Exploration of Paths for Artificial Intelligence to Empower Civil Affairs Vocational Education

Zhanxiong Liu*

China Civil Affairs University, Beijing, 102600, China
**Corresponding author: LiuZhanXiong@bcsa.edu.cn*

Abstract: *The development of artificial intelligence technology has brought about all sorts of changes in vocational education. Civil Affairs vocational education has a compound system of knowledge and contextual features in its job situation, so different demands are placed on the embedding methods of intelligent technologies. The following three aspects of artificial intelligence's promotion of the development of civil affairs vocational education will be studied in this paper: reconstruction of technology embedding and adaptability of the educational ecosystem, construction of intelligent collaborative models among teaching subjects, and coupling mechanisms between training objectives and intelligent technologies. How far has technology been applied to education so far? How are all kinds of technologies, such as machine learning, natural language processing and knowledge graphs, being used in education, and then will a resource-matching optimisation mechanism based on semantic fusion be introduced? The organisation of this paper is as follows: Adaptive Path Generation for Learners, Intelligent Decision Support for Instructors, and Knowledge Discovery Tools for Researchers in the field of subject collaboration. At the level of objective coupling, this paper studies the intelligent construction of vocational competency profiles, the modality transformation mechanism of skill training, and the value transformation path of educational technology investment. This paper will provide some systematic theoretical support for the intelligent transformation of civil affairs vocational education.*

Keywords: *Artificial Intelligence, Civil Affairs Vocational Education, Technology Embedding, Subject Collaboration, Competency Profile, Intelligent Education.*

Introduction

Civil Affairs Vocational Education provides the foundation for training high-end talents in the construction of the civil affairs industry. Our university is a typical case; we have set up many professional clusters, such as healthy ageing, modern funeral services, rehabilitation assistance technology, grassroots social governance and child development and services. Most of these programmes have good cross-disciplinary knowledge, high demands for all-roundness and are very context-dependent. Most of the current research on the application of artificial intelligence in education is general in scope, and there has been no systematic study of the mechanisms of technology adaptation, models for subject collaboration, or ways to integrate training objectives in specific areas of vocational education. Vocational education in Civil Affairs has certain specific problems, such as diverse backgrounds of students, scattered distribution of resources and high context dependency in skill training; therefore, the application of intelligent technology will differ from that in general education. Based on the three dimensions of the adaptability of technology embedding, subject collaboration and training goal alignment, this paper constructs an artificial intelligence empowerment path in line with the characteristics of civil affairs vocational education to provide theoretical support for the intelligent development of this field.

1. Adaptive Reconstruction of Technology Embedding and the Educational Ecosystem

1.1 Mapping the Relationship between the Spectrum of Artificial Intelligence Technology and Civil Affairs Vocational Education Scenarios

1.1.1 General Applications of Machine Learning Technology in Identifying Learner Attributes

Collect behaviour data of the students in the system, build predictive models for their grades, and

classify all kinds of learners. Given that students in the area of civil affairs vocational education come from all sectors of society and have different academic backgrounds, machine learning technology can identify groups of students at risk of academic difficulties based on their previous learning data and classify them according to cognitive traits to provide data support for targeted teaching and guidance[1].

1.1.2 Functional Embedding of Natural Language Processing in Civil Affairs Case Teaching

Civil Affairs Vocational Education has a large number of case studies, policies and regulations, etc. Natural Language Processing technology can automatically extract information from a case, construct a semantic network of regulatory provisions, and determine the type of written document. Apply this technology to the teaching of cases to improve the efficiency of case teaching and provide students with prompt feedback on their text analysis and writing.

1.1.3 Supporting Role of Knowledge Graphs in the Structured Presentation of the Civil Affairs Knowledge System

The knowledge system of civil affairs professionals is multidisciplinary and highly correlated. Organised networks of concepts and semantics are constructed to organise dispersed units of knowledge in a Knowledge Graph. A knowledge graph can help students organise the knowledge they have gained in class and provide a foundation for learning about other related subjects.

1.2 Mechanisms of Resource Allocation in Intelligent Education: Stagnation and Breakthrough Paths

1.2.1 The Problem of Fragmented Resource Labeling Systems Due to Data Heterogeneity

Civil Affairs vocational education resources include all kinds of case libraries, regulatory documents, training videos, teaching courseware, etc. The resources are of different types, have various metadata structures and labelling rules, and thus cannot be uniformly retrieved and matched by intelligent systems. The data are in many different forms, so intelligent resource allocation cannot be done and the repository cannot be used to its full extent.

1.2.2 The Dilemma of Resource Recommendation Bias Due to the Lack of Algorithm Adaptability

Most of the existing recommendation algorithms are based on collaborative filtering or content matching, and they do not know much about the deep semantic features of civil affairs vocational education resources and their relevance to teaching goals. Algorithm models tend to be uniform in the process of resource recommendation; therefore, it is difficult to meet the various needs of learners and ensure full coverage of knowledge according to the curriculum system, and the distribution of resources lacks a scientific basis.

1.2.3 Optimization Path of the Resource Matching Mechanism Based on Semantic Fusion

To address the problem of stagnation mentioned above, a new kind of matching mechanism that takes into account resource semantics and teaching goals will be introduced. Build a general semantic representation system for the resources in this way, align the features of the resource content with the curriculum knowledge graph semantically, and add the constraints of teaching objectives at the algorithmic level to achieve a dynamic balance between personalisation and systematisation in resource recommendation[2].

1.3 Structural Tensions and Adaptation Strategies in the Digital Transformation of Teaching Spaces

1.3.1 Tension in the Positioning of Teachers and Students Caused by the Reconstruction of Spatial Boundaries

With the development of digital teaching areas, the traditional division of space and roles in education has been broken down. Learners will have more freedom in the above areas, and teachers' control will be weaker. Structurally, there has been a conflict between the old model of teaching authority based on fixed locations and the new demand for self-directed learning in all-around spaces; as a result, the stability of the teaching order and the quality of teaching interaction have been affected.

1.3.2 Tension in Cognitive Load Distribution Caused by the Parallel Presentation of Multimodal Information

Although the synchronous presentation of all kinds of information in digital teaching areas has expanded the forms of teaching content, it has also increased the information-filtering load on learners

and reduced their attention spans. Courses that need to be learned on how to use a skill have a high cognitive switching cost, so students will be under extra cognitive load and learning efficiency will decrease.

1.3.3 Teaching Space Adjustment Mechanism Based on Human-Computer Collaboration

Given the problems above, a teaching space adjustment mechanism in cooperation with humans and computers will be proposed in this paper. At the level of technical design, a mechanism will be built that is context-aware and configurable, so that all the different demands in various teaching situations can be met flexibly. At the level of teaching organisation, a mechanism has been introduced to increase the flexibility of the teaching process, and now both teachers and students are allowed to use their own judgment and make adjustments in class; thus, a combination of technical efficiency and teaching autonomy has been achieved.

2. Construction of a Model for Intelligent Collaboration Among Teaching Subjects

2.1 Generation Mechanism of Learner-Oriented Adaptive Learning Paths

2.1.1 Dynamic Modeling of Learners' Knowledge States Based on Knowledge Tracing

The first step in constructing an adaptive learning path is to model knowledge states. A deep knowledge tracing model will be used to record the sequence of learners' answers, interaction behaviour and study time in the civil affairs vocational education course, and thus dynamically determine their level of mastery and forgetting for each point of knowledge. Based on the model's identification of deficiencies in students' learning in the sections on social security policies and community service, etc., an accurate knowledge-state profile for the next revision of the plan can be obtained[3].

2.1.2 Dynamic Planning Method for Learning Paths Based on Cognitive Characteristics

According to the model of knowledge states, we can consider the cognitive style, learning preference and attention of the learners in path planning this way. Reinforcement learning is used to build a path selection model, so the problem of learning path generation has been converted into a sequential decision problem. A reward function can be employed to trade off the scope of known items, learning speed and the amount of cognitive load. Based on the actual performance of the students, the learning path for all students will be adjusted flexibly at this time.

2.1.3 Multi-objective Optimisation and Constraint-Handling Mechanism for Path Generation

The aim of adaptive learning path generation is to fully master the knowledge, manage one's own study time, and maintain a reasonable order in learning. An optimisation framework for multiple objectives has also been added that takes into account the prerequisite-successor relationships in the curriculum knowledge graph, the difficulty level of teaching resources and the time constraints of learners as constraint conditions. It can form a good learning order in line with the goals of teaching and avoid the cognitive bias of single-objective path planning.

2.2 An Intelligent Auxiliary Decision Support System for Instructors

2.2.1 Multi-source Fusion of Learning Data and Extraction of Teaching Features

Teachers' Choices of Teaching Methods should be in line with all the circumstances of learning. All kinds of information on the students will be collected by the intelligent auxiliary decision-support system from the learning management system, intelligent practice platform and virtual training environment. Some teaching features can be added to help the model learn about the distribution of students' learning results in the class, how spread out this progress is, and what kinds of mistakes are happening frequently. The first goal of feature extraction is to make the data more accessible and help teachers better understand the teaching conditions.

2.2.2 Identification of Teaching Intervention Timing Based on Predictive Models

The Time of the Teaching Intervention Affects Its Effect. A model for the early warning of problems has been developed to address issues such as poor grades, lack of study motivation and reduced interest in learning among students. The model will output the risk level and time window of the problem to help teachers know how urgent the situation is and what kind of assistance to provide; thus, it will be

changed from a reactive to a proactive early warning system in the teaching support model.

2.2.3 Support for Interpretability and Feedback on Teaching Decisions

The sense of responsibility of the teachers for intelligent assistance directly affects the quality of the help given. A Support Mechanism for Interpretability will be added to show why the algorithm came to this specific conclusion visually; this may include the main features of the prediction results, how the recommended teaching materials were selected, and the basis for clustering the suggestions. At the same time, there is also feedback for the instructors; data on their adoption behaviour and the results of interventions are fed back into the decision model to jointly optimise the model and the experience of the instructors.

2.3 Application of Intelligent Tools for Knowledge Discovery and Academic Collaboration of Researchers

2.3.1 Semantic Extraction and Association Analysis of Literature Knowledge Units

Scholars of vocational education in civil affairs need to read a large number of papers for their research. Tools based on natural language processing can be used to automatically extract knowledge units from literature, such as research topics, research methods, key findings and data sources, etc., in academic papers, research reports and conference proceedings. The above tools can construct association networks of documents by calculating the semantic similarity of the documents and help researchers find research paths and new directions in this field more easily[4].

2.3.2 Intelligent Identification of Research Trends and Construction of Knowledge Graphs

Given that the times and subjects of the domain literature are changing, intelligent tools can discover new popular topics and research directions in the field of civil affairs vocational education. Tools can show the results of the identification in the form of knowledge graphs, present inheritance relationships, cross-pollination and potential research gaps among research topics visually, provide an organised reference for topic selection, and point out the direction of research for scholars.

2.3.3 Intelligent Platform Support for Cross-institutional Academic Collaboration

Inefficiency in the cooperation of scholars is caused by information asymmetry and lack of resources. To solve the above problem, an intelligent collaboration platform has been built to create researcher profiles and repositories of institutional research resources, and now it can intelligently match research interests, recommend relevant resources, and build a collaborative network. A semantic matching algorithm will be employed to recommend scholars from different institutions who have similar research interests or complementary research materials; thus, a cross-institutional research collaboration network will be established and the integration efficiency of academic resources and collaborative research capabilities will be improved.

3. Coupling Mechanism of Training Objectives and Intelligent Technology

3.1 Intelligent Construction and Dynamic Update Mechanism for the Vocational Competency Profile

3.1.1 Semantic Parsing of Job Task Texts and Extraction of Competency Elements

The construction of the vocational competency profile should be based on job task analysis. Named entity recognition and dependency parsing in natural language processing technology are used to perform semantic parsing on job descriptions, occupational standard documents and work procedure texts in the field of civil affairs services to extract task units, operation steps, required knowledge and skills, etc. Based on the construction of a domain terminology dictionary and a semantic annotation system, unstructured job descriptions can be converted into an ordered list of competency items and thus serve as the basis for building a competency profile.

3.1.2 Automatic Construction of Competency Relationship Networks and Generation of Hierarchical Structures

Based on the competency elements extracted above, association rule mining and semantic similarity calculation are used to find logical relationships among them, such as prerequisite-successor, inclusion-parallelism and support-complementarity. Graph neural networks can be employed to organise the components and connections of abilities in a hierarchy graph, and thus several levels of a

competency profile can be established, such as core abilities, specialised skills and fundamental knowledge. The above profile can show the basic logical structure of the training goals in civil affairs vocational education and provide a reference system for the design of the curriculum system and teaching evaluation[5].

3.1.3 The Dynamic Evolution Mechanism of the Competency Profile in Light of Industry Changes

With the changes in society, the nature of work and the required attributes for civil affairs services have also been evolving. Add the new knowledge and regularly update the edition of the competency profile in the system. Keep adding new job descriptions, industry reports and changes in occupational standards, and then use text comparison and difference detection algorithms to find modifications in competency elements, such as newly added competency items, outdated competency items and adjustments to the connotations of existing competencies. The evolution mechanism will automatically update the changed information in the profile according to the current situation of the industry.

3.2 Modality Transformation and Adaptation of Skill Training in the Era of Intelligent Systems

3.2.1 Reorganisation of Skill Components in the Human-Computer Collaboration Mode

With the development of intelligent systems, skills in the traditional workplace are being used differently today. Intelligent systems are gradually taking over some or all of the work in civil affairs services, such as data entry, document processing and data query; at the same time, there has been an increase in demand for skills in interpersonal communication, situational judgment and ethical decision-making. Therefore, in reforming the components of skills, the goals of skill education will include the ability to cooperate with computers, such as being able to use intelligent tools, having an understanding and verification ability for system results, and learning how to transmit information in human-computer interaction.

3.2.2 Optimisation of Human-Computer Task Division in the Skill Training Process

At the same time, in training skills for an intelligent system, the traditional form of education should not be overlooked. Skill elements that do not need to be standardised to some extent in operation and have a short feedback cycle can be added to the training system for intelligent recognition and immediate feedback based on real-time assessment of practical operation by computer vision and motion capture technology. Skill modules that have many circumstances and values should be taught separately, and case studies can also be used. Optimisation of task division should be based on the cognitive characteristics of the skill elements and the reasons for achieving the training goals at any given time.

3.2.3 Integration of Operational Skills and Cognitive Skills from the Perspective of Embodied Cognition

Skill cultivation is the ability to operate according to procedures and knowledge of the circumstances of operation. According to the theory of embodied cognition, artificial intelligence can create virtual simulation training environments that offer contextual information feedback and cognitive cues for learners in the process of operation to promote the joint development of physical operation and cognitive processing. Skill training for civil affairs services can be conducted in a virtual environment to simulate all kinds of changes and unforeseen circumstances that occur in actual service operations, and trainees can develop a good sense of the needs of service recipients, environmental factors, ethical norms, etc., through practice.

3.3 The Path for Value Transformation of Educational Technology Investment and Structural Cost Optimisation

3.3.1 Initial Investment in the Technology System Deployment and Economies of Scale

Investment in the construction of intelligent technology systems for civil affairs vocational education includes all kinds of items, such as hardware and software, system integration and data management, etc., and the initial investment is relatively high. Both the amount of cost and the scope of benefit from changing technology systems are relatively large. As the system has been used repeatedly in many programmes and various teaching links, the marginal cost per teaching activity will gradually decrease. The Design of the System Architecture should be scalable and reusable, and it needs to have good interfaces and be compatible with future large-scale applications.

3.3.2 Cost Impact of Resource Reusability and Degree of System Integration

The Cost Structure of Educational Technology Investment is Affected by the Degree of Resource Reuse and System Integration. Resource reusability is the proportion of teaching resources that can be used in different courses, programmes and campuses; the higher this proportion is, the lower the average cost of resource development. The Degree of System Integration is the extent to which the intelligent system has been incorporated into the existing teaching management system; the higher this degree is, the lower the additional costs of data collection and system maintenance will be. Build a complete system of resources and an integration system to reduce the total cost of technology investment and improve the utilisation efficiency of resources.

3.3.3 A Multi-Dimensional Evaluation Framework for Value Spillover Effects

The purpose of applying intelligent technology in education is to improve the efficiency of teaching and achieve all sorts of other positive outcomes. The two kinds of benefits in the evaluation system are direct and indirect. The direct effects are that teaching hours will be reduced, funds will be used more efficiently, and administrative costs for education will fall. Indirect effects are values that are difficult to observe directly, such as the improvement in students' academic performance, an increase in student happiness and well-being, the development of professional skills for teachers, and the enhancement of school reputation. Build a multi-dimensional index of all relevant reasons and do not give too much weight to any single economic indicator in the assessment of technology investment.

Conclusion

The three main ways artificial intelligence will promote civil affairs vocational education will be introduced in this paper: the reconstruction of technology embedding and adaptation of the educational ecosystem; the construction of intelligent collaboration models among teaching subjects; and the coupling mechanism between training objectives and intelligent technologies. At the level of technology embedding, this paper studies the adaptive relationship of intelligent technologies and teaching scenarios, points out the problems of data heterogeneity and the dilemma of algorithm adaptability in resource allocation, proposes an optimisation plan for a matching mechanism based on semantic fusion, and puts forward a teaching space adjustment strategy oriented towards human-computer collaboration. The following three ideas have been put forward in this paper at the level of teaching subjects: an adaptive learning path generation mechanism for students, an intelligent auxiliary decision-support system for teachers, and an application framework of academic collaboration tools for researchers. The objectives of the training in this paper are to study the intelligent construction and dynamic evolution mechanism of the competency profile, analyze the modality transformation characteristics of skill training, and explore the value transformation path of investment in educational technology. Further studies will explore the reasons for the application of new technologies, what new directions the reform of the teaching evaluation system is taking, and the long-term effects of human-computer collaborative teaching models.

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