Research on Modular Development of Artificial Intelligence General Education Courses in the Context of Civil Affairs Vocational Education

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Abstract: *The continuous evolution of artificial intelligence technology imposes new requirements on talent cultivation in vocational education. Effectively delivering artificial intelligence general education among learners with diverse professional backgrounds and varying levels of prior knowledge has become a key issue in the curriculum development of vocational undergraduate programs. This study focuses on the field of civil affairs vocational education, targeting a characteristic professional cluster that covers the full life cycle, and explores the modular development path of artificial intelligence general education courses. Through an adaptability analysis of course positioning, this study clarifies the "bridge-type" knowledge system attribute of the course and proposes a knowledge selection strategy that distinguishes technical appearance from underlying logic. On this basis, a three-level progressive modular curriculum system of "foundation-application-extension" is constructed. The basic principles module condenses core concepts and thinking paradigms, while the professional mapping module achieves knowledge integration between general technology and specialized civil affairs domains. Guided by cognitive load theory, this study designs a layered progressive teaching path. By combining the pedagogical transformation of the essential characteristics of artificial intelligence with a cross-disciplinary collaborative learning mechanism, a systematic curriculum framework aimed at cultivating technical literacy is formed.*

Keywords: *Civil Affairs Vocational Education; Artificial Intelligence General Education Courses; Modular Development; Technical Literacy; Curriculum Construction*

Introduction

The deep penetration of artificial intelligence technology has reshaped the operational models and talent demand structures of various industries. Vocational education faces the practical requirement of integrating artificial intelligence literacy into its training system. In the field of civil affairs vocational education, service scenarios such as healthy aging, modern funeral management, rehabilitation assistive technology, and social work are gradually introducing artificial intelligence technology, which imposes on practitioners the ability to understand technical logic, judge technical boundaries, and collaborate in technical applications. However, learners have diverse professional backgrounds and uneven starting points of knowledge. Artificial intelligence general education courses must not only meet the in-depth requirements of technical literacy cultivation but also balance the acceptability for learners with different starting levels. At the same time, due to rapid technological iteration, course content faces the tension between stability and timeliness. This study focuses on the modular development of artificial intelligence general education courses in the context of civil affairs vocational education, conducting systematic research from three dimensions: course positioning, content construction, and teaching strategies, in order to respond to the dynamic adaptation needs between technological evolution and talent cultivation.

1. Analysis of the Adaptability Between Course Positioning and Interdisciplinary Knowledge Needs

1.1 Definition of the Course Attributes of Artificial Intelligence General Education

In the civil affairs vocational education system, artificial intelligence general education courses present unique attributes that distinguish them from computer science professional courses. The core positioning of this type of course is not to train technical specialists with algorithm development capabilities, but rather to cultivate systematic cognition and critical understanding of artificial intelligence technology among learners from non-technical backgrounds. This attribute determines that the selection of course content needs to go beyond the purely technical operation level and shift toward an in-depth interpretation of the underlying logic, operational boundaries, and social embedding methods of artificial intelligence. The course objectives focus on enabling learners to understand how artificial intelligence can be embedded as an "enabling tool" into various civil affairs service scenarios, thereby equipping them with the ability to effectively dialogue with technical systems in their future professional practice.

From the perspective of curriculum theory, artificial intelligence general education lies at the intersection of general literacy and professional application. Its course attributes require the construction of a "bridge-type" knowledge system. On the one hand, this system must maintain the logical rigor and conceptual integrity of the artificial intelligence discipline itself; on the other hand, it must form an organic connection with the core knowledge frameworks of various majors in the field of civil affairs. This dual attribute imposes an inherent tension in course development between knowledge selection and reorganization, meaning that while ensuring the accuracy of technical knowledge, it must also accommodate the cognitive accessibility of learners from different professional backgrounds. Therefore, the definition of course attributes becomes the fundamental basis for subsequent modular development, determining the baseline for content selection and the morphological characteristics of knowledge presentation[1].

1.2 Cognitive Starting Points and Hierarchical Needs for Diverse Professional Backgrounds

The significant differences in the professional backgrounds of the learners constitute the core reality that the course development must address. The learners come from multiple professional fields such as healthy aging, modern funeral management, rehabilitation assistive technology, social work, and marriage services. Their prior knowledge structures show obvious heterogeneity regarding their cognitive reserves about artificial intelligence. Some learners may only have experiential exposure at the level of daily applications, while others may have a deeper understanding of information technology. This dispersion of cognitive starting points requires the establishment of inclusive knowledge entry points in the course design, ensuring that learners from different starting levels can obtain appropriate learning support.

Based on the differences in cognitive starting points, the course content needs to establish a clear hierarchical structure of needs. The foundational level targets all learners, focusing on the core concepts, basic principles, and development trajectories of artificial intelligence, aiming to establish a common knowledge benchmark. The higher level targets specific professional fields, exploring the specific application logic and technical adaptation methods of artificial intelligence in corresponding service scenarios. This hierarchical design does not simply classify learners but rather enables the course content to be flexibly adjusted according to the learners' cognitive levels and professional needs through modular combinations. The division of hierarchical needs also takes into account the potential technical application scenarios in the learners' future career development, ensuring that the course content not only meets current learning needs but also reserves space for articulation with subsequent professional learning and technological evolution.

1.3 Knowledge Selection and Content Stability Strategies Under Dynamic Technological Evolution

The speed of technological iteration in the field of artificial intelligence poses a continuous challenge to the timeliness of course content. New model architectures, application paradigms, and development tools are constantly emerging. If the course content excessively follows technological trends, the knowledge system may lack stability, and learners may find it difficult to form a systematic understanding of artificial intelligence. Faced with this dilemma, knowledge selection needs to establish a screening principle that distinguishes between "technical appearance" and "underlying logic." Content at the level of technical appearance has strong timeliness and is suitable as material for trend introduction. Content at the level of underlying logic, however, includes relatively stable algorithm principles, system architecture thinking, and data operation mechanisms, which constitute the core framework of the course content.

To achieve the unity of content stability and dynamic adaptability, a layered screening mechanism can be established. The core layer focuses on the basic concept clusters and thinking paradigms in the field of artificial intelligence, such as data-driven cognitive methods, the basic process of model training, and the probabilistic relationship between input and output. These contents have strong cross-cycle stability. The expansion layer focuses on the latest developments in technological evolution and is incorporated into the course in a modular way to allow flexible adjustments according to technological progress. This layered strategy enables the course content to resist the risk of fragmentation caused by rapid technological iteration while maintaining the ability to engage with recent technological advances. On this basis, the course system can form a stable core framework and updateable peripheral modules, balancing the rigor of knowledge transmission with the openness of content presentation[2].

2. Modular Construction of Course Content Based on the Characteristics of Civil Affairs Professional Clusters

2.1 Logical Framework and Hierarchical Design of the Modular Curriculum System

The construction of a modular curriculum system requires the establishment of a clear logical framework to address the practical situation of diverse professional backgrounds and dispersed cognitive starting points among learners in the context of civil affairs vocational education. This framework adopts a three-level progressive design of "foundation-application-extension," with each level carrying differentiated teaching objectives and content functions. The foundation level focuses on the core concepts and general principles of the artificial intelligence discipline, establishing a common knowledge benchmark for all learners and ensuring that subsequent learning is built upon a unified cognitive framework. The application level undertakes the function of bridging technical knowledge with professional fields, projecting general artificial intelligence technologies onto specific service scenarios of various civil affairs majors and demonstrating the implementation forms of technologies under different business logics. The extension level focuses on cutting-edge issues and technological ethics in the evolution of artificial intelligence, guiding learners to develop cognition and judgment regarding the boundaries of technology.

The three levels are not linearly separated but form an organic nested and supportive structure. The conceptual tools provided by the foundation level run through the entire learning process of the application and extension levels. The specific cases in the application level, in turn, deepen the understanding of the principles from the foundation level. The ethical issues in the extension level need to be analyzed using the conceptual framework of the foundation level. This hierarchical design also endows the curriculum system with the ability to be flexibly combined. For learners from different educational systems and different professional directions, the three levels can be configured differently. For example, two-year vocational undergraduate programs can appropriately compress the content of the extension level and strengthen the connection between the application level and professional scenarios. Four-year vocational undergraduate programs, however, can retain the complete three-level structure, providing learners with more systematic training in technical literacy.

2.2 Basic Principles Module: Condensation of Core Concepts and Thinking Paradigms

The core task of the basic principles module is to condense the vast knowledge system of the artificial intelligence field into a collection of core concepts that can be mastered by learners from non-technical backgrounds. This condensation process needs to select the most explanatory and transferable conceptual units, including the synergistic relationship among the three elements of data, algorithms, and computing power; the logical distinction between supervised learning and unsupervised learning; the basic composition and information transmission methods of neural networks; and the basic processes of model training, validation, and testing. These concepts together form the cognitive foundation for understanding the operational mechanisms of artificial intelligence technology, enabling learners to move beyond the surface-level use of technological products and enter the level of understanding their internal logic. The selection of concepts also takes into account their potential application frequency in various civil affairs professional scenarios, ensuring that the learned content has cross-domain applicability[3].

The cultivation of thinking paradigms is the deeper goal of the basic principles module, which is different from the mere transmission of knowledge points. The unique thinking modes of artificial intelligence include data-driven inductive thinking, probabilistic result interpretation thinking, and modular thinking from the perspective of system architecture. The teaching of these thinking paradigms needs to be realized through concrete means, such as explaining the hierarchical structure of neural networks with everyday analogies and demonstrating classification logic through simple decision tree cases. While mastering the core concepts, learners gradually internalize these thinking modes and form a stable cognitive framework for the essence of artificial intelligence technology. This cultivation at the thinking level enables learners, even when facing changes in technological forms in the future, to transfer and adapt based on their understanding of the underlying logic, rather than merely remaining at the level of dependence on specific technological tools.

2.3 Professional Mapping Module: Knowledge Integration Between General Technology and Specific Domains

The professional mapping module undertakes the core function of integrating general artificial intelligence technology with various professional fields in civil affairs, serving as the key link that embodies the course's specificity. For the healthy aging professional cluster, this module focuses on the application logic of intelligent perception and health monitoring technologies, explaining how technologies such as non-contact sensing, behavior recognition, and anomaly alerting interface with elderly care scenarios, with an emphasis on revealing the adaptive relationship between technological implementation and care needs. For the modern funeral management professional cluster, the module's content shifts to digital humanities and virtual interaction technologies, exploring how technologies such as digital memorials and virtual space construction respond to new societal demands for life commemoration, while emphasizing the balance between technological ethics and humanistic values[4].

For the professional cluster of rehabilitation assistive technology and social work, the professional mapping module focuses on analyzing the construction methods of assisted decision-making and human-machine collaboration mechanisms. In social work scenarios, artificial intelligence can undertake auxiliary functions such as information screening and resource matching, but its intervention boundaries and decision-making authority need to be defined based on professional ethics. In the field of rehabilitation assistive technology, the personalized adaptation of intelligent devices and the optimization of human-machine interaction are the core issues of technological integration. The marriage service and management major involves the application boundaries of technologies such as intelligent matching and affective computing. The mapping design for each professional direction follows the principle of “parallel operation of technical logic and professional logic,” which not only ensures the accuracy of technical knowledge but also respects the inherent knowledge systems and value norms of each professional field. This approach enables learners to maintain a clear awareness of the boundaries of technological intervention while mastering the methods of technology application.

3. Teaching Strategies and Path Optimization for the Cultivation of Technical Literacy

3.1 Layered Progressive Teaching Design Based on Cognitive Load Theory

Cognitive load theory provides an effective instructional design framework for addressing the challenges of diverse professional backgrounds and dispersed cognitive starting points among learners. This theory distinguishes among three types of cognitive load: intrinsic cognitive load, extraneous cognitive load, and germane cognitive load. Intrinsic cognitive load is determined by the complexity of the learning material itself. Extraneous cognitive load originates from inappropriate presentation of information. Germane cognitive load refers to the cognitive investment learners make in constructing schemas and integrating knowledge. In artificial intelligence general education courses, intrinsic cognitive load mainly comes from the abstractness of the artificial intelligence conceptual system and the complexity of technical logic, which needs to be controlled through knowledge decomposition and hierarchical processing. The artificial intelligence knowledge system should be deconstructed into several relatively independent knowledge units, allowing learners to master the basic units before gradually proceeding to the study of complex concepts, thereby avoiding cognitive blockage caused by information overload.

The layered progressive design is manifested at the operational level as the division into three cognitive stages: “Core Essential - Deepening Expansion - Integrated Application.” The Core Essential stage focuses on the most basic concept clusters and thinking paradigms, employing concrete and analogical teaching presentation methods to reduce extraneous cognitive load, enabling learners to efficiently establish initial cognitive schemas. The Deepening Expansion stage introduces more complex application scenarios and technical details. At this point, learners already possess a basic cognitive framework and can incorporate new information into existing schemas, allowing germane cognitive load to be effectively utilized. The Integrated Application stage guides learners through comprehensive tasks to integrate scattered knowledge points into systematic technical cognition, completing the transformation from fragmented knowledge to structured literacy. This design creates a dynamic adaptation between the course content and the learners' cognitive development patterns, respecting the receptivity of learners from different starting points while ensuring the depth and completeness of technical literacy cultivation.

3.2 Pedagogical Transformation and Presentation Path of the Essential Characteristics of Artificial Intelligence

The essential characteristics that distinguish artificial intelligence from traditional information technology constitute an important focus for the transformation of teaching content. These characteristics include the probabilistic rather than deterministic nature of output results, the black-box rather than transparent nature of system operation, and the unpredictable rather than fully controllable nature of capability emergence. Transforming these abstract characteristics into teachable content that can be understood by learners from non-technical backgrounds requires the use of a comparative difference framework and embodied experience design. The comparative difference framework juxtaposes artificial intelligence systems with traditional software systems, comparing their similarities and differences in terms of input-output relationships, error manifestation patterns, and boundary conditions, enabling learners to identify the unique nature of artificial intelligence through comparison. Embodied experience design guides learners to directly experience the uncertainty of artificial intelligence systems through interactive tasks, such as observing output differences by inputting the same instruction multiple times or observing output changes by fine-tuning input content, thereby forming an experiential understanding of probabilistic characteristics.

The pedagogical presentation of essential characteristics also needs to establish a connection with the boundaries of technological application. The understanding of probabilistic characteristics helps learners recognize that artificial intelligence systems are not suitable for scenarios requiring absolute certainty. The understanding of black-box characteristics helps learners comprehend the importance of algorithmic interpretability in professional decision-making. The understanding of emergence enables learners to maintain a cautious judgmental attitude when system outputs exceed expectations. This pedagogical transformation from technical characteristics to application boundaries allows learners not only to grasp “what” artificial intelligence is but also to form a stable cognitive framework of “what it can do” and “what it cannot do.” In various professional fields of civil affairs, this accurate judgment ability regarding technological boundaries is particularly critical for the responsible introduction of artificial intelligence technology, directly relating to the assurance of service quality and professional ethics.

3.3 Collaborative Learning and Knowledge Transfer Mechanisms Under Cross-Professional Backgrounds

The diversity of learners' professional backgrounds poses a challenge at the instructional level, but it can be transformed into a favorable condition for promoting knowledge transfer at the level of learning design. The core mechanism of cross-professional collaborative learning lies in the interaction among heterogeneous group members, which enables the collision and integration of general knowledge of artificial intelligence with domain-specific knowledge from various professional fields. In the design of collaborative learning tasks, learners from different professional backgrounds should be mixed into groups and required to jointly complete tasks of envisioning technological applications for civil affairs service scenarios. The understanding of elderly care needs from learners in the healthy aging major, the familiarity with service processes from learners in the social work major, and the attention to the dimension of life culture from learners in the modern funeral management major form complementary knowledge resources within the tasks. The technical knowledge of artificial intelligence then becomes a common language that connects these different bodies of professional knowledge.

The effective operation of the knowledge transfer mechanism depends on the setting of “transfer triggers” in task design. The triggers manifest as decision points that require learners to apply artificial intelligence concepts to specific professional contexts. For example, when determining the deployment plan of an intelligent monitoring system, learners need to balance technical feasibility with service recipient acceptability. When conceiving intelligent interactive services, learners need to consider the relationship between technological intervention and humanistic care. These triggers force learners to invoke the artificial intelligence knowledge they have learned in group discussions and integrate it with their own professional background knowledge, thereby completing the transformation from classroom knowledge to application ability. The outcomes of collaborative learning include not only an understanding of how to apply artificial intelligence technology but also, more importantly, the development of problem-solving skills from a cross-professional perspective, which has direct transfer value in comprehensive service scenarios within the civil affairs field.

Conclusion

This study has constructed a modular development framework for artificial intelligence general education courses covering three dimensions: course positioning, content construction, and teaching strategies. At the level of course positioning, this study clarifies the attribute of artificial intelligence general education as a “bridge-type” knowledge system, establishes cognitive starting point analysis and hierarchical needs division, and proposes a knowledge selection strategy that distinguishes technical appearance from underlying logic. At the level of content construction, this study designs a three-level progressive modular architecture of “foundation-application-extension,” with the basic principles module condensing core concepts and thinking paradigms, and the professional mapping module achieving knowledge integration between general technology and specialized civil affairs domains. At the level of teaching strategies, this study introduces cognitive load theory to guide layered progressive teaching design, explores the pedagogical transformation path of the essential characteristics of artificial intelligence, and constructs a cross-professional collaborative learning mechanism to promote knowledge transfer. Future research can focus on the evaluation mechanism of module learning outcomes, the optimal matching relationship between module combinations and professional backgrounds, as well as the design and validation of a dynamic content update mechanism for the course.

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