Application of Intelligent Technology in Digital Publishing of Teaching Aids - Postprint

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Abstract

[Purpose] With the rapid development of artificial intelligence technology, the field of digital educational publishing is undergoing profound transformation. [Methods] The application of intelligent technology in digital educational publishing involves multiple stages including content production, resource integration, and personalized recommendation. By introducing technologies such as natural language processing, machine learning, and knowledge graphs, digital educational publishing has achieved intelligent content analysis, precise push delivery, and interactive learning experiences. [Results] The application of intelligent technology not only enhances the efficiency and quality of educational publishing but also provides learners with more personalized and intelligent learning support. [Conclusion] An in-depth exploration of the specific application scenarios and implementation strategies of intelligent technology in digital educational publishing is of great significance for promoting the intelligent construction of educational resources.

Full Text

Application of Intelligent Technology in Digital Publishing of Teaching Aids

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Abstract

[Objective] With the rapid development of artificial intelligence technology, the field of digital publishing for teaching aids is undergoing profound transformation. **[Method]** The application of intelligent technology in digital publishing of teaching aids involves multiple stages including content production,

resource integration, and personalized recommendation. Through the introduction of natural language processing, machine learning, knowledge graph, and other technologies, digital publishing of teaching aids has achieved intelligent content analysis, precise delivery, and interactive learning experiences. [**Result**] The application of intelligent technology not only enhances the efficiency and quality of teaching aid publishing but also provides learners with more personalized and intelligent learning support. [**Conclusion**] An in-depth exploration of specific application scenarios and implementation strategies for intelligent technology in digital publishing of teaching aids holds significant importance for promoting the intelligent construction of educational resources.

Keywords: intelligent technology; teaching aid publishing; digitalization; personalized learning; knowledge graph

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The Evolution of Digital Publishing of Teaching Aids

The rapid development of digital technology has driven profound transformation in the education sector, and teaching aid publishing has consequently entered a stage of digital transformation. As the core driving force of digital transformation, intelligent technology is reshaping the production methods, service models, and value creation of teaching aid publishing. Faced with the new educational ecosystem brought about by the "Double Reduction" policy, educational publishing should focus on creating high-quality content and leveraging paper-digital integrated educational services to build a sound educational publishing ecology [1]. In-depth research on the application of intelligent technology in digital publishing of teaching aids holds significant importance for improving the quality of educational resources, promoting educational equity, and advancing educational modernization.

Digital publishing of teaching aids originated in the late 1990s, gradually advancing alongside the development of computer technology and the internet. Between 2000 and 2010, teaching aid publishing institutions began exploring digital transformation by digitizing paper-based teaching aid resources to establish foundational teaching aid resource libraries, forming a simple digital publishing model primarily based on PDF formats. From 2010 to 2015, driven by the rapid development of mobile internet, digital publishing of teaching aids entered a deepening stage, with publishing institutions developing digital teaching aid products supporting multi-terminal access and enabling online browsing and downloading of teaching aid resources. After 2015, the introduction of big data and artificial intelligence technology ushered in an intelligent stage for digital

publishing of teaching aids. Publishing institutions utilized intelligent analysis technology to mine learner data and developed intelligent teaching aid products supporting personalized learning. Concurrently, the application of cloud computing technology transformed teaching aid resource storage and distribution methods, forming a cloud platform-based digital teaching aid resource service system. In recent years, digital publishing of teaching aids has progressed toward diversification and intelligence, with emerging technologies such as augmented reality and virtual reality enriching the presentation forms of digital teaching aids, while deep application of artificial intelligence technologies like knowledge graphs and natural language processing has enhanced the service capabilities of digital teaching aids, providing strong support for intelligent teaching [3].

Content Creation for Teaching Aids Supported by Intelligent Technology

Application of Natural Language Processing Technology in Text Creation

Natural language processing technology plays a crucial role in the content creation process for teaching aids [4]. Deep learning algorithms, trained on large-scale educational text corpora, have constructed specialized language models for the education domain, providing intelligent support for teaching aid content creation. Text generation systems based on pre-trained language models can automatically generate teaching aid content that meets instructional requirements according to given topics and teaching objectives. Intelligent writing assistance systems utilize semantic understanding technology to extract and expand key content from textbooks, generating supporting exercises, knowledge point explanations, and learning guidance. In the field of essay grading and evaluation, natural language processing technology has enabled automatic essay scoring and intelligent commentary through functions such as grammatical analysis, semantic understanding, and text evaluation. The application of machine translation technology has made multi-language conversion of teaching aid content more efficient and accurate, promoting cross-language sharing of high-quality educational resources. Professional terminology recognition and processing technologies tailored to subject characteristics ensure the professionalism and standardization of teaching aid content across different disciplines. The combination of language generation technology and knowledge graphs enables intelligent generation of problem-solving processes based on knowledge point associations, providing learners with clear problem-solving approaches and methodological guidance. Intelligent writing assistance systems also possess contextual understanding capabilities, accurately grasping the coherence and logical consistency of teaching content to ensure the pedagogical value of generated content. Text classification and sentiment analysis technologies specific to the education domain support difficulty grading and sentiment tendency analysis of teaching aid content, helping editorial staff optimize content structure and expression methods. The application of natural language processing

technology in teaching aid content creation has significantly enhanced the intelligence level of teaching aid publishing.

Intelligent Proofreading and Layout Design Systems

Intelligent proofreading and layout design systems have achieved automated quality control and layout optimization for teaching aid content through deep learning technology [5]. Intelligent proofreading systems employ text error detection techniques from natural language processing to conduct multi-dimensional quality checks on teaching aid content, including identification of typos, detection of grammatical errors, verification of punctuation standardization, and review of professional terminology usage standardization. Machine learning-based intelligent layout systems can automatically identify text structure and hierarchical relationships, generating layout arrangements that conform to cognitive patterns according to teaching aid types and target learner characteristics. Intelligent graphic layout technology uses computer vision algorithms to analyze semantic associations between images and text, automatically completing image-text configuration and position adjustment. Adaptive layout technology for teaching aid content can dynamically adjust layout parameters according to the display characteristics of different terminal devices, ensuring optimal reading experiences. Intelligent proofreading systems also integrate subject knowledge bases to intelligently review the professionalism and accuracy of teaching aid content, ensuring scientific validity of teaching content. The intelligent component library in layout design systems achieves standardization and modularization of commonly used teaching aid layouts, improving the efficiency and quality of teaching aid publishing. Intelligent layout systems possess layout aesthetics evaluation functions, forming scientific layout assessment models through learning from layout features of numerous excellent teaching aid works. The application of deep learning-based image enhancement technology in layout optimization has improved the display effects of teaching aid images. The continuous learning mechanism of intelligent proofreading systems enables them to constantly accumulate and update proofreading rules, adapting to dynamic changes in teaching aid publishing standards. Layout design systems also support multi-user collaborative editing modes, enabling intelligent collaboration in teaching aid publishing workflows.

Intelligent Processing Methods for Teaching Resources

Intelligent processing methods for teaching resources are built upon multimodal data analysis technology, achieving deep processing and intelligent application of teaching resources through technology empowerment [6]. Machine learning algorithms perform intelligent recognition and semantic annotation on multimedia teaching resources such as images, audio, and video, constructing structured metadata systems for teaching resources. Deep learning models enable intelligent analysis of teaching videos, achieving automatic extraction of key knowledge points and intelligent indexing of video content. Audio processing

technology applied to voice-based teaching resources supports automatic speech recognition, audio-to-text transcription, and voice quality optimization. Computer vision technology intelligently processes teaching images and experimental demonstration videos, extracting key visual features to construct visual knowledge systems. Intelligent resource processing platforms integrate functions such as content review, format conversion, and quality optimization, ensuring the standardization and usability of teaching resources. Intelligent processing technologies for teaching resources also support automatic classification and aggregation of resources, forming knowledge point-based resource association networks. Through iterative optimization of deep learning models, intelligent resource processing systems continuously improve their understanding and processing capabilities of teaching resources. The application of intelligent technologies such as ChatGPT has extended to virtual reality and augmented reality domains, supporting intelligent production of immersive teaching resources. Deep learning-based image segmentation and 3D reconstruction technologies enable teaching resources to present more intuitive and three-dimensional effects. Teaching resource intelligent processing platforms have also established resource quality assessment systems, ensuring educational value through multi-dimensional quality indicator analysis. Intelligent processing methods conduct semantic understanding and knowledge extraction of teaching resources, constructing resource service systems that support intelligent retrieval and personalized recommendation.

Construction of Teaching Aid Resources Based on Intelligent Technology

Construction and Application of Educational Knowledge Graphs

Educational knowledge graphs play a core supporting role in the construction of teaching aid resources. Knowledge graph technology formalizes concepts, attributes, and relationships in the education domain through semantic network construction, forming structured knowledge systems [8]. During graph construction, natural language processing and machine learning technologies are employed to automatically extract knowledge entities and relationships from educational resources such as textbooks, lesson plans, and exercises, establishing multi-level knowledge network structures. Educational knowledge graphs integrate knowledge modeling experience from subject experts, constructing knowledge association systems that conform to cognitive patterns, including hierarchical relationships, prerequisite-successor relationships, and correlational relationships between knowledge points. Knowledge graphs support knowledge reasoning and discovery functions, enabling automatic derivation of new knowledge associations based on existing knowledge. At the application level, educational knowledge graphs provide knowledge support for intelligent lesson preparation, personalized recommendation, and adaptive learning. Visual presentation of knowledge graphs helps teachers and students understand knowledge structures and master knowledge systems. Knowledge graphs also integrate test item banks and learning resource libraries, achieving intelligent matching

of resources based on knowledge points. Graph update mechanisms ensure dynamic expansion of knowledge systems, timely absorbing new achievements in disciplinary development. The combination of knowledge graph technology and deep learning improves the accuracy of knowledge representation and the intelligence of knowledge reasoning. The application of educational knowledge graphs promotes intelligent organization and precise service of teaching aid resources.

Intelligent Classification System for Teaching Aid Resources

The intelligent classification system for teaching aid resources is built upon deep learning and natural language processing technologies, achieving automated classification and indexing of educational resources [9]. The intelligent classification system employs multi-layer neural network models to master feature representations and classification rules of teaching aid resources through learning from large-scale annotated samples. The classification system covers multiple dimensions including subject classification, grade classification, difficulty classification, and resource type classification, forming a complete classification standard system (see Figure 1 [Figure 1: see original paper]). Intelligent classification algorithms can extract features and make classification judgments on multimodal teaching resources such as text, images, audio, and video, ensuring accuracy and consistency of classification results. The classification system also possesses self-learning capabilities, continuously optimizing classification models through user feedback and expert corrections. The intelligent classification system supports fine-grained knowledge point classification, achieving precise alignment between teaching aid resources and curriculum standards. The interpretability design of classification results enables teachers to understand and adjust classification bases. The teaching aid resource classification system integrates subject expert experience, establishing rule bases that conform to teaching practices. The distributed architecture of the classification system ensures efficient classification processing of large-scale resources. Intelligent classification technology provides foundational support for retrieval, recommendation, and personalized learning of teaching aid resources.

Intelligent Resource Integration and Association Technology

Intelligent resource integration and association technology achieves deep integration and intelligent association of teaching aid resources. Resource integration platforms employ semantic understanding technology to conduct content analysis and semantic annotation of teaching aid resources from different sources, establishing unified resource description frameworks. Intelligent association algorithms based on knowledge graphs and deep learning models mine semantic relationships and knowledge associations between resources, constructing multi-dimensional resource association networks. Resource integration systems support unified management of heterogeneous data, achieving integrated organization of multi-type resources including text, images, audio, and video. Association technology automatically establishes citation, supplementation, and

extension relationships between resources by calculating semantic similarity and knowledge relevance. Intelligent resource integration platforms possess version control and update synchronization functions, ensuring timeliness and consistency of teaching aid resources. Resource association systems support dynamic expansion, automatically discovering and establishing association relationships for newly added resources. Intelligent integration technology enables modular management and flexible combination of teaching aid resources, meeting resource requirements for different teaching scenarios. The application of association technology promotes sharing and reuse of high-quality educational resources, improving the efficiency of teaching aid resource utilization. Resource integration platforms also integrate intelligent retrieval and personalized recommendation functions, providing precise resource services for users and continuously practicing intelligent publishing [10]. Continuous optimization of association technology ensures accuracy and practicality of resource associations.

Intelligent Service System for Digital Publishing of Teaching Aids

Personalized Learning Recommendation Mechanism

The personalized learning recommendation mechanism provides precise learning resource recommendation services for learners based on deep learning and knowledge graph technology (see Figure 2 [Figure 2: see original paper]). The recommendation system constructs dynamic learner profile models by mining and analyzing multi-dimensional data including learners' knowledge mastery levels, learning behaviors, and interest characteristics [11]. Collaborative filtering-based recommendation mechanisms can discover user groups with similar learning characteristics, enabling sharing of learning experiences among groups. Deep neural network models conduct sequential analysis of learners' learning trajectories, predicting learning needs and knowledge blind spots to generate personalized learning path recommendations. Knowledge graph-supported semantic reasoning technology helps the system understand associations between learning contents, recommending extension resources related to current learning topics. The recommendation system employs attention mechanisms to identify key factors affecting learning effectiveness and dynamically adjusts recommendation strategies. Real-time analysis of learning feedback data enables the recommendation system to timely adjust resource provision and maintain adaptability of recommended content. The recommendation mechanism integrates teaching scenario factors such as course progress and examination arrangements, ensuring consistency between recommended content and teaching objectives. The system also establishes a cold start handling mechanism to solve recommendation problems for new users and new resources. Multi-objective optimization algorithms balance multiple dimensions including learning effectiveness, learning interest, and learning difficulty during the recommendation process, enhancing the scientific validity of recommendation services. The interpretability design of recommendation results enhances learners' understanding and trust of recommended

content.

Intelligent Test Question Generation and Evaluation

Intelligent test question generation and evaluation systems utilize natural language processing and machine learning technology to achieve intelligent teaching evaluation. Test question generation engines based on deep learning models master structural features and language patterns of different question types through learning from massive test question samples. Knowledge graph support enables the system to automatically generate diverse test questions based on knowledge point associations, covering multiple cognitive levels including knowledge comprehension, problem analysis, and comprehensive application [12]. Test question evaluation systems employ semantic understanding technology to achieve intelligent scoring of subjective answers, with scoring criteria covering knowledge accuracy, logical completeness, and expression standardization. Machine learning-based test difficulty prediction models can accurately assess difficulty coefficients of test questions, supporting intelligent test paper assembly. Answer data analysis technology mines error types and problem-solving processes to form detailed diagnostic reports. The system possesses test question duplication checking functions, ensuring originality of test questions. Intelligent evaluation systems support complex evaluation tasks such as essay scoring and experimental report evaluation, with evaluation indicator systems comprehensively reflecting learning outcomes. Test item bank management systems achieve intelligent classification and dynamic updating of test questions, meeting diverse needs of teaching evaluation. Visual presentation of evaluation results helps teachers grasp learning situations and optimize teaching strategies. The combination of intelligent test question systems and learning diagnosis systems forms a complete closed loop for teaching evaluation.

Intelligent Learning Interaction Platform

Intelligent learning interaction platforms construct professional support networks that support diverse learning interactions through artificial intelligence technology [13]. Platforms employ natural language processing technology to implement intelligent question-answering functions that can understand learners' question intentions and provide accurate knowledge answers. Speech recognition and speech synthesis technology support voice interaction modes, enhancing naturalness and convenience of learning processes. Intelligent dialogue systems based on knowledge graphs and deep learning models can conduct multi-round dialogues, guiding learners to think deeply and explore. Learning behavior analysis technology mines learners' operation trajectories on the platform, identifying learning patterns and preferences. Affective computing technology perceives learners' emotional states by analyzing textual expressions and interactive behaviors, providing emotional support. Intelligent teaching assistant systems can answer common questions and provide learning suggestions, reducing teachers' workload. Collaborative learning support systems optimize learning group con-

figurations through social network analysis, promoting effective group learning. Virtual laboratories and simulation teaching systems provide immersive experiences for practical learning. Real-time monitoring and data analysis of learning processes enable platforms to timely identify learning problems and adjust learning strategies. The open interface design of platforms supports extended development of teaching applications, meeting personalized teaching needs.

Enhancement of Intelligent Service Effectiveness

Optimization of Intelligent Production Models

Intelligent production models have restructured traditional teaching aid publishing workflows through deep learning and artificial intelligence technology. Intelligent production platforms apply machine learning algorithms to content creation, editorial processing, and quality control, establishing data-driven production decision mechanisms. Deep application of natural language processing technology in teaching aid content production enables systems to automatically identify knowledge points and generate supporting exercises and analytical materials. Computer vision technology introduced in layout design forms intelligent layout rule bases through deep learning of layout features. Intelligent production tool chains integrate functional modules including text analysis, image processing, and audio-video editing, enhancing production efficiency. Knowledge graph-based content organization methods achieve modular production and flexible combination of teaching aid resources. Digital transformation of production processes enhances precision of quality management, with error warning mechanisms capable of timely identifying and correcting content deviations. Intelligent workflow systems support multi-user collaborative creation, optimizing resource allocation and progress management. Market planning employs market data analysis technology to predict user demand changes, guiding product development directions. Digital asset management systems achieve intelligent management and reuse of teaching aid materials, reducing production costs.

Intelligent Integration of Educational Resources

Intelligent integration of educational resources achieves deep integration and value enhancement of educational resources through artificial intelligence technology. Resource integration platforms employ natural language processing and deep learning technology to conduct content analysis and semantic indexing of scattered educational resources, establishing unified resource description systems. Knowledge graph technology supports multi-dimensional association of educational resources, forming complete knowledge network structures. Intelligent integration tools can automatically identify intrinsic connections between resources, establish knowledge point mapping relationships, and achieve precise resource matching. Cross-media resource processing technology supports unified management of multimodal resources including text, images, audio, and video, improving resource utilization efficiency. Educational resource quality assessment systems establish scientific resource evaluation indicator systems through

machine learning methods. Intelligent reasoning technology plays a key role in resource integration processes, capable of discovering potential knowledge associations and expanding resource application scenarios. The distributed architecture of resource integration platforms ensures efficient processing capabilities for large-scale resources. Copyright management systems achieve intelligent tracing and protection of educational resources.

Enhancement of Intelligent Service Effectiveness

The enhancement of intelligent service effectiveness is built upon deepened application of artificial intelligence technology, achieving precision and personalization of teaching aid services. Intelligent recommendation systems precisely analyze learner characteristics through deep learning algorithms, providing learning resources that meet individual needs. Knowledge tracing technology enables real-time monitoring of learning processes, accurately assessing knowledge mastery levels and dynamically adjusting learning strategies. Intelligent question-answering systems employ natural language understanding technology to provide accurate knowledge answers and learning guidance. Learning behavior analysis technology identifies learning patterns and obstacles through mining of learning data, formulating targeted intervention plans. Intelligent evaluation systems support multi-dimensional assessment of learning effectiveness, providing data support for teaching decision-making. Interaction design of service platforms incorporates affective computing technology, enhancing service affinity and adaptability. Intelligent service tools optimize resource deployment efficiency and improve service response speed. User feedback analysis systems accurately grasp user demand changes through sentiment analysis technology, continuously improving service quality. The application of intelligent technology in digital publishing of teaching aids is continuously deepening, driving teaching aid publishing toward intelligent and personalized development. Through deep application of intelligent technology, digital publishing of teaching aids has achieved qualitative leaps in content production, resource management, and service delivery. In the future, with continuous evolution of artificial intelligence technology, digital publishing of teaching aids will further unleash intelligent potential, providing stronger support for educational modernization.

References:

[1] Chen Jie, Chen Qi. Development Trends of Educational Publishing Under the "Double Reduction" Policy [J]. Editorial Friends, 2022(6): 26-32.
[2] Li Zehui. Transformation and Development Path of Teaching Aid Editors in the Digital Era [J]. Communication and Copyright, 2024(10): 11-14.
[3] Yang Wei, Li Xiangfei. Innovation in Academic Journal Publishing Under the Integration of Intelligent Editing Technology [J]. China Media Technology, 2024(9): 96-99.
[4] Yin Xiaokai, Li Xiaoli. Application Prospects and Challenges of Artificial Intelligence in Publishing Design [J]. China Media Technology, 2024(9): 104-108.

[5] Duan Yongfei. Reshaping the Knowledge Production Role of Book Editors in the Artificial Intelligence Era [J]. China Media Technology, 2024(9): 113-116.
[6] Xu Minmin, Shi Mianjie. Exploration of Intelligent Publishing Under the "Double Reduction" Background—Intelligent Teaching Aid Solutions for Campus Homework Management [J]. Publishing Wide Angle, 2023(10): 55-59.
[7] Hao Li. Impact of ChatGPT on Editing and Publishing of Teaching Aid Newspapers and Coping Strategies [J]. Communication and Copyright, 2023(24): 28-30.
[8] Wang Haike. Artificial Intelligence Technology Promotes Comprehensive Development of Subjects and Objects in Sci-Tech Journals [J]. China Media Technology, 2024(7): 120-124.
[9] Yang Sijia, Yuan Shuyun. Reflections on News Ethics of Generative AI Technology from a Human-Machine Collaboration Perspective—Taking ChatGPT as an Example [J]. China Media Technology, 2024(7): 50-53, 62.
[10] Deng Jie. Research on the Transformation and Development of Primary School Teaching Aid Publishing Editors Under the Background of Integrated Publishing [J]. News Research Guide, 2023, 14(11): 166-168.
[11] Xia Wenxue. Research on the Application of Artificial Intelligence Technology in the Development of Sci-Tech Journals [J]. China Media Technology, 2024(5): 141-145.
[12] Qin Xue, Wang Shaopeng, Yang Yi, et al. Penetration and Value Reengineering of Artificial Intelligence Technology in the Sci-Tech Journal Industry Chain [J]. China Media Technology, 2023(11): 141-145.
[13] Li Huiying. Research on the Configuration Path of Digital Transformation of Teaching Aid Book Publishing [J]. Science and Technology Communication, 2025, 17(1): 43-46.

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Note: Figure translations are in progress. See original paper for figures.