Construction and Application of Digital Instructional Resources of Mathematics Course in Secondary Vocational Schools under the Background of AI

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Abstract: Under the background of the rapid development of artificial intelligence (AI), mathematics teaching in secondary vocational schools is facing the need for change. This paper focuses on the digital instructional resources of mathematics courses in secondary vocational schools under the background of AI, and discusses its construction and application. By combing the relevant theories, this paper analyzes the opportunities and challenges faced by the construction, and puts forward the construction strategies from the aspects of resource types and AI-based characteristics. Strategies include customizing individualized resources with AI, optimizing resource presentation forms, focusing on systematic and dynamic updating, etc., and elaborated in detail through the key points of digital instructional resources construction of mathematics in secondary vocational schools. At the same time, this paper puts forward the application mode of classroom teaching and after-class autonomous learning, with specific examples. It is found that the scientific and reasonable construction and application mode can improve the quality of mathematics teaching in secondary vocational schools, meet the individualized learning needs of students, and provide a feasible path for the development of mathematics teaching in secondary vocational schools in the AI era.

1. Introduction

With the rapid development of information technology, AI has been deeply integrated into all fields of society, and the education field is also facing unprecedented opportunities for change [1]. Secondary vocational education is an important position to cultivate technical and skilled talents, and its mathematics curriculum is very important for students' logical thinking and problem-solving ability [2]. However, the traditional mathematics teaching mode in secondary vocational schools has many limitations, which can not fully meet the diverse learning needs of students, and the rise of digital instructional resources provides a new way to solve this dilemma [3].

Under the background of AI, the construction and application of digital instructional resources of mathematics courses in secondary vocational schools have significant practical significance [4]. On the one hand, it can improve teaching efficiency and quality. Digital resources, with its rich forms of expression, such as vivid animations and vivid videos, present abstract mathematical knowledge intuitively, which is helpful for students to understand and absorb and stimulate their interest in learning [5]. On the other hand, it meets the needs of individualized learning [6]. AI can accurately analyze students' learning data, push adaptive learning resources for each student, realize teaching students in accordance with their aptitude, and meet the learning rhythm and ability level of different students.

At present, many secondary vocational schools have tried to build digital instructional resources, but they still face problems such as uneven quality of resources, lack of systematicness, low degree of fit with teaching practice and poor application effect [7]. International exploration in related fields started earlier, and some countries have built a relatively mature digital instructional resource system, and made some achievements in individualized learning path planning and intelligent counseling. However, due to the differences in education system and cultural background, its

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experience cannot be directly copied.

In view of this, it is imperative to deeply study the construction and application of digital instructional resources of mathematics courses in secondary vocational schools under the background of AI. Through this study, the purpose is to explore a set of scientific and effective strategies for resource construction and application, to provide a useful reference for improving the quality of mathematics teaching in secondary vocational schools and promoting the all-round development of students, and to help secondary vocational education achieve high-quality development in the AI era.

2. Related concepts and theoretical basis

As an important part of the curriculum system of secondary vocational education, secondary vocational mathematics curriculum aims to cultivate students' basic mathematics literacy and lay the foundation for their subsequent professional curriculum study, career development and lifelong learning [8]. It not only covers basic mathematical knowledge and skills, but also pays attention to the combination with professional needs, emphasizing the application of mathematical knowledge in practical professional scenes.

Digital instructional resources refer to the sum of all kinds of resources, including text, image, audio, video, animation and software, which can be run in multimedia computer and network environment after digital processing [9]. These resources have the characteristics of convenient storage, rapid dissemination and strong interaction, which provide rich materials and diversified means for teaching.

On the theoretical level, constructivist learning theory emphasizes learners' active constructive role in the learning process. Students do not passively accept knowledge, but actively build their understanding of new knowledge through interaction with the environment on the basis of existing knowledge and experience. In the construction and application of digital mathematics instructional resources in secondary vocational schools, interesting and exploratory resources can be designed to guide students to explore independently and promote knowledge construction.

Cognitive load theory focuses on the cognitive load of learners in the learning process [10]. Too much cognitive load will hinder the learning effect, so digital instructional resources should organize and present information reasonably to avoid information overload. For example, when designing mathematics video resources, reasonably arrange the rhythm of explanation, highlight the key points, reduce the interference of irrelevant information, and ensure students to learn efficiently under moderate cognitive load [11]. These theories provide a solid theoretical support for the construction and application of digital instructional resources of mathematics courses in secondary vocational schools.

3. Strategies for the construction of digital instructional resources of mathematics courses in secondary vocational schools under the background of AI

Under the wave of AI, the construction of digital instructional resources of mathematics courses in secondary vocational schools needs to make full use of the advantages of new technologies to meet the actual teaching needs. The following describes the construction strategy from multiple dimensions.

AI systems first need to customize differentiated learning resources for students with different learning levels and styles based on their personalized analysis capabilities. AI can collect students' daily learning data, such as homework completion and classroom interaction performance, and analyze students' knowledge weaknesses and learning preferences. Accordingly, teachers can make layered instructional resources in a targeted way. For students with weak foundation, more micro-videos can be provided to explain the basic knowledge; For students who have spare capacity for learning, design extended case materials of mathematics application. Secondly, the intelligent presentation technology of AI is used to optimize the form of resources. Traditional text resources can combine dynamic graphics, animation and other elements to visualize abstract mathematical

concepts. Taking the change of function image as an example, this paper shows the dynamic evolution of the image when the parameters in the function change through animation, which helps students understand the nature of the function intuitively. At the same time, virtual reality and augmented reality technology are introduced to create immersive mathematics learning scenes, such as simulating geometric measurement problems in building construction scenes, to enhance students' learning interest and participation. Educational institutions should pay attention to the systematic and integrated nature of resources, and achieve this goal by building a comprehensive resource library that covers curriculum standards, textbook systems, teaching objectives, and evaluation mechanisms. The various components of this resource library need to be closely related, so that teachers can flexibly select and combine resources according to actual teaching needs. For example, the resource library can be organized into chapters, integrating elements such as knowledge point explanation videos, supporting exercises, and expanded reading materials to form a complete teaching unit resource package. In addition, it emphasizes the dynamic updating and feedback mechanism of resources. AI can monitor the new trends and new cases in the field of education and students' learning feedback in real time, and update the content of resources in time. Teachers optimize and adjust resources according to students' evaluation of the use of resources, such as whether the difficulty of resources is appropriate and whether the explanation is clear. The key points of digital instructional resources construction of secondary vocational mathematics are shown in Table 1:

Table 1 Key Points of Digital Instructional Resources Construction of Secondary Vocational Mathematics

Resource type	Key points of construction	Example	Suitable learning scenario	Expected learning effect
Micro video	510 minutes short duration, focusing on a single point of knowledge.	Video and animation of trigonometric function induction formula show the relationship between angle and function value	Preview before class, explain knowledge in class, and review and consolidate after class.	Students understand the principle and application of trigonometric function induction formula
Online test questions	Concise language explanation with animation assistance.	Knowledge points of general formula of series, setting up foundation, improving and expanding questions.	After-class knowledge consolidation and stage self-testing	Students can draw inferences from others by mastering the related knowledge of the general formula of series.
Virtual scene	Highlight key points, contrast examples and strengthen understanding.	Virtual scene of mechanical manufacturing specialty, measuring parts size and calculating.	Practice simulation in class and expanding application after class	Students apply mathematical knowledge to professional practice to improve their practical ability.
Electronic teaching materials	Set questions in layers according to knowledge points and difficulty.	Electronic teaching materials of mathematics in secondary vocational schools with animation and video explanation.	Daily study and review.	Students learn mathematics knowledge systematically, which is convenient for marking key points independently.
Interactive courseware	Equipped with detailed problem-solving ideas and answer analysis.	Interactive courseware of function image properties, operating and displaying image changes	Knowledge inquiry and group cooperative learning in class	Students deeply understand the nature of function and cultivate their ability of inquiry and cooperation.

Through the above-mentioned construction strategies and key points, we will create digital instructional resources of mathematics courses in secondary vocational schools that meet the needs of the AI era and provide strong support for improving teaching quality.

4. Application mode of digital instructional resources in secondary vocational mathematics curriculum

In the process of AI empowering mathematics teaching in secondary vocational schools, it is very important to construct a scientific and effective application mode of digital instructional resources. This can not only improve the teaching effect, but also meet the individualized learning needs of students. The related application modes will be described in detail below, with the help of diagrams.

4.1. Application mode in classroom teaching

In secondary vocational mathematics classroom, digital instructional resources can be organically integrated with traditional teaching to help teachers achieve teaching goals. Teachers choose appropriate resources to carry out teaching according to the course content and the actual situation of students.

Taking the function chapter as an example, in the course introduction, teachers can play an animated video about the trend of economic growth (Figure 1), which can stimulate students' interest in learning and guide them to think about the application of functions in actual scenes by showing the intuitive embodiment of the function relationship in real life. In the knowledge explanation stage, with the help of interactive courseware made by dynamic geometry software, the changes of function images are displayed in real time, so that students can explore the properties of functions independently and deepen their understanding of knowledge by operating courseware. In the process of consolidating exercises, teachers can push targeted exercises in real time according to students' learning progress and ability by using the online question bank system, so that students can know their own learning situation in time.

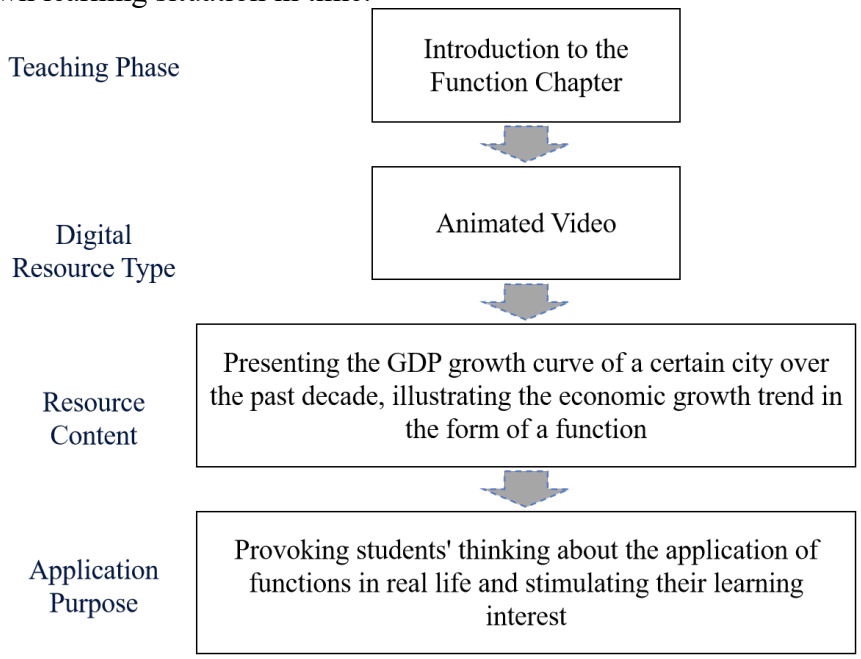

Figure 1 Application of digital resources in classroom introduction

4.2. Application mode in after-class autonomous learning

After class, students can learn independently with the help of digital instructional resources according to their own learning progress and needs. AI learning platform can push individualized learning resources for students according to their performance in classroom study and homework.

Suppose that students have a poor grasp of the application of general formula in an after-school assignment about sequence. The learning platform will automatically analyze students' mistakes and recommend a series of targeted learning resources for them (Figure 2), such as micro-video explanation on the derivation and application of the general formula of series, exercises of the same type and detailed analysis. Students can make up for the shortcomings of knowledge by watching

videos, reorganizing knowledge points, and then practicing and consolidating. At the same time, the learning platform also has a learning community, where students can exchange learning experiences and share learning resources, and ask teachers or classmates for advice when encountering problems, thus forming a mutual learning atmosphere and promoting common progress.

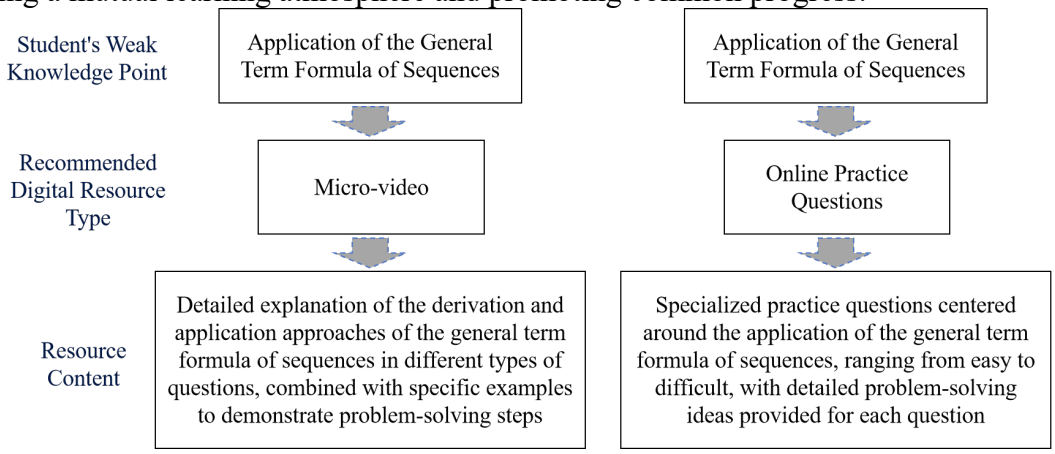

Figure 2 Recommendation of individualized learning resources after class

To sum up, through classroom teaching and after-class autonomous learning, we can give full play to the advantages of digital instructional resources of mathematics in secondary vocational schools under the background of AI, improve students' mathematics learning effect and ability, and lay a solid foundation for their career development and lifelong learning.

5. Conclusions

This paper focuses on the construction and application of digital instructional resources of secondary vocational mathematics courses under the background of AI, and has achieved a series of results. In the aspect of construction strategy, resources are customized for students of different levels with the help of AI individualized analysis ability, resources are enriched and diversified with intelligent presentation technology, systematic integration of resources is emphasized, and a dynamic updating and feedback mechanism is established. These strategies provide a direction for building high-quality digital instructional resources. This paper clearly shows the key points of the construction of all kinds of resources through the Key Points Table of Digital Instructional Resources of Mathematics in Secondary Vocational Schools, which has strong operability.

In the application mode, the integration of digital instructional resources and traditional teaching in classroom teaching plays an important role in leading-in, explaining and practicing. After class, students use the AI learning platform to obtain individualized resources for autonomous learning, and at the same time, the learning community promotes mutual assistance and communication. Through concrete examples, the application of digital resources in classroom lead-in and the recommendation map of individualized learning resources after class, this paper presents in detail the operation mode of application mode in actual teaching.

To sum up, AI brings new opportunities for the construction and application of digital instructional resources of mathematics courses in secondary vocational schools. Scientific construction strategy and reasonable application mode are helpful to improve the effect of mathematics teaching in secondary vocational schools, meet students' individualized learning needs and lay a good foundation for their career development. It is necessary to continue to pay attention to the development of AI technology in the future, continuously optimize the construction and application of resources, and promote the continuous improvement of the quality of vocational mathematics teaching.

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