Education Insights

Article

Research on the Integration and Quality Improvement of Computer Basic Courses for Non-Computer Majors in Universities Driven by the Dual Forces of Industry-Education Integration and AI

Genyuan Wang [1,*], Xiaona Liu [1] and Kaixuan Wang [1]

[1] Hainan Vocational University of Science and Technology, Haikou, Hainan, 571126, China
* Correspondence: Genyuan Wang, Hainan Vocational University of Science and Technology, Haikou, Hainan, 571126, China

Abstract: Under the new round of scientific and technological revolution and industrial transformation, new quality productive forces place new demands on talent cultivation in higher education. Computer basic courses in universities are facing a paradigm shift from "imparting tool operation" to "reshaping digital-intelligence logic." However, current challenges include lagging course content, superficial industry-education integration, lack of authentic logic in practice, and single-dimensional evaluation. This paper integrates the collaborative education mechanism of industry-education integration with the empowerment pathways of artificial intelligence technology to construct a three-tier "general education + fusion + expansion" curriculum system. This is supplemented by personalized guided learning, real project-driven learning, a "Four Threes" practical model, and a multi-dimensional dynamic evaluation system, forming a comprehensive teaching reform plan. Practice shows that this plan can effectively stimulate the digital innovation potential of non-computer major students, enhance their professional competence in the digital-intelligence era, and provide a reference paradigm for the digital transformation of higher education.

Keywords: industry-education integration; artificial intelligence; computer basic courses

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1. Introduction

Against the macro-background of the national digital transformation strategy, the social function of higher education is undergoing a profound shift. Computer basic education is no longer merely disciplinary education but has evolved into a cross-disciplinary universal competency foundation. With the advancement of the "Artificial Intelligence+" action plan, the requirements for workers across various social sectors have escalated from "possessing computer operation skills" to "possessing the ability to solve complex problems through human-machine collaboration." However, traditional university computer basic teaching systems reveal obvious structural contradictions when confronting this dramatic change. On one hand, there exists a "spatial gap" between the campus laboratory environment and real enterprise engineering scenarios; on the other hand, there is a "time lag" between the update cycle of standardized textbooks and the exponential growth of technology [1]. Industry-education integration, as a hub connecting the education chain and the industry chain, and artificial intelligence, as the technological foundation empowering the entire teaching process, offer possibilities for resolving the aforementioned contradictions. This paper aims to systematically explore how to reshape university computer basic courses through the deep coupling of this dual-drive mode, making them a core driving force empowering non-computer major talents for cross-boundary innovation.

2. From "Technology Application" to "Intelligent Thinking"

2.1. Reshaping Worker Competencies Driven by New Quality Productive Forces

New quality productive forces are marked by a substantial increase in total factor productivity, and their essence is a qualitative change in productivity driven by "breakthrough technological innovation." In this context, the digital literacy of workers is no longer an auxiliary skill but has become the most dynamic component among production factors. Some scholars argue that the new quality productive forces driving education development are characterized by high technology, high efficiency, and high quality. This implies that the reform logic of computer basic courses must shift from a "knowledge-oriented" to an "efficiency-oriented" approach. Students learning Python or data processing should not merely aim to earn credits but should learn how to utilize these tools to optimize production, research, and innovation pathways within their own professional fields [2].

2.2. Institutional Guarantee for Overcoming the "Disconnect Between Learning and Application"

The most acute challenge in current university teaching is the lag in knowledge production. Relevant analyses indicate that traditional teaching suffers from a certain degree of "disconnect phenomenon," where the skills students master within campus walls are often outdated upon entering the workplace. The essence of industry-education integration is to break this knowledge isolation by introducing industry standards, business logic, and desensitized data through university-enterprise co-construction mechanisms. This deep integration transforms teaching from exercises conducted in a vacuum into rehearsals within real industrial environments. This institutional linkage is the cornerstone for ensuring the sustained vitality of computer basic education.

2.3. Paradigm Evolution from Auxiliary Tool to Educational Foundation

The impact of artificial intelligence on education has evolved from a singular "auxiliary tool" to an "environmental foundation." AI algorithms not only change the efficiency of knowledge transmission but also reshape the cognitive patterns of teachers and students. Some viewpoints emphasize that integrating AI general education is a necessary path to adapt to the rapidly developing technological environment. Within the AI environment, the connotation of computational thinking has expanded [3]. It now encompasses not only logical deduction but also precise control of large models, critical thinking on data ethics, and strategic vision for human-machine task division. This paradigm shift demands that our courses embed AI general education at the foundational level, cultivating students' "intelligent sensitivity."

3. Constructing a "Trinity" Teaching Structure

3.1. Three-Layer Nested System of "General Education + Fusion + Expansion"

To balance "basic universality" and "professional specificity," a flexible three-layer nested curriculum architecture should be constructed. The bottom layer is the general education core module, focusing on algorithm logic, AI ethics, data security, and information literacy, laying the common foundation for all majors. The middle layer, serving as the core of reform, is the cross-disciplinary fusion module [4]. This module requires deeply customized teaching content based on students' professional backgrounds. For example, introducing "Natural Language Processing Assisted Creation" for literature majors, and setting up "Intelligent Sensing and Data Modeling" for engineering majors, demanding that teachers possess interdisciplinary perspectives. The top layer is the innovation and expansion module, relying on industry-education integration resources to introduce certification courses and cutting-edge competition projects from leading enterprises like Huawei and Tencent, supporting students in high-level research exploration.

3.2."Dynamic Resource Repository" Construction Mechanism Driven by Industry-Education Integration

Addressing the pain points of traditional paper-based textbooks-knowledge updates lagging behind intelligent technology iteration, lack of practical scenarios, and disconnect from job requirements-a reform path for industry-education integration should be constructed, supported by technological empowerment, oriented towards capability cultivation, and centered on practical innovation. This is achieved through deep university-enterprise collaboration to jointly build a cloud-based "Dynamic Resource Repository." This repository is characterized by practicality, incorporating real enterprise project cases, job operation manuals, and technical solutions to achieve seamless integration of theory and industrial practice; timeliness, establishing a quarterly update mechanism, relying on a joint university-enterprise review committee to track industry frontiers and job demands, ensuring resources keep pace with the industry; and intelligence, embedding AI recommendation algorithms to accurately match resources based on students' majors, learning progress, skill gaps, and career plans [5]. This model transforms static, solidified knowledge points into a fluid capability cultivation system that is perceptible, practical, and iterative, helping students keep pace with technological frontiers, strengthening the ability to translate theory into practice, and enhancing job adaptability and innovation potential.

3.3. Knowledge Graph Construction from an Interdisciplinary Perspective

In the context of the digital-intelligence era, interdisciplinary integration has become a core engine for cultivating innovative talents. Relevant research explicitly states that teaching innovation should focus on the core path of "AI + interdisciplinary integration." To break down disciplinary barriers and achieve systematic knowledge interconnection, it is necessary to use computer science as the technological foundation, deeply extract its cross-disciplinary knowledge points with humanities, social sciences, engineering, economics, management, and other different majors. By clarifying the logical relationships, dependencies, and application scenarios between knowledge points, a visualized interdisciplinary knowledge graph can be constructed [6]. This graph can intuitively present the internal logical chains through which computer technology supports professional research, transforming scattered knowledge points into a structured knowledge network. This helps students clarify the integration path between technology and their professional fields, effectively solving the "two separate layers" problem between computer courses and professional studies. This visualized correlation not only lowers the barrier to understanding interdisciplinary knowledge but also stimulates students' active learning motivation, transforming computer technology from a mere course "burden" into a core "tool" empowering professional research and innovative practice, thereby strengthening the transfer and application capabilities of interdisciplinary knowledge.

4. Project-Based Teaching Practice Empowered by Artificial Intelligence

4.1. Reconstruction of a Blended Teaching Paradigm Based on AI-Precise Guidance

Non-computer major students exhibit significant differences in digital foundations, and their learning needs focus on "technology empowering professional practice" rather than in-depth technological R&D, making the traditional "uniform intensity" model difficult to adapt. This research relies on artificial intelligence algorithms to construct a closed-loop precise teaching system of "prediagnosis-intervention-feedback," achieving a transformation from "large-scale standardized instruction" to "personalized value-added evaluation for non-computer majors." In teaching practice, the intelligent platform specifically collects data from such students during the preview stage, including online interaction data, simulation test results, and code logic debugging traces. Combined with interdisciplinary knowledge graph technology modeling, it automatically generates a personalized "knowledge defect map" covering "knowledge mastery level, professional adaptation gaps, and logical thinking habits"-for example, strengthening data processing tool application guidance for literature students, and focusing on data analysis logic decomposition for economics and management students [7]. This upgrades learning resource delivery from "passive retrieval" to "active adaptation aligned with professional needs." The classroom format is simultaneously optimized. Teachers transform from traditional knowledge monopolists into "chief designers-guides" for non-computer major teaching, focusing on high-level discussions and value guidance regarding "technology and professional scenario integration." AI teaching assistants answer basic questions in real-time. This model increases classroom participation to over 85%, achieving a qualitative leap in teaching effectiveness.

4.2."Learning by Doing" Practical Path Under Deep Deconstruction of Industry-Education Integration

The practical teaching for non-computer majors takes "deep integration of digital technology and professional scenarios" as its core goal. The reform focus needs to shift from "pure technical experiments in a vacuum environment" to "professional scenario-based meaning construction" driven by real industrial logic. This plan deconstructs frontline enterprise demands relevant to the majors into "professionally-adapted project packages," allowing students to complete the transfer from knowledge to cross-boundary competency while solving non-standardized professional problems. Engineering non-computer majors carry out projects like "Intelligent Sensor Data Modeling and Equipment Status Monitoring," internalizing data processing and modeling principles; humanities majors design projects like "Natural Language Processing Assisted Content Creation and Public Opinion Analysis," practicing skills like text generation and public opinion visualization; economics and management majors implement projects like traffic prediction and consumer data mining, using algorithmic tools to solve professional field problems. This "professional scenario-driven, deep role immersion" model integrates technical knowledge points into professional logic. Students shift from passively completing instructions to actively exploring the compatibility between technology and their major, achieving a qualitative change from "understanding technology" to "using technology," while cultivating a holistic view and collaborative innovation awareness of "technology + profession."

4.3."Dual-Teacher-Type" Teaching Team and the Long-Term Mechanism Integrating Courses, Competitions, and Certifications

Improving the quality of computer basic courses for non-computer majors requires an educational ecosystem adapted to their "cross-boundary integration" needs. Through institutional innovation, a "dual-teacher coupling mechanism" of "on-campus academic mentors + enterprise technical mentors" is constructed-on-campus mentors focus on "teaching the logic of technology and major integration," while enterprise mentors concentrate on "technical application norms in industrial scenarios." The two collaborate to align with the characteristics of professional learning and industry demands. Universities should establish a special "on-site secondment" system for teachers, organizing them to participate in relevant enterprise technology application projects, while simultaneously absorbing industry experts to participate in course syllabus revision and professionally-adapted module development to avoid the disconnect between teaching and practical application. Simultaneously, a "trinity" synergistic incentive mechanism integrating "course teaching-professional certification-disciplinary competitions" is constructed. Professional certification preferably selects general digital skill certifications, and disciplinary competitions focus on "technology + major" cross-boundary events. Competition standards are transformed into references for classroom assessment. This not only provides students with a practical verification platform for "technology empowering the major" but also narrows the gap between campus talent specifications and societal digital literacy demands through "promoting learning through competition, integrating courses and certifications," achieving an upgrade from localized model innovation to reshaping the entire system's ecology [8].

5. Constructing a Full-Dimensional Quality Assurance System

5.1. Theoretical Framework and Logical Evolution of the "Four Threes" Progressive Practical Teaching Model

The scientific nature of practical teaching directly determines the integration quality of "digital technology + professional ability" for non-computer major students. Under the dual-drive background of industry-education integration and artificial intelligence, this research integrates the cultivation patterns of these majors and industry demands, condensing the "Four Threes" practical teaching model (see Table 1), which constructs the theoretical foundation for the migration from computational thinking to "professional scenario-based engineering practice." The model's logic is rigorous and precisely adapted to the characteristics of non-computer majors. "Three-stage progression" follows a spiral path of "basic verification-professional synthesis-cross-boundary innovation," driving digital knowledge from fragmented perception to systematic application of "technology adapted to the major." "Three levels" realize the horizontal sublimation from single digital skills to "deep professional adaptation literacy + digital ethics," such as emphasizing technology ethics boundaries in humanities fields and data compliance in economics and management fields. "Three major groups" are stratified according to "zero-based type-advanced application type-excellent elite type," adapting to differences in student backgrounds and ensuring capability increments at all levels. Ultimately, they collaboratively forge "digital tool operational ability, professional scenario project execution ability, and 'technology + profession' cross-boundary innovation ability," precisely anchoring industry demands for digital literacy in these majors and ensuring the practical teaching is coherent and systematic.

Table 1. "Four Threes" Practical Teaching Model for Computer Basic Courses.

Core Dimension	Logic ladder	Core objective
Three-stage progression	Basic verification - Comprehensive design - Research innovation	Solve the transformation from "knowing" to "doing"
Three levels	Knowledge perception - Skill internalization - Literacy sublimation	Strengthen the deep construction of thinking modes
Three major groups	Zero-based type - Advanced application type - Excellent elite type	Implement personalized layered and graded teaching
Threefold abilities	Basic operational ability - Project execution ability - Innovative R&D ability	Ultimately align with actual industry job requirements

5.2. Whole-Process Data Monitoring and Predictive Intervention Supported by Intelligent Platforms

Empowered by AI, the teaching evaluation for non-computer majors is shifting from an "outcome-oriented" to a "process-tracking + professional adaptation" structural transformation. Relying on cloud-based practice platforms and big data analysis technology, full-spatiotemporal, granular monitoring of such students' learning behaviors is achieved. Monitoring indicators are precisely adapted to their learning characteristics-focusing on "tool application proficiency, professional scenario adaptation, and logical solution effectiveness," rather than the depth of technological R&D. The system captures data in real-time, such as code submission paths for professional projects, frequency of logic error corrections, and time spent solving professional problems, building dynamic learning behavior models. Through deep data mining by AI algorithms, it accurately identifies issues like "technology-major disconnect" and "logic bottlenecks," locking onto potentially struggling students before critical periods like finals. This drives teachers to shift from "experience-based judgment" to "data-driven decision-making," implementing precise individualized tutoring. This significantly reduces the information lag of traditional assessments and establishes a solid data foundation for the continuous optimization of teaching quality for non-computer majors.

5.3. Reconstruction of the Multi-Dimensional Dynamic Evaluation System and the Value Closed Loop

As the "command baton" of teaching reform, the evaluation mechanism must precisely match the cultivation goal of "technology empowering the major" for non-computer majors. Addressing the problems of rigid traditional assessments and difficulty reflecting cross-boundary innovation potential, this research constructs a dynamic evaluation closed loop with multi-agent participation and full-dimensional coverage, focusing on the core of "the application value of technology in the professional field" rather than merely the degree of technical mastery. The new system places strategic importance on process assessment, with weights aligned with professional characteristics: process performance 50%, project practice 30%, AI logic and innovation dimension 20%, guiding students to value daily integration accumulation. The evaluation subjects break through single limitations, introducing a "three-dimensional perspective." Teachers focus on digital logic and professional adaptability; enterprise mentors focus on industry application value and norms; peer evaluation focuses on collaboration efficiency and complementary ideas. This forms a value closed loop of "evaluation-feedback-targeted correction-ability re-enhancement," driving students to deepen the integration of "technology + major," and ensuring the steady improvement of talent cultivation quality under industry-education integration.

6. Conclusion

The dual drive of industry-education integration and artificial intelligence is promoting the deep-level quality improvement and upgrading of computer basic courses for non-computer majors in universities. Centering on the cultivation needs of these majors, this paper systematically demonstrates the reform logic of the dual drive across four dimensions: philosophy, system, teaching, and assurance. Philosophically, it achieves the paradigm shift from "imparting tool operation" to "digital-intelligence logic + professional integration." System-wise, it constructs the three-tier "general education + fusion + expansion" curriculum. Teaching-wise, it overcomes the "disconnect between learning and application" through AI-personalized guided learning, professional scenario-based projects, etc. Assurance-wise, it establishes a quality closed loop with the "Four Threes" model and multi-dimensional evaluation. Research indicates the plan can effectively stimulate the cross-boundary innovation potential of "digital technology + major" and enhance professional competence. Although challenges such as insufficient adaptation of "dual-teacher-type" teams and inadequate coupling of university-enterprise resources exist, adhering to the core logic allows for sustainable optimization of the courses. In the future, efforts should deepen "native large model teaching," develop major-specific modules, and improve university-enterprise collaboration mechanisms to contribute to cultivating globally competitive composite talents among non-computer majors.

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