important means to achieve the integration of professional education and regional service. Existing research focuses on two main lines: Integration within the curriculum and connection to external services, but there are gaps in logic and pathways. Curriculum-level integration mostly stays at the level of general teaching methods, lacking regional strategic orientation; studies on service regions largely focus on macro mechanisms, lacking feasible pedagogical transformation. To address this, this paper constructs a "strategic anchoring–curriculum reconstruction–practical transformation" framework, systematically converting macro strategic needs into curriculum objectives and content modules.

2. Integration logic: The unity of value guidance and content reconstruction

The integration of ideological and political education in computer courses with the "two major bases" strategy is essentially a dialectical unity between value logic and content logic. At the value level, it is necessary to embed the macro national will into specific talent cultivation standards: For the needs of serving the national science and technology innovation base, focus on nurturing students' "spirit of independent tackling of key problems" and "patriotism through science and technology"; for the needs of serving the regional digital economy talent base, emphasize strengthening the "craftsman spirit" and "local industry identity", thereby breaking the constraints of pure "instrumental rationality" in traditional computer

education. At the content level, the key lies in deconstructing real industrial scenarios into core knowledge points and establishing their mapping relationships with ideological and political elements. For example, when teaching network security protocols, relate them to energy data security and the "cyber power strategy"; when explaining intelligent algorithm optimization, delve into its societal value in improving agricultural production efficiency. Through this "scenario-knowledge-value" three-in-one transformation, abstract ideological and political theory is concretized into operable teaching modules, fundamentally solving the problems of "having no material to cook" or "awkward grafting" in the integration process.

3. Practical path: The 'four-in-one' collaborative education mechanism

To bridge the gap between talent cultivation and regional strategic demands, this study reconstructs the curriculum system by embedding the development goals of Inner Mongolia's "Two Major Bases" directly into the teaching syllabus. This top-level design shifts the educational objective from mere technical proficiency to strategic service. For instance, in the Principles of Computer Composition course, the syllabus was revised to require students not only to master CPU structures but also to analyze hardware reliability within scenarios such as smart energy control devices and agricultural IoT terminals. Furthermore, in Operating System Principles, new requirements were added for designing real-time scheduling strategies for industrial monitoring and livestock management. This strategic orientation is actualized through specific teaching units that replace abstract exercises with real-world cases. A prime example is the "Smart Ranch Multi-device Collaboration System," used in the chapter on process synchronization. Here, automatic feeders, environmental sensors, and drones are modeled as concurrent processes competing for shared resources like feed databases. By analyzing how race conditions can disrupt feeding schedules or how semaphore mechanisms ensure data integrity, students move beyond theoretical abstraction to understand the critical role of operating systems in ensuring the safety and efficiency of national agricultural production.

Building upon this curricular foundation, a tiered project-based practice system was established to facilitate the transition from knowledge acquisition to practical application. This approach replaces traditional closed-ended assignments with "real-problem" solving aligned with regional industries. In practical sessions for Computer Assembly and Maintenance, students are tasked with assembling mobile monitoring workstations for smart ranches, requiring them to select industrial-grade components suitable for harsh environments. This hands-on experience extends to final year projects, where students have developed sophisticated solutions such as "Wind Power Prediction Models Based on Spatiotemporal Graph Neural Networks" and "Crop Pest Recognition Systems Using Cloud Computing." These projects demand more than just coding; they require students to consider the economic feasibility and social impact of their designs. For example, the award-winning "Smart IoT New Agriculture Assistant" project required students to optimize low-power sensor networks and multi-protocol data fusion technologies specifically for the cost constraints and operational habits of local farmers. This process forces students to confront complex engineering challenges while internalizing the social value of their work, thereby transforming external strategic demands into intrinsic innovation drivers.

Finally, high-level discipline competitions serve as the validation arena where professional competence and ideological education converge. Under the guidance of the "Internet Plus" and "Challenge Cup" competitions, students are required to synthesize their curricular knowledge and project experience into comprehensive solutions that address strategic needs. This competitive environment acts as a crucible for refining both technical and soft skills, compelling students to conduct rigorous market research, justify their technical choices, and articulate the societal value of their innovations. The outcomes have been significant: Projects like the "Smart IoT New Agriculture Assistant" and "AI Smart CHNGPT" not only secured awards in regional competitions but also demonstrated clear potential for enhancing agricultural intelligence and public health management. Beyond the accolades, the deeper success lies in the students' evolution. Through pitching their ideas to industry experts, they learn to frame their technical achievements within the broader context of national food security and energy independence. This journey validates that the integrated pathway effectively transforms students from passive learners into active contributors who possess both advanced engineering capabilities and a profound sense of social responsibility.

4. Optimization strategy: Building a sustainable development eco-loop

Although the above "four-in-one" pathway theoretically constructs a complete closed loop, it still faces three constraints in practical operation: First, the connection gap—There exists a transformation gulf between abstract computer foundational theory and the concrete industrial scenarios of the "two major bases," making it difficult for integration to deeply penetrate core courses; Second, poor coordination—The mechanisms for integrating cross-disciplinary faculty and engaging enterprises in depth have yet to be fully established, resulting in industry–education integration remaining largely superficial; Third, delayed evaluation—The quantitative assessment tools for implicit qualities such as "patriotism" and "craftsmanship spirit" are still insufficient. To address these issues and effectively enhance service performance, optimization is urgently needed from the following three dimensions.

4.1. Establish a dynamic adjustment mechanism: Build an 'industry demand–teaching feedback' closed loop

Break the static rigidity of course content and establish an annual revision mechanism. Regularly invite industry experts from the "two major bases" to participate in the demonstration of talent training programs, promptly transforming the latest industrial technologies and industry standards into teaching cases. For fundamental theory courses, promote "problem-introduction" teaching by introducing real pain points from regional industries to reverse-drive students' understanding and application of abstract knowledge, thereby achieving seamless integration between strategic scenarios and foundational knowledge.

4.2. Strengthen the collaborative education network: Build a 'cross-disciplinary on-campus + external industry' dual engine

At the on-campus level, form a "Curriculum Ideological and Political Education Teaching Community" composed of teachers from multiple disciplines such as computer science, energy, agriculture, and economics & management, jointly apply for teaching reform projects, and collaboratively develop interdisciplinary integrated courses to break down barriers through organizational structure. At the off-campus level, deepen the reform of "bringing enterprises into education" by transforming real enterprise technological research projects into a teaching project library. Establish a "revolving door" mechanism to encourage teachers to take temporary positions in enterprises, enhancing their ability to convert industry demands into teaching resources.

4.3. Establish a results transformation platform: Unblock the value chain of "teaching—Research—Industry"

Relying on university science and technology parks, establish two major bases for digital innovation incubators. Excellent design plans and award-winning competition works generated from courses will be productized through the incubator. Students are encouraged to bring their technical solutions to counties and enterprises to carry out social practice and volunteer services, enabling technology services to step out of campus and take root. Through this virtuous cycle of "promoting learning through application and promoting application through learning," computer science ideological-political education will ultimately achieve a leap from knowledge transmission to value creation.

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