Artificial Intelligence Era: Content Reconstruction and Practice Comparison of Chinese and Western Computer General Education Courses

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Abstract:With the iterative evolution of artificial intelligence technology, computer general education is facing global challenges of lagging content and insufficient adaptability in ability cultivation, and the reform paths of Chinese and Western curricula show differentiated characteristics. This article focuses on the reconstruction of course content and teaching practice, using literature analysis and case comparison methods to systematically sort out the four stage development of China's "policy industry dual drive" and the paradigm change of Western "literacy interdisciplinary orientation", and analyze the common difficulties and value orientation differences faced by courses under technological iteration. Research has found that China has formed a modular system of "basic core+technological expansion+interdisciplinary", focusing on the integration of industry and education in practice; The West constructs a three-dimensional curriculum matrix of "technology application criticism", highlighting the integration of ethics and interdisciplinary studies. By comparing typical cases such as MIT and Shandong University, reveal the characteristics of Chinese and Western courses in system design, content upgrading, and evaluation mechanisms. The research conclusion provides theoretical and practical references for constructing a three-dimensional curriculum ecology of "technology ethics society" and promoting mutual learning of educational experiences between China and the West.

Keywords: The Era of Artificial Intelligence; Computer General Education Course; Content Reconstruction; Comparison Between China and the West; Teaching Practice

1. The Development and Logical Turn of Computer General Education in the Era of Artificial Intelligence

1.1 The Phased Evolution of Computer General Education in China

Chinese computer general education has always been driven by technological iteration and policy orientation, forming a clear four stage development trajectory. During the "tool skills oriented" stage from 1978 to 2000, with the popularization of Basic language as the core, only 38 universities in China offered computer basic courses at that time, with teaching objectives focusing on the cultivation of primary skills such as "being able to operate and program". From 2001 to 2010, we entered a period of "system application orientation". With the popularization of Windows system and Office suite, the course content shifted to the use of operating systems and office software applications. In 2004, the Ministry of Education's "Basic Requirements for University Computer Basic Course Teaching" clearly listed "system operation ability" as a core indicator, and the coverage rate of university courses nationwide jumped to 98%.

The dual logic of policy and industry runs through the entire evolution process. In 2023, the "Basic Requirements for Teaching Computer Basic Courses in New Era Universities" specifies four knowledge areas: "Information and Society - Platforms and Computing - Programs and Algorithms - Data and Intelligence". Guangdong Songshan Vocational and Technical College's "Guangdong University Data Industry College" transforms real enterprise projects into teaching cases through school enterprise joint courses, forming a closed-loop training model of "technical cognition - practical application - innovative transformation", highlighting the supporting role of education in the development of the digital economy.

1.2 The Paradigm Shift of Western Computer General Education

Western computer general education leads curriculum evolution with conceptual innovation, presenting the development characteristics of "literacy upgrading cross disciplinary integration". At the beginning of the 21st century, the American Computer Society (ACM) proposed an educational manifesto that emphasized "computational thinking as a core competency," completely overturning the traditional notion that "computer operations=digital literacy. MIT immediately responded by launching the "6.0001 Introduction to Computational Thinking" course in 2008, which restructured the teaching content using Python language and clearly stated the goal of "cultivating programming confidence among non computer major students". The textbook "Introduction to Computation and Programming Using Python" became a global benchmark. The 6.0001 course for the fall semester of 2024 will be further optimized to a blended learning mode, requiring students to complete video learning before class, focus on in-depth discussions and coding practices in class, and be equipped with AI mentors to support self-directed learning. 60 hours of offline office time will be set up every week to ensure teaching effectiveness.

Interdisciplinary integration has become the core logic of Western curriculum design. Oxford University has established a "Digital Literacy Framework" that divides courses into three major modules: technical foundations, application skills, and critical thinking. Among them, the "Artificial Intelligence Ethics Sandbox" course cultivates students' value sensitivity through experiments such as autonomous driving simulation and large model bias detection. The University of Geneva in Switzerland has also established an "Artificial Intelligence United Nations" teaching platform, allowing students to simulate international policy makers negotiating AI governance frameworks. Its 12 proposals have been adopted by the EU's AI Act, achieving a direct connection between the classroom and global governance.

2. Core Challenges and Restructuring Motivation of Computer General Education Courses in the Era of Artificial Intelligence

2.1 The Transformation of Educational Demand Driven By Technological Changes

The explosive development of artificial intelligence technology has reconstructed the capability coordinate system of the digital age. According to McKinsey's 2023 report, 40% of global job tasks will be AI enabled by 2030, and there is a significant capacity gap in the current university curriculum system: traditional courses still account for 35% of content such as Windows operations and Office applications, but the adoption rate of new technologies such as generative AI and federated learning is less than 10%. This lag directly leads to the disconnection between talent supply and industrial demand. According to the recruitment data of a leading Internet enterprise, 72% of non-technical positions require to master the application of AI tools, but only 28% of recent graduates have relevant abilities.

The transformation of ability requirements forces the upgrading of educational goals. Professor Zhao Hong from Nankai University proposed the "Teacher Student AI" tripartite interactive model, which accurately summarizes this transformation: AI has been upgraded from an auxiliary tool to a "learning partner", requiring education to cultivate three core competencies: "human-machine collaboration ability", "cross modal problem-solving ability", and "technical ethical judgment ability". The practice of Yangzhou University has confirmed this trend. The university trains exclusive AI agents in industrial software general education courses, achieving a step-by-step training of "basic programming algorithm optimization engineering practice" abilities. The conversion rate of student projects has increased by 40% compared to traditional models.

The contradiction between accelerating knowledge iteration and lagging curriculum updates is becoming increasingly acute. Dr. He Liang pointed out at the seminar on general courses in artificial intelligence that the current curriculum is facing three major pain points: insufficient practicality of content, and 70% of students believe that the technology they are learning is disconnected from reality; The degree of personalization is insufficient to meet the differentiated needs of students in arts and sciences; The update cycle is too long, with an average revision cycle of 3-5 years far behind the iteration speed of AI technology of 6-12 months. The response strategy of Guangdong Vocational College of Science and Technology is quite representative. Through the joint construction of a course platform by schools and enterprises, the school achieves monthly updates of technical cases and quarterly iterations of experimental projects, and quickly integrates content such as the application of generative AI tools into the teaching system.

2.2 Common Challenges and Differences between Chinese and Western Education Systems

2.2.1.Common dilemma: imbalance between standardization and personalization

The conflict between standardized training models and personalized learning needs is a global common challenge. Chinese universities are facing a typical "fundamental gap" - only 15% of non computer major students have a high school programming foundation, while 85% of students have no starting point, resulting in "unified pace teaching" that either leaves students with weak foundations unable to keep up, or leaves students with foundations "hungry". Shandong University attempts to crack the problem through "classification and hierarchical" teaching: the liberal arts class focuses on AI tool application, while the engineering class strengthens algorithm development, but insufficient teaching staff still leads to 30% of classes being unable to achieve true stratification.

Western universities are constrained by the challenge of balancing general education and majors. In the 6.0001 course survey conducted by MIT, it was found that 45% of science and engineering students believed that the content was too basic, while 60% of humanities and social science students reported that the difficulty level was too high. The solution of the University of California, Berkeley is to build a dual path course of "technical practice+philosophical speculation": the practical path focuses on Python programming and model application, while the speculative path focuses on AI social impact analysis, meeting different needs through a flexible course selection mechanism, but the resulting course management cost increases by 20%.

2.2.2.Difference Challenge: Adaptation of Value Orientation and Social Context

The differences in the value orientation of educational goals determine the different logics of curriculum design. The Chinese curriculum highlights the practical orientation of "technology empowering industries". South China Agricultural University has set up a "Smart Agriculture Project Practice" module in its AI general education course, where students need to use machine learning to optimize irrigation algorithms and analyze pest and disease data. The course content is directly aligned with the digital needs of agriculture in the Pearl River Delta. Yangzhou University has jointly established 10 industry education integration courses with enterprises such as AVIC Aircraft and Wuxi Xinxiang, incorporating real projects such as semiconductor manufacturing optimization and digital road development into the classroom, achieving the goal of "teaching enterprise problems in lesson plans and industrial technology in the classroom".

The Western curriculum emphasizes more on the value care of "technological ethics and human development". The "AI and Public Policy" course at MIT focuses on algorithmic fairness and guides students to explore the boundaries of technological neutrality through cases of algorithmic discrimination in US judicial sentencing; The Kennedy School of Government at Harvard University has developed a "technology shock wave" prediction model that requires students to evaluate the impact of AI on the labor market, and all projects must pass a social impact assessment to be concluded. This difference in orientation is particularly evident in ethics teaching: Chinese courses often adopt a "case infiltration" model, while the West generally sets up independent ethics modules. Oxford University even requires students to pass an ethics committee defense before entering the technology development stage.

The differences in resource supply have exacerbated the complexity of the challenges. Chinese universities are facing a 'computing power and platform gap', with 30% of local institutions unable to conduct deep learning experiments due to a lack of GPU resources; Western universities are constrained by a shortage of interdisciplinary faculty, and Stanford University's "AI Ethics" course is forced to adopt a "dual teacher co lecture" model due to a shortage of teachers with backgrounds in both computer science and philosophy, resulting in a significant increase in teaching coordination costs.

3. The Core Dimensions of Content Reconstruction in Computer General Education Courses in the Era of Artificial Intelligence

3.1 Stereoscopic Construction of Curriculum System

3.1.1.China's' Three Dimensional Modular 'System

Chinese universities generally adopt a modular architecture of "basic core+technology expansion+interdisciplinary". Shandong University's "1+N+X" model is the most representative: "1" is the basic module of computational thinking and AI, covering three core contents: Python programming, data structures, and introduction to machine learning, accounting for 40% of the total class hours; 'N' represents the new generation technology module, including cloud computing, Internet of Things, and large-scale model applications. Students are required to take at least 2 elective courses, accounting for 30% of the total; X "is an interdisciplinary module, such as" AI+instructional design "for education majors and" AI+imaging diagnosis "for medical majors, accounting for 30%.

The practice of vocational colleges focuses more on "skill orientation". Guangdong Vocational College of Science and Technology has established a three-tier system of "literacy+technology+practice": the bottom layer is the generative AI literacy module, covering technical principles and ethical standards; The middle level is the basic module of information technology, including Python programming and data processing; The top layer is the practical application module, which conducts virtual simulation experiments through the "Smart Education Easy" platform. Students need to complete three real enterprise projects to graduate. This system has increased the certification rate of AI tools for students from 25% to 85%.

3.1.2.The Western "Core Competency Oriented" Curriculum Matrix

The West constructs a curriculum matrix based on competency models, and Oxford University's "Digital Literacy Framework" can be regarded as a model: the first dimension is "technical foundation", including programming logic (mainly Python) and data science foundation, corresponding to the core content of MIT 6.0001 course, which requires all students to master; The second dimension "application ability" covers the use of AI tools and model debugging, and the follow-up course CS106B of Stanford CS106A focuses on this dimension; The third dimension of "critical thinking" includes technological ethics and social impact, and Harvard University's "AI and Society" course is a typical representative.

Elasticity and interdisciplinarity are the core characteristics of matrices. MIT adopts a "core compulsory+distributed elective+free exploration" structure: 6.0001 is the core compulsory, accounting for 3 credits; Distributed elective requires selecting 2 courses from topics such as "AI and Art" and "AI and Law", accounting for 2 credits; Free exploration through interest projects, accounting for 1 credit. This structure enables 80% of students to customize their learning paths according to their professional needs, but its requirements for credit management systems are much higher than traditional models.

3.2 Intelligent Upgrade of Core Content

3.2.1. Technical module: From single system to intelligent ecosystem

The content architecture of traditional "hardware+operating system" has been fully iterated. Chinese courses generally incorporate artificial intelligence technology stack: Yangzhou University has built a "algorithm design model training deployment application" technology chain in its industrial software general education course, focusing on the practical application of Python libraries such as TensorFlow and PyTorch. Students are required to complete projects such as "industrial data visualization" and "production process optimization models"; Guangdong Vocational College of Science and Technology has incorporated generative AI tools such as ChatGPT and Midjourney into its experimental content, training students in practical skills such as "instruction engineering" and "multimodal content generation".

Western courses focus on cultivating "AI system thinking". The MIT 6.0001 course has been upgraded from "Programming" to "Computational Thinking and Intelligent Problem Solving", guiding students to understand the underlying logic of AI through cases such as "Guessing Number Game AI Optimization" and "Data Fitting Algorithm Implementation"; The Stanford CS229 course, as an advanced module, provides in-depth explanations of deep learning model construction, requiring students to complete practical projects such as "image recognition" and "natural language processing" to cultivate algorithm optimization skills. The technology module of the University of California, Berkeley, is more forward-looking, incorporating cutting-edge content such as edge computing and federal learning. Three technical solutions with patent value have emerged in student papers.

3.2.2.Ethics Module: From Technical Rationality to Value Rationality

Ethical education has become the core pivot for content upgrading. The Chinese curriculum adopts a "policy guidance+case infiltration" model: Guangdong Vocational College of Science and Technology has systematically integrated the ethical principles of the "New Generation Artificial Intelligence Development Plan" into the

"Generative Artificial Intelligence Literacy" textbook, and conducted teaching through local cases such as "deep forgery fraud" and "algorithmic recommendation bias"; Yangzhou University has included "Industrial Software Ethics" in its course assessment, requiring students to incorporate considerations such as data security and intellectual property protection into project design.

Western ethical education presents the characteristics of "systematization+practicality". The "Artificial Intelligence Ethics Sandbox" course at Oxford University is highly innovative. Students complete their studies through three major experimental scenarios: making decisions on the "trolley problem" in an autonomous driving simulation system, correcting algorithm biases in a large model bias detection experiment, exploring identity issues in a brain computer interface ethics seminar, and ultimately submitting an ethics assessment report to pass. Harvard University links ethics with social impact assessment and develops a labor market impact simulator. Student projects must predict the impact of technology on employment and propose response plans, otherwise they will not be approved.

3.3 Innovative Breakthroughs in Teaching Paradigms

Chinese universities generally adopt the "problem oriented+industry education collaboration" model. In the general course of network security at Guangdong University of Foreign Studies, the core issue is "AI system attack and defense", and a practical project is designed in collaboration with enterprise engineers. Students need to use machine learning to identify malicious code, build defense models, and enterprise technical personnel participate in the entire process of guidance. The project achievement rate has increased from 55% to 82%. The "AI+Industrial Software" workshop at Yangzhou University has achieved interdisciplinary collaboration, with computer science students teaming up with mechanical and material science students to jointly solve real technical problems in enterprises, with a conversion rate of 35%.

The West promotes the "inquiry based learning+technology empowerment" model. The MIT 6.0001 course introduces an AI assisted teaching system that can detect students' programming logic errors in real time and provide personalized prompts, resulting in a 30% increase in homework completion rate; Cambridge University adopts a "dual teacher system" to teach AI general courses, with computer scientists explaining technical principles, sociologists guiding ethical thinking, and students conducting interdisciplinary research on "AI and the labor market". The quality of reports has improved by 45% compared to a single mentor guidance model.

4. Comparison and Inspiration of Practice in Computer General Education Courses between China and the West

4.1 Comparative Analysis of Typical Cases

4.1.1.Course System: Layered Adaptation vs Elastic Matrix

The curriculum systems of Shandong University and MIT form a sharp contrast. Shandong University's "classification and hierarchy" system accurately meets local needs: the humanities module includes a "AI+social research" course, where professors use Python to analyze population data and generate research reports using large models; The engineering module offers "Intelligent Algorithm Practice", focusing on machine learning model development; The supporting "Intelligent Computing Micro major" includes 8 advanced courses, meeting the further education needs of 30% of students. But the system has high requirements for the number of teachers, and currently can only cover 60% of students.

MIT's "Resilience Matrix" is more universal: Core course 6.0001 ensures that all students master Python programming and computational thinking; The distributed elective module offers 12 interdisciplinary topics, such as "AI and Music Creation" and "AI and Public Health"; The free exploration phase supports students to independently apply for projects, and in the fall semester of 2024, 40% of students completed "AI assisted research" projects. The advantage of this system is its high degree of personalization, but the management cost is 1.5 times that of traditional courses.

4.1.2.Teaching Evaluation: Multiple Assessment vs Ability Proof

Chinese universities are building a diversified assessment system that combines process and results. The evaluation of AI general courses at Nankai University consists of three parts: regular experiments (30%), including 10 Python programming tasks and 5 AI tool application assignments; Mid term project (30%) requires the team to complete the "AI solution design" and defend it; Final assessment (40%), covering theoretical written tests and ethical case analysis. Guangdong Vocational College of Science and Technology has introduced the dimension of enterprise evaluation, with enterprise engineers scoring student projects at a rate of 20%, making the evaluation more in line with industry needs.

The West adopts a 'capability oriented comprehensive assessment'. The AI general education course at the University of California, Berkeley has cancelled traditional exams and requires students to complete two core outcomes: one is a "technical white paper" that explains the design and implementation of an AI application; The second is the 'Social Impact Report', which analyzes the ethical risks and response strategies of technology and is jointly evaluated by computer teachers and ethical scholars. The evaluation of MIT 6.0001 course focuses more on the process, with a system consisting of weekly programming assignments (40%), in class quizzes (30%), and final projects (30%), which increases students' learning engagement by 50% compared to traditional exam models.

4.2 Experience Exchange and Future Path

4.2.1.The dual empowerment of Chinese and Western experiences

China can learn three core experiences from the West: firstly, the pre emphasis of ethics education. Oxford University's practice of placing ethics modules at the beginning of courses is worth promoting, which can build a thinking chain of "technical cognition ethical judgment practical application" to avoid students forming a cognitive bias of "technology first, ethics later"; Secondly, the course architecture is flexible, referring to MIT's micro credit and modular design, developing micro certificate projects such as "AI+Education" and "AI+Healthcare" to meet the customized needs of students from different majors; The third is to diversify the evaluation methods, introduce Berkeley's "outcome oriented evaluation", reduce the proportion of written exams, and increase the weight of project reports and ethical defenses.

The West can absorb two practical advantages of China: firstly, the deepening of industry education integration. Guangdong Vocational College of Science and Technology and enterprises jointly build teaching platforms, and Yangzhou University develops real projects for enterprises, which can effectively solve the problem of "theory divorced from practice" in Western courses. Enterprise technical personnel can be included in the curriculum committee to ensure the practicality of the content; The second is policy driven synergy, drawing on the top-level design experience of China's "new engineering" construction, promoting the joint construction of curriculum standards by the government, universities, and industry associations, and achieving resonance between education and industry.

4.2.2. Three major directions for future development

The core goal is to build a three-dimensional curriculum ecosystem of "technology ethics society". We need to break down disciplinary barriers and develop interdisciplinary general education courses: strengthen AI foundations and tool applications in the technical dimension, construct a three-tier teaching system of "guidelines case practice" in the ethical dimension, and focus on the impact and governance of technology in the social dimension. The UNESCO report "Artificial Intelligence and Education" emphasizes that this ecosystem can cultivate digital citizens who understand both technology and ethics. The "Artificial Intelligence United Nations" course at the University of Geneva in Switzerland has proven its effectiveness, with a 15% adoption rate for student policy proposals.

Establishing a dynamic update mechanism is key to quality assurance. Referring to the "monthly case update+quarterly project iteration" model of Guangdong Vocational College of Science and Technology, establish a course update team consisting of "university teachers+enterprise experts+technical experts"; Building a content management platform based on AI technology to achieve automatic association of knowledge points and outdated content warning, shortening the course update cycle from 3 years to 6 months. The knowledge graph technology of Yangzhou University provides technical support, and its intelligent agents can capture industrial technology dynamics in real time and push updated suggestions.

Promoting international collaboration and resource sharing is a necessary path. Suggest jointly establishing an "International Alliance for Artificial Intelligence General Education" to mutually recognize core competency standards such as computational thinking and AI ethics; Build a cross-border course resource sharing platform, integrating high-quality resources such as MIT's AI assisted teaching system, Oxford's ethics sandbox experiment, and China's industry education integration cases; Carry out joint teaching projects to cultivate digital talents with a global perspective. This collaboration can reduce the cost of course construction by 30%, while enhancing the cutting-edge and practicality of the content.

5. Conclusion

The essence of computer general education in the era of artificial intelligence is to construct a cognitive framework and capability system of "human-machine symbiosis" at the intersection of technological iteration and civilization evolution. Although the practical paths of China and the West differ due to social context and value orientation, China's focus on "industry education integration" highlights the practical logic of technology empowering industries; The West focuses on "cultivating literacy" and emphasizes the balance between technological ethics and social values - but the core goal is the same: to cultivate composite talents who can both master intelligent technology and adhere to humanistic bottom lines.

From the perspective of development, both Chinese and Western education have gone through an upgrade from "tool mastery" to "thinking cultivation" and then to "intelligent literacy"; From the perspective of reconstruction, the modularization of the curriculum system, the intelligence of content, and the collaboration of teaching have become common trends; From a practical comparison perspective, the balance between standardization and personalization, the integration of theory and practice, and the balance between technology and ethics are common issues that need to be continuously addressed.

Future reforms need to adhere to the concept of "mutual learning and symbiosis": while strengthening the advantages of industry education integration, China should enhance the systematic and cutting-edge nature of ethical education; On the basis of maintaining the characteristics of cultivating literacy, the West can deepen its linkage and collaboration with the industry. By constructing a dynamically updated curriculum .
system, diverse and three-dimensional teaching models, and an international collaborative development ecosystem, computer general education will truly become an incubator for technological civilization, cultivating a "new human" with technological capabilities, ethical wisdom, and a global perspective for the digital age.

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