Research on the Digital Development Path of Teaching Resources for University Industry-Education Integration Courses Empowered by AI

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Abstract: The digitalization of teaching resources is the core link in the digital transformation of education, as well as the material foundation for the effective implementation of curriculum reform in industry-education integration. Nevertheless, current industry-education integration courses in universities are generally confronted with prominent problems such as severe lag in the development of teaching resources, difficulty in introducing high-quality industrial resources, and obstacles in generating personalized resources. From the perspective of AI empowerment, this paper systematically analyzes the bottlenecks of traditional teaching resource development methods, and proposes a digital development path for teaching resources driven by AI technology, namely precision collection — intelligent processing — dynamic generation — personalized recommendation. This paper focuses on exploring methods for intelligent capture and transformation of industrial resources, structured decomposition of scientific research achievement resources, personalized generation of interactive learning resources, and construction of intelligent resource labeling and recommendation systems. It aims to provide theoretical guidance and practical strategies for universities to efficiently and high-quality develop industry-education integrated teaching resources by leveraging AI technology.

Keywords: Artificial Intelligence; Industry-Education Integration; Teaching Resources; Digital Development; Resource Generation

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1.Introduction

Against the background of industry-education integration, the connotation of curriculum teaching resources has far exceeded the scope of traditional textbooks, courseware and exercise sets. Instead, it is necessary to dynamically integrate real project cases from the industry, desensitized enterprise operational data, industrial operation specifications, technical development tools, as well as cutting-edge achievements and innovative methods in scientific research. On the expansion of the connotation of teaching resources under industry-education integration, some researchers have put forward the "three-integration resource view", which integrates industrial resources, scientific research resources and traditional teaching resources; see the systematic elaboration by Yang Xianmin and other scholars.

The rapid development of AI technologies, especially natural language processing, generative large language models, knowledge graph construction and personalized recommendation algorithms, creates great possibilities for the digital development of teaching resources. These technologies enable the automatic extraction of valuable information from massive, heterogeneous and unstructured industrial and academic data, and further transform it into structured, reusable digital resources adapted to specific teaching scenarios. This study focuses on how AI empowers the whole chain of teaching resource development for industry-education integration courses, and systematically explores a new digital development path from resource perception to intelligent generation, so as to provide a feasible scheme for university teachers to reduce burden, improve efficiency and optimize the quality of curriculum resources.

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2.Practical Dilemmas in the Development of Teaching Resources for Industry-Education Integration Courses

Current development of teaching resources for industry-education integration courses mainly faces four practical dilemmas:

First, the sharp contradiction between the high value and difficult accessibility of industrial resources. Real enterprise project cases, desensitized operational data, standardized technological processes and internal operation specifications are valuable resources with high teaching value. By analyzing and conducting simulated operations based on these real materials, students can greatly shorten the adaptation cycle from campus to workplace. However, due to objective factors such as intellectual property rights and technical barriers, university teachers find it difficult to obtain such resources systematically and continuously from enterprises.

Second, the mismatch between the academic expression of scientific research achievements and the teaching-oriented demands. Research papers and project reports written by university teachers usually adopt rigorous and standardized academic language, involving profound theoretical derivation and complex data processing procedures. There is a lack of effective technical tools and methodologies to downgrade these sophisticated research achievements into teaching cases or experimental projects that are understandable and inquiry-worthy for students, which currently relies mostly on teachers' personal experience and trial-and-error.

Third, the huge gap between the massive demand for personalized resources and limited supply. Students in one class show significant individual differences in cognitive level, learning styles and interest preferences. An ideal teaching resource system should support the design of differentiated and personalized learning paths. However, it is almost impossible for individual teachers to customize tailored teaching resources for each student or learning group within limited time and energy.

Fourth, efficiency loss caused by one-time investment and long-term idleness of resource development. Many teachers devote enormous efforts to producing elaborate multimedia courseware and designing complete project case libraries, yet these valuable intellectual achievements are often neglected once the course ends or the teacher transfers posts. This reflects an in-depth problem: the lack of an effective mechanism for resource accumulation, sharing and iterative updating, resulting in a huge waste of intellectual resources within universities.

The above dilemmas indicate that the traditional development mode of people searching for resources is no longer sustainable, and it is imperative to shift to an intelligent new mode of resources reaching people and machine-aided generation.

3.Path Design for AI-Empowered Digital Development of Teaching Resources

This study designs a closed-loop four-step development path: precision collection, intelligent processing, dynamic generation, and personalized recommendation.

Precision Collection

The adoption of AI technology enables the systematic acquisition of industrial resources. Specifically, an intelligent perception system targeting specific industrial sectors can be developed. By deploying targeted web crawlers, the system regularly captures public information from official websites of target enterprises, open-source communities, vertical industrial media and other platforms. More importantly, instead of simply downloading web pages mechanically, the system applies document layout analysis and semantic parsing technologies to automatically identify and extract substantive content with real teaching value.

In addition, for tacit knowledge generated in university-enterprise cooperation, such as lecture recordings of enterprise tutors, minutes of university-enterprise seminars, and interview audios of enterprise experts, speech-to-text conversion and natural language processing technologies can be used for automatic transcription and content analysis. Classic cases, problem-solving ideas and lessons learned from failures can be identified and sorted into structured text cases or situational scripts.

Intelligent Processing

AI technologies provide efficient tool support for transforming scientific research achievements into teaching resources. For lengthy academic papers dense with professional terms, text summarization technology can automatically generate multiple abstract versions with different lengths and linguistic styles. Meanwhile, text simplification technology can reduce the linguistic difficulty of original papers to fit the reading level of undergraduates.

Furthermore, a disciplinary knowledge graph can be constructed to semantically associate and map keywords and innovative points of each paper with nodes in the existing curriculum knowledge graph. The system thereby puts forward suggestions on whether to take the paper as extended reading material, classroom case material or reference for curriculum design. For research papers involving algorithm models or data analysis processes, AI can assist in generating simplified simulated data sets or experimental scripts in pseudo-code form, allowing students to reproduce part of the core research work in a simplified environment and gain authentic research experience without dealing with the high complexity of original codes.

Dynamic Generation

Generative AI represented by large language models opens up new possibilities for the batch and personalized creation of interactive learning resources. Given a real industrial background, teachers can use large language models to automatically generate project task books, role-playing scripts, simulated dialogues and other forms of resources with diverse perspectives and complexity levels for students' group discussions and simulated decision-making exercises in class.

In terms of exercises and assessments, the system can automatically generate a large number of different question types only by inputting knowledge points and expected difficulty levels. It can even intelligently generate personalized targeted exercises aiming at students' weak knowledge points based on their historical answer data. In addition, the core teaching resources of a course can be taken as a knowledge base to build a course-specific AI teaching assistant based on Retrieval-Augmented Generation (RAG) technology.

Personalized Recommendation

AI realizes the precise delivery of teaching resources. Firstly, a multi-dimensional resource labeling system needs to be established to conduct refined metadata annotation for each digital resource, covering affiliated courses and knowledge points, resource type, prerequisite knowledge, difficulty level, suitable learning modes, and related typical industrial posts.

Secondly, by analyzing students' behavioral data on online learning platforms, including resource click records, video viewing duration, exercise accuracy and forum posts, a dynamic learner profile can be built to fully depict students' knowledge mastery, learning style preferences and ability aptitude. On this basis, combined with resource labels and learner profiles, recommendation algorithms such as collaborative filtering or knowledge graph-based recommendation are adopted to provide differentiated learning resources for individual students or learning groups, realizing personalized resource supply for all learners.

4.Implementation Guarantee and Effect Prospect

The smooth implementation of the above AI-empowered teaching resource development path requires solid support from multiple aspects.

First, it is necessary to construct or purchase a highly integrated AI teaching resource development platform, which organically integrates functional modules including precision collection, intelligent processing, dynamic generation and personalized recommendation, and provides a unified and user-friendly interface for teachers.

Second, a mechanism for co-construction, sharing, incentive and recognition of resources should be established, and teachers' achievements in developing digital teaching resources with AI tools should be incorporated into the assessment system of teaching workload and academic performance.

Third, great importance must be attached to ethical and copyright issues. Strict intellectual property review shall be conducted on AI-collected and AI-generated content, and a necessary manual review and error correction mechanism shall be established to ensure the legality, accuracy and reliability of teaching resources. Regarding the copyright ownership of AI-generated content, there is no unified legal consensus at home and abroad. It is suggested that universities clearly mark "AI-assisted generation" and keep manual review records when applying AI-generated resources.

In terms of expected effects, the full implementation of this development path will significantly shorten the update cycle of teaching resources, greatly expand the scale and diversity of resource supply, and strongly support personalized teaching. It will also effectively accumulate and revitalize a large number of scientific research achievements and university-enterprise cooperation resources accumulated by universities. Ultimately, teachers will be liberated from cumbersome and repetitive resource collection work, enabling them to devote more energy to creative teaching design and in-depth teacher-student interaction. AI-empowered digital resource development will lay a solid resource foundation for realizing curriculum teaching of genuine industry-education integration and integration of science and education.

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