Multidimensional Quality Improvement of Teaching Models and Curriculum Resources under the Empowerment of Digitization

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Abstract: In the rapidly evolving landscape of information technology, the concept of smart education has emerged as a progressive notion. Building digitalized curriculum resources and advancing teaching methods empowered by digital technology have become essential choices to achieve educational progress. Therefore, this paper aims to explore the significance and approaches of constructing digitalized curriculum resources and enhancing the quality of education under the empowerment of digitization. This research intends to leverage advanced technologies such as intelligent data analysis and state-of-the-art cloud-based devices. It revolves around modern innovative educational theories and experimental teaching concepts, aiming to establish a virtual simulation teaching and experimental platform. Simultaneously, it aims to facilitate the exchange and professional development of educational management personnel and teachers. The research also involves organizing student internships and practical training activities, following the principles of practical teaching and extensively applying information technology. By integrating digital online resources with classroom teaching, the goal is to foster multidimensional experimental teaching resources. Ultimately, this endeavor seeks to enhance students' self-learning abilities, cultivate their professional competence, and facilitate their personalized development.

Keywords: Modern Food Detection Techniques, Digital Empowerment, Teaching Model, Informatization, Smart Education

1. Introduction

The 21st century has ushered in the era of information and knowledge economy, with rapid advancements in information technology providing a solid technological foundation for the development of the knowledge economy. Furthermore, it has injected new impetus into the digitalization and modernization of education [1,2]. With the continuous development of information technology, educational digitalization, and educational modernization, the concept of smart education has gradually emerged [3]. Essentially, smart education is based on emerging technologies such as the Internet of Things and cloud computing, supported by computers and educational networks, with a focus on the construction of educational information infrastructure and the goal of resource development and management services. It aims to promote the comprehensive construction of digital campuses, technological campuses, and scholarly campuses, while constructing a modern educational system that is networked, digitalized, personalized, intelligent, and international[4]. The essence of smart education lies in utilizing information technology extensively to create a new educational landscape, fully leveraging educational resources in the field of education, promoting technological innovation, knowledge innovation, and the sharing of innovative achievements, enhancing the quality and effectiveness of education and teaching, and propelling the historical process of education reform and development. In summary, smart education is a vital component of national informatization, holding profound significance in transforming educational ideas and concepts, deepening educational reform, improving education quality and effectiveness, and cultivating innovative talents. It is an inevitable choice for achieving transformative development in education [5, 6].

Digital empowerment enables the utilization of advanced technology in teaching resources, showcasing the comprehensive quantity, application forms, usage time, and utilization space of teaching resources to be flexible and efficient. It enriches the teaching scenarios and learning contexts of instructional resources, enhancing the spatial experience of both online and offline learning, and elevating the intelligent interaction, communication, and feedback in higher education teaching and learning experiences [7, 8]. Situated teaching emphasizes the utilization of rich, specific, vivid, and effective scene applications in the teaching process, enhancing learning interests and improving learning quality. By constructing diverse and content-rich learning contexts in terms of the quantity and quality of teaching resources, time and space, modes, and effects, the quality of teaching resources is enhanced. Immersive learning leverages digital empowerment and learning contexts to provide students with rich teaching resources, facilitating their deep learning [9]. Immersive experiences focus on the learning and teaching experience of the curriculum and teaching resources, emphasizing the promotion of continuous learning and deep learning. By analyzing the cognitive aspects and quality requirements of teaching resources in diverse learning contexts, the immersive learning experience, and the management of teaching resources and its quality requirements, the digital empowerment of teaching resources is analyzed from multiple dimensions, enhancing the immersive experience and improving teaching quality [10].

Hence, exploring the construction of digitalized curriculum resources and enhancing the quality of courses, enabling every college student to engage in diversified learning approaches and immerse themselves in the curriculum, becomes an imperative subject worth investigating.

2. The Ideas of Constructing Digital Information Curriculum Resources and Improving Curriculum Quality

To begin with, it is crucial to establish a large-scale digitalized curriculum resource repository that is user-friendly, portable, and applicable for future use. This repository should be seamlessly integrated with student spaces, teacher spaces, and personal resource spaces, ensuring effective alignment with the resource platform. Subsequently, a diverse range of experimental courses should be developed, incorporating innovative teaching modes such as flipped classrooms and online micro-experiments. Additionally, personalized forms of experimental learning should be constructed, leveraging accumulated student learning data and utilizing modern information means to understand individual learning characteristics and provide tailored teaching assistance. By utilizing developed guided learning software, blended teaching projects, and interactive teaching systems, a project-based learning approach can be implemented, encompassing pre-class self-study, in-class discussions, and post-class feedback and expansion [11,12]. Lastly, the development of intelligent and gamified chemistry experiment safety games can aid students in mastering specific knowledge related to food science experiments. This initiative broadens their understanding of laboratory safety while enhancing independent thinking skills and fostering cooperative learning abilities.

2.1 Creating an Abundant Repository of Digitized Curriculum Resources

In the pursuit of integrating traditional theoretical and experimental teaching information systems using cloud technology, the plan is to introduce newly developed instructional videos, virtual operating systems, online learning mobile and PC applications, and optimize the educational cloud service platform. This will culminate in the creation of a mobile-connected digitalized teaching system [13]. Accompanied by a broader range of instructional resources, a large-scale repository for *Modern Food Detection Techniques* will be established, ensuring flexibility, post-application capabilities, and an enhanced user experience. Building upon this foundation, individual learning spaces will be constructed to encompass student-specific areas, teacher-specific domains, and personal resource zones, enabling effective integration with the resource platform.

2.2 Building an Immersive Virtual Simulation Experiment Teaching Platform

In the context of digitized education, collaborating with enterprises to develop instructional software for laboratory teaching will create a virtual simulation platform where courses, teaching, and learning seamlessly converge. Through virtual simulation experiments, realistic scenarios in production, operation, and management positions can be effectively recreated, enabling students to gain a deeper understanding of instrument structures, fundamental principles, testing procedures, and equipment usage. This, in turn, facilitates better comprehension of complex concepts that are often challenging to grasp solely from textbooks.

Within the realm of simulation-based teaching, students are able to store and retrieve the states and data of their virtual experiments, greatly enhancing the efficiency of their learning process. Serving as a learning tool, this platform effectively improves the quality of instruction by enabling the swift execution of complex and advanced technical experiments. Additionally, it provides robust support for the implementation of networked laboratory teaching and the cultivation of students' innovation capabilities. It represents a crucial breakthrough in deepening the reform of educational ideology, content, methods, means, and models, ultimately promoting the construction of the underlying framework of undergraduate institutions.

By leveraging a network-based virtual simulation laboratory, students can engage in hands-on experiments anytime and anywhere, utilizing convenient network computing environments such as mobile devices and personal computers. Through this virtual simulation environment, students will gain a vivid and comprehensive understanding of the production processes in the food industry. They will have the opportunity to apply the knowledge from textbooks to practical scenarios, resulting in a substantial improvement in the quality of laboratory teaching.

Through the implementation of virtual technology, both experimental instruments and consumables can be simulated, breaking free from the constraints imposed by the performance of physical laboratory equipment. This revolutionizes the process of laboratory teaching reform, allowing for adjustments in experimental projects and optimization of experimental designs. The traditional challenges associated with long construction cycles, large investments, limited equipment functionality, performance degradation, and inadequate updates and supplements can be effectively addressed. As a result, the normal progression of teaching can be guaranteed. Furthermore, substantial savings can be made in terms of manpower, material resources, and financial input in laboratory construction, thereby reducing the cost of experimental teaching.

2.3 Constructing a Multiform Digital Informationized Curriculum Teaching Model

Leveraging open educational resources, students are no longer confined to learning solely within the classroom. It is proposed to integrate and establish various curriculum resources, providing students with a comprehensive digitally-enhanced classroom experience. Through the comprehensive development and design of flipped classrooms, online micro-experimental courses, and other network-based, semi-open hybrid courses, open teaching across time and space can be implemented. This will create an interactive and experiential teaching model, offering students more personalized and effective support for their learning, ultimately constructing a personalized learning approach.

Traditional experimental teaching possesses several significant characteristics. Firstly, it involves a heavy workload in terms of experimental reports, implying that achieving good grades equates to both hard work and a substantial number of reports. Secondly, the content lacks specificity, as in traditional experimental teaching, each student's experimental report is identical, resulting in a lack of individuality in student assignments. Thirdly, the process of writing experimental reports lacks emotional support and interaction. Essentially, all basic experimental reports are completed and handed in to the teacher in order to receive feedback [14]. In the context of experimental education supported by big data, such learning and educational ecosystems will undergo transformations. It will be possible to accumulate individual learning data and employ modern information methods to understand the unique learning characteristics of each individual. Personalized teaching and assistive support can be provided based on these characteristics. Each student is a unique individual with different needs and aspirations. Personalized learning can address the individual differences of learners, such as abilities, knowledge, styles, preferences, and needs. Personalized experimental learning can offer diagnostic recommendations and learning services tailored to individuals, utilizing big data technology and intelligent algorithms to intelligently analyze the learning situation of each student. Based on the students' thinking patterns, learning interests, and learning hotspots and blind spots reflected in process-oriented evaluations, learning content and test questions can be delivered, truly achieving differentiated instruction. This will construct a customized learning model, thereby effectively enhancing students' efficiency in experimental learning.

2.4 Implementing Project-Driven Practical Teaching Content based on Digital Informatization

The implementation of networked teaching resources, such as tutorial software, blended teaching projects, and interactive learning systems, allows for project-based learning that encompasses pre-class self-study, in-class discussions, and post-class feedback and expansion. Students can engage in autonomous learning, inquiry-based learning, and collaborative learning through the tutorial system. They can also have in-depth interactions with teachers through the interactive learning system. For more complex scientific and engineering problems, students can engage in face-to-face discussions with their teachers. These multiple approaches create various channels for communication between teachers and students, forming an open teaching organization that breaks through the limitations of time and space, characterized by "students' autonomous learning", "in-depth exchanges between teachers and students on-site", and "collaborative learning through the interactive learning system". Moreover, organization and implementation of on-campus and off-campus project-based training are conducted. Under the undergraduate mentorship system, various projects that meet the needs of society are assigned to students, who then form research groups and apply to enter open laboratories to conduct project research and practice within a specified time frame. This process includes literature review, research plan formulation, product prototype development, testing, and writing research summary reports. It deepens and tests classroom knowledge, allows students to grasp systematic scientific research methods and development skills, transforms them from pure learning-oriented individuals into socially responsible individuals, enriches their work experience, and enhances their confidence in controlling their own career development trajectory. Additionally, close cooperation with renowned companies within and outside the area establishes joint training and practice bases, ensuring the deep integration of student internships, course design, and graduation projects with engineering practice. This approach efficiently utilizes the talent and advanced equipment resources of enterprises, creating a sound teaching environment for project-based learning both on and off-campus.

2.5 Promoting the Openness and Sharing of Experimental Courses at all Levels

The laboratory practices an open management system, providing space and flexibility for teachers and students to engage in comprehensive experiments, research experiments, and scientific research. This implementation achieves four major aspects of sharing: 1. Intra-campus sharing: A selection of virtual simulation experiment projects are fully open, providing comprehensive experimental teaching resources to students from relevant departments and majors within the campus. 2. Inter-campus sharing: Through collaboration with sister institutions via the education network, various types of network virtual simulation courses are continuously improved. Partial virtual simulation platforms are opened to teachers and students from other institutions, enhancing post-training opportunities for teachers and students while promoting a richer understanding of their respective disciplines and experimental processes. 3. Campus-industry sharing: The central laboratory establishes initial connections and collaborations with multiple enterprises, building an ecological network for virtual simulation application and maintenance. 4. Society sharing: With the core objective of sharing high-quality experimental teaching resources, the central laboratory continuously deepens and broadens its connections with social network resources, ensuring that university resources are ultimately oriented towards the society and serve the society.

2.6 Developing Digital Games for Laboratories Safety

Game-based education is an innovative and effective teaching method that sparks students' interest in learning. It is specifically developed for specific educational purposes, supported by mature educational theories, and achieves a balance between education and entertainment [15,16]. Good games can guide students to cultivate their interests, problem-solving abilities, and dialectical thinking skills through collaboration and interaction. In this project, we propose to develop a series of mini games for experimental safety. By guiding students to complete laboratory safety tasks through exploration and cooperation in the gaming process, we aim to help students acquire specific knowledge of chemical experiment safety, broaden their understanding of laboratory safety, enhance their independent critical thinking skills regarding safety, and foster their collaborative learning abilities, thus improving the learning efficiency of laboratory safety knowledge.

2.7 Carrying out Joint Training Programs for Teachers and Students

Projects for communication, professional development, and student internships and practical training can be conducted, with a focus on the application of information technology. The aim is to explore the integration of digital online resources with classroom teaching in a versatile manner and the construction of multidimensional experimental teaching resources. This approach helps bridge the gap in uneven experimental resources and conditions, and fosters a "community of practice between teachers and students". In doing so, development is supported from the perspective of talent cultivation.

3. Conclusions

The key to developing digital information curriculum resources and improving the quality of courses lies in enriching the digital information curriculum resource repository. This can be achieved by constructing virtual simulation laboratories, virtual simulation projects, and cloud-based mobile teaching software to form a complete set of teaching resources specifically designed for the course *Modern Food Testing Techniques*. This teaching model breaks through the limitations of time and space. High-quality resources for teaching are made available 24/7 through the implementation of project-based experiments and practical teaching on online platforms. By complementing both online and offline teaching, the integration of in-class instruction, extracurricular teaching, virtual simulations, and practical operations is achieved, creating an optimal learning environment and context. This allows for the maximization of accessibility to project-based teaching resources and the facilitation of the sharing of high-quality societal resources.

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