Technology-Enabled New-Form Digital Textbook Publishing Practice in the Post-Print Era

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Abstract

The report of the 20th National Congress of the Communist Party of China proposes to "promote digitalization of education,"and the National Education Work Conference proposes to "implement the national strategic action for educational digitalization," making educational digitalization a strategic theme in China' s education reform and development. [Objective] How to construct high-quality digital textbooks to adapt to changes in learning methods in the digital era, and how to properly position digital textbooks to better support institutions in the digital reform of teaching processes constitute the core tasks facing educational publishing. [Method] This article seeks to elucidate the basic conditions for constructing new-form digital textbooks by introducing their concepts and characteristics, as well as the construction of platform core modules and intelligent applications. [Results] By analyzing the typical case of the new-form digital textbook construction of "Applied Writing Tutorial (2nd Edition)" published by the National Open University Press, this study reconstructs elements such as "people, courses, and environment" in the teaching and learning process, achieving comprehensive enhancement and transformation of resource digitalization, process digitalization, and role digitalization. [Conclusion] This paper proposes future development directions for digital publishing, emphasizing the need to formulate national standards, establish update mechanisms, ensure copyright protection, and create demonstration projects.

Full Text

Preamble

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Abstract

The report from the 20th National Congress of the Communist Party of China calls for "advancing education digitalization," and the National Education Work Conference proposes "implementing the national education digitalization strategic action." Education digitalization has become a strategic theme in China' s educational reform and development. [**Objective**] This paper addresses how to construct high-quality digital textbooks that adapt to changing learning patterns in the digital age, and how to properly position digital textbooks to better support institutions in their digital teaching reform—core tasks facing educational publishing. [**Methods**] By introducing the concept and characteristics of new-form digital textbooks, along with platform core module construction and intelligent applications, this article aims to help the public understand the fundamental conditions for building new-form digital textbooks. [**Results**] Through analysis of the typical case of the new-form digital textbook *Application Writing Tutorial (2nd Edition)* published by National Open University Press, the paper reconstructs key elements such as "people, curriculum, and environment" in the teaching and learning process, achieving comprehensive enhancement and transformation of resource digitalization, process digitalization, and role digitalization. [**Conclusion**] The paper proposes future development directions for digital publishing, emphasizing efforts in establishing national standards, creating update mechanisms, strengthening copyright protection, and building demonstration projects.

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In traditional teaching activities, conventional textbooks suffer from untimely updates, slow knowledge iteration, monotonous formats, difficult theoretical comprehension, limited materials, and lack of real-time interaction, resulting in poor learning experiences. Most integrated publishing textbooks primarily use paper textbooks as carriers, empowering them through audio-video resources, animations, and extended materials accessible via QR codes. However, paper textbooks and online learning resources remain separate, preventing cross-media interaction with discussion, testing, and Q&A components designed for online learning. This inability to support process-based assessment and learning analytics during the learning process has become a major obstacle in education digitalization.

This paper takes the new-form digital textbook *Application Writing Tutorial (2nd Edition)* published by National Open University Press as a case study

[1]. By establishing a multimodal learning mechanism, it explores the digital innovation of "education + publishing + technology" to construct a future model for new-form digital textbook publishing.

1. Concept and Characteristics of New-Form Digital Textbooks

Facing challenges and opportunities brought by educational informatization and digitalization, meeting learners' personalized learning needs and building open, interconnected digital textbooks has become urgent. Based on this, the author proposes constructing new-form digital textbooks to explore future development directions for educational publications.

New-form digital textbooks are innovative teaching materials that, based on curriculum outlines and comprehensive consideration of teaching content, requirements, and assessment standards [2], utilize internet, big data, and artificial intelligence technologies to integrate various digital learning resources including teaching materials, e-books, online courses, teaching platforms, and question banks. These resources are packaged and officially published according to certain standards [3], enabling full-process learning of "study, practice, test, and evaluation." New-form digital textbooks represent not merely a change in carrier format but a transformation of the entire textbook ecosystem. Grounded in systematic and standardized teaching, they simultaneously carry teaching content and activities, innovatively presenting content through text, images, audio-video, animations, AR (augmented reality), VR (virtual reality), and intelligent assistants. This achieves "panoramic, three-dimensional, and simulated" content presentation, combining teaching practice with educational publishing to effectively create teaching scenarios, enrich sensory experiences, reduce cognitive load, and reshape the boundaries of educational publishing [4]. New-form digital textbooks feature four key characteristics: multi-medium, digitalization, intelligence, and rapid iteration [5].

1.1 Multi-Medium: Learning Convenience

New-form digital textbooks provide full-scenario support and multi-terminal adaptation, offering learners a multi-terminal reading experience with rich resource interactions. Textbooks are no longer paper-dependent, allowing learners to utilize fragmented time and various terminals for learning anytime, anywhere.

1.2 Digitalization: Learning Interactivity

Learning resource interaction is upgraded beyond simple audio-video playback. Through online authoring tools, various digital resources are presented optimally, encouraging active learner participation. This enables deeper interaction with digital resources to achieve knowledge comprehension and application, thereby transforming knowledge into competence.

1.3 Intelligence: Learning Effectiveness

Intelligent assistance enhances learning effectiveness. With AI-powered tutors addressing common learner questions, teachers are liberated from repetitive tasks. The system tracks learners' entire learning process, generating formative assessments and learning reports to help teachers analyze teaching outcomes.

1.4 Rapid Iteration: Learning Continuity

Authors or editors can conveniently edit textbooks using authoring tools to achieve rapid iteration, creating sustainable learning materials that overcome the limitations of slow content updates and low efficiency in paper textbooks.

2. Platform Core Module Construction and Intelligent Applications

New-form digital textbooks require platform and App intelligent applications to support textbook reading, editing, and management, reflecting their intelligent and rapidly iterative attributes. Open Cloud Academy is an independent digital publishing public service cloud platform developed by National Open University Press. Based on internet and cloud storage technologies, it provides learners with integrated online learning services combining text, video courses, teaching materials, extended resources, and question banks. Core platform modules include modular resource organization, diversified component invocation, visualized learning data, and intelligent learning services.

2.1 Modular Resource Organization

Through Open Cloud Academy's online authoring tools, various media resources for new-form digital textbooks—such as text, images, audio-video, animations, and question banks—can be systematically organized to rapidly produce digital textbooks through editing interfaces. The system supports automatic text typesetting, improving production efficiency. [Figure 1: see original paper] illustrates the new-form digital textbook authoring tool.

2.2 Diversified Component Invocation

The online authoring tool integrates diverse teaching components that editors can flexibly use according to textbook content. Major components include question bank testing components, interactive components, and teaching activity components.

Question Bank Testing Components. New-form digital textbooks enable learning-while-practicing by associating test questions from the question bank with textbook chapters as in-lesson exercises. After completing knowledge points or chapters, learners can selectively start practice or testing. This self-assessment differs from traditional heavyweight testing, primarily addressing

immediate detection and feedback to help learners quickly identify and solve problems. It also supports launching examination activities to validate teaching effectiveness. [Figure 2: see original paper] shows the new-form digital textbook question bank.

Interactive Components. Human-computer interaction includes directory indexing, page-turning mode switching, mind map jumps to related tasks, and text resource downloads from extended resource libraries. Discussion interaction enables student-student and teacher-student interaction on textbook chapters or specific topics. Teacher-student interaction includes a questioning function designed at relevant knowledge points (tasks), with backend aggregation of learner questions and teacher feedback guidance.

During learning, learners can mark, annotate, and take notes on key and difficult content, conduct keyword searches for knowledge points, and access extended reading. They can also structurally view and download resources associated with textbooks and chapters.

Teaching Activity Components. These include teaching cases, practical training, assignments and examinations, and discussion feedback, supporting the output and publication of teaching and training results as cases.

2.3 Visualized Learning Data

Visualized analysis must support teaching and learning. Textbook usage analysis examines reading behavior and knowledge point mastery by chapter to assist teachers in evaluating teaching effectiveness, while providing basic statistics on platform users, textbook quantities, reading frequency, resource viewing frequency, and user learning habits. Learning behavior analysis allows learners to view their progress and notes through websites and Apps. The system records the entire learning process, tracking login time, learning duration, progress, resource downloads, answer performance, and knowledge point mastery [6] to construct learner profiles for further resource recommendation, as shown in [Figure 3: see original paper].

2.4 Intelligent Learning Services

New-form digital textbooks adopt a loose-leaf structure and H5 dynamic web technology to support structured dynamic updates. Currently, AI assistants are embedded into the Open Cloud Academy platform through standardized interfaces as a module providing intelligent Q&A services. Functions include creating multiple intelligent assistants, category management, corpus management, keyword management, intelligent answering, manual message answering, and data recording and statistics. This enables teachers and learners to enjoy real-time services. Teachers can flexibly disassemble and combine project and task modules, add and modify content through online editing. After editorial review, dynamic publication allows learners to update textbook content in real

time. Platform functions iterate and optimize according to business needs, enabling teachers to seamlessly use new functions and modules to add capabilities to existing digital textbooks.

3. Typical Case Application

Textbook content is always the foundation, and learner-centered design is the starting point. Through holistic design of new-form digital textbooks, clear learning objectives, emphasis on process-based learning, and full utilization of various media resource advantages, an integrated learning system is formed with interactive and complementary media resources. The new-form digital textbook *Application Writing Tutorial (2nd Edition)* represents a practice implementing vocational education textbook reform. Developed with learners at the center, it implements project-based teaching, emphasizes outcome-oriented education, combines theoretical knowledge with practice, and organically integrates text, audio, video, 2D animations, extended reading, exercise testing, and learning evaluation to create an effective interaction model among teachers, learners, digital textbooks, and platforms, striving to create an autonomous learning path.

3.1 Editorial Team Construction

For new-form digital textbook development across different majors, National Open University Press has created a multi-participatory, collaborative expert team. Each digital integrated media textbook project establishes a reasonable construction team.

Industry and enterprise experts lead the development to ensure vocational and practical characteristics, aligning textbook content with job talent cultivation needs. Subject matter experts control the advancement, scientific rigor, and standardization of content to ensure alignment with teaching principles and reform goals. Frontline backbone teachers ensure practicality, making content and format meet actual teaching needs. In-house digital editors and technical personnel design and produce new media content, structurally presenting textbook content through modern technology according to overall design and frontline teachers' needs.

3.2 Modular Main Content

The new-form digital textbook *Application Writing Tutorial (2nd Edition)* breaks through traditional discipline-based and knowledge-systematic textbook frameworks. Centered on workplace content, job requirements, and task-driven approaches, it constructs the entire textbook system focusing on writing genres needed for workplace communication. Traditional theoretical knowledge is transformed into practical work scenarios, guiding learners to master relevant workplace skills through practice and cultivating qualified talent for society.

The textbook opens with a project overview "Overview of Applied Writing," selecting ten common applied writing projects: job seeking and entrepreneurship, official document communication, affairs management, investigation and research, negotiation and cooperation, etiquette communication, information dissemination, legal proceedings, scientific research, and online communication [7]. Each project comprises 2-6 tasks covering common writing genres, constructing an action-oriented project-based textbook. [Figure 4: see original paper] shows sample chapter pages.

3.3 Diversified Digital Resources

Digital resources are the core of digital textbook content and a crucial pathway for content expression and dissemination, reflecting the digital and multimedium characteristics of new-form digital textbooks. In teaching, students primarily learn through these digital resources. Digital textbook design must maintain content accuracy, scientific rigor, logical coherence, and completeness. Various teaching resources should be designed based on learners' actual situations, achieving diversified design through rich technical means to meet personalized learning needs.

Basic resource construction focuses on key and difficult point analysis and application cases, using multiple media forms—text, images, audio, and video—to convey knowledge from different angles. For example, in *Application Writing Tutorial (2nd Edition)*, project introductions subtly integrate ideological and political education to fulfill talent cultivation requirements. By clicking the "Hello, Student" play button, teachers' gentle voices convey proper job-seeking and value perspectives [8]. Each task includes scenario introductions that reproduce real work situations through stories to provoke thinking and clarify learning tasks. Knowledge explanations are refined to concisely introduce genre knowledge. Small sections like "Genre Differentiation," "Friendly Reminders," and "Think About It" are interspersed throughout to strengthen teacher-learner interaction, making learners feel guided and avoiding monotonous knowledge transmission. All key and difficult content is presented through high-quality micro-lectures (5-8 minutes) in various forms including teacher explanations, 2D animations, and teacher-student dialogues, visualizing knowledge for easier understanding. Unlike integrated media textbooks, learners can directly click to watch videos without scanning QR codes, maintaining learning continuity.

Extended resource design in *Application Writing Tutorial (2nd Edition)* includes many highlights. The "Model Learning" section provides typical positive cases with analysis of merits for imitation practice. The "Faulty Text Diagnosis" section provides typical negative cases with error analysis to show learners what to avoid. "Related Links" sidebars supplement related genres, effectively expanding content. The "Wisdom Sharing" section at each task' s end provides relevant famous quotes to enhance emotional intelligence cultivation. These extended resources use multiple display methods such as pop-ups, image galleries, and links, offering diverse reading experiences that enhance learning interest.

3.4 Interactive Learning Activities

The learning activity design in *Application Writing Tutorial (2nd Edition)* promotes achievement of teaching objectives. Learner-centered, it builds scaffolding for autonomous learning. Aiming to facilitate "learning," it emphasizes problems learners may encounter in writing, focusing on learner-digital resource interaction and teacher-learner and learner-learner interaction to construct a combined autonomous and assisted learning model.

First, autonomous learning creates a student-centered learning path under project-task drivers through diversified course resources. Second, interactive learning strengthens guidance and assistance through the Open Cloud Academy platform, promoting teacher-student and student-student interaction and collaboration. The textbook also features an "Excellent Student Work Case Library" where teacher comments and peer reviews promote learning effectiveness and transform learning outcomes into personal competence.

3.5 Diversified Learning Assessment

Each task in *Application Writing Tutorial (2nd Edition)* ends with several exercises for timely knowledge point mastery detection. Each project includes about 20 chapter test questions to assess project knowledge mastery. Multiple mock exams at the textbook' s end evaluate overall content comprehension. Learning assessment should test course learning objective completion through multiple methods and dimensions. This textbook establishes an evaluation system aligned with curriculum standards and teaching objectives, combining assessment content and forms. Assessment content transitions from knowledge-based to competence-based, shifting from memorization to application and ability mastery. It moves from summative to formative assessment and from single to multiple evaluators, supporting self-assessment, peer assessment, and teacher evaluation. In multi-terminal learning environments, it enables "learn-practice-test-anytime" to achieve learning outcome certification.

3.6 Standardized Publishing Process

The new-form digital textbook *Application Writing Tutorial (2nd Edition)* deeply integrates teaching content, resources, and information technology to demonstrate advanced modern education models, ensuring legal and widespread dissemination. National Open University Press has formed an integrated "resource-platform-publishing" service, establishing a complete publishing chain from "topic selection planning—integrated design—resource development—resource integration—new-form textbook production—review—release—after-sales service" to ensure content scientific rigor and standardization, as shown in [Figure 5: see original paper].

4. Future Development Directions

4.1 Establishing National Standards

With rapid information technology development, new-form digital textbooks will inevitably occupy an important position in textbook publishing. To promote healthy, balanced development of the digital publishing industry, relevant national departments should formulate development and publishing standards for digital textbooks to further improve digital textbook publishing. Development standards could address content R&D, technical specifications, and teaching implementation [9]. Publishing standards could specify technical standards for various media resources, resource storage specifications (metadata standards), copyright citation norms, digital textbook production standards, unified interface standards, and compatibility standards. Quality evaluation indicators should be established to ensure standardized R&D of new-form digital textbooks.

4.2 Establishing Update Mechanisms

New-form digital textbooks depend more heavily on information technology than traditional textbooks. With evident diversification trends in digital publishing, new-form digital textbook publishing standards require continuous revision and improvement according to social development. Therefore, standard maintenance must be dynamic and advanced to ensure healthy, rapid development of new-form digital textbook publishing.

4.3 Strengthening Copyright Protection

Content management and copyright protection technologies should be established to prevent infringement. Copyright transactions in the information age require new technical means. Blockchain technology can be utilized to ensure complete traceability of copyright-related records, technically preventing infringement and safeguarding the future development of digital publishing [10].

4.4 Building Demonstration Projects

Currently, the promotion of new-form digital textbooks and teachers' and students' awareness of them remain insufficient, and their positioning in schools is unclear. Establishing demonstration projects for new-form digital textbook applications is particularly important. For example, selected vocational colleges could build pilot projects. After several rounds of teaching use, all encountered problems could be collected for product iteration, continuously updating new-form digital textbooks to better suit learners' needs.

In the future, National Open University Press will continue using digital technology as a driving engine to integrate resources, platforms, and publishing services, further advancing the digital transformation of educational publishing.

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