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Research on Countermeasures of Construction and Development of Digital Educational Resources from the Perspective of Collective Intelligence

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Abstract

With the deepening of education informatization project, the construction of digital education resources is of great importance in order to realize the deep integration of Internet and education. How to promote the construction and development of China' s digital education resources has become a key issue in the Action Plan of Education Informatization 2.0. There are many problems in the use of high-quality digital education resources in the construction and development of digital education resources in China. This paper discusses how to use collective intelligence to integrate high-quality and personalized digital education resources, and puts forward corresponding countermeasures, in order to improve the construction and application efficiency of digital education resources.

Keywords

Education informatization; Collective intelligence; Digital education resources.

1. Introduction

To promote the fusion of Internet education development, the construction of network, digital, intelligent, lifelong education system, in 2018 the Ministry of Education issued by the action plan for "Education Informatization 2.0 Action Plan" in explicitly pointed out that, by 2022 basic implementation "three complete projects a big" development goals, to build the Internet education platform. The plan will implement a large resource sharing plan for education and realize the transformation of education resources from "dedicated resource services" to "large resource services"[1]. In the "Guidance on Promoting the Construction of New Educational Infrastructure to Build a High-Quality Education Support System" issued by the Ministry of Education and other six departments in 2021, it is mentioned that the new educational infrastructure should focus on the construction of digital resources, optimize resource supply services, innovate the supply mode, and improve the quality of supply [2]. It can be seen that digital education resources can promote education informatization reform and provide a digital base for high-quality education development. However, with the continuous proliferation of educational resources gathered by various platforms, the contradiction of educational resources has changed from insufficient resources to a mismatch between supply and demand, which cannot meet the needs of learners. This is mainly because the construction of digital educational resources lacks social practical guidance, does not realize the importance of group wisdom in the construction of educational resources, and ignores the allocation of educational resources under the perspective of group wisdom. The article first systematically expounds the importance of group wisdom in the construction of digital education resources in China, then deeply analyzes the current problems in the construction of domestic digital education resources, considers how to use group wisdom to integrate high-quality and personalized resources in conjunction with the problems, and then proposes countermeasures for the

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construction and development of digital education resources in order to improve the construction and application effectiveness of digital education resources.

2. Collective Intelligence

2.1. The Connotation of Collective Intelligence

In 1964, William Morton Wheeler, an American entomologist, observed the foraging behavior of ants, and found that a colony of ants could make an orderly division of labor and cooperation, and the colony would "listen" to the opinions of many ants when making collective decisions. "The concept of group intelligence was developed by the American entomologist William Morton Wheeler, who observed the foraging behavior of ants [3]. The transition from animals to human groups has led to the formation of various kinds of group wisdom through interactive communication and cooperative cooperation among groups. Later, with the progress and development of the Internet, group wisdom has received extensive attention from many scholars, and researchers at home and abroad have analyzed the connotation of group wisdom from different angles. Leimeiste believes that group wisdom is the ability of the group to learn, understand and adapt to the environment based on existing knowledge, and this ability can help the group to better adapt to environmental changes [4]. Shu Hang defines collective intelligence as the group intelligence or ability shown by group members in the process of participating in collaborative inquiry, problem solving, and reaching consensus ideas in order to accomplish a common learning task [5]. Professor Jianping Zhang believes that collective intelligence is not a simple sum of individual minds in cyberspace, but an effective combination of intelligence and thinking distributed on the Internet, a collaboration and aggregation of individual intelligences [6]. The focus of each scholar on the definition of the concept of collective intelligence is slightly different, but the common point is that collective intelligence is not the simple sum of each individual, but the sum of wisdom and ability generated by the interactive communication between a large number of individuals. The digital educational resources generated by collective intelligence will surpass the digital resources generated by individual self-construction.

2.2. The Process of Generating Collective Intelligence

Collective Intelligence originates from individuals, is formed in the process of learning community interaction, and can have a profound impact on the cognition of individuals in the group. The group educational resources thus formed can better solve the main problems in the construction and application of digital educational resources in the past. The process of generating collective intelligence is a development process from individual to group and from simple to complex. Mao Can believes that the formation of collective intelligence is divided into three stages, which are: the dispersion stage, the cohesion stage and the integration and innovation stage. The collective intelligence 's is the effective combination of individual intelligence, the cooperation and cohesion of individual intelligence [7], see Figure 1. Shu Hang et al. believe that the process of generating collective intelligence is to take individual cognition as the starting point, group intelligence coalescence, and continuously integrate external information, so as to form collective intelligence. The formation process of group intelligence is a dynamic, spiraling cyclical process [5]. The process of generating collective intelligence is the knowledge innovation between individuals in the group through interactive communication, and individual knowledge generates collective intelligence in the interaction with the group. The collective intelligence realizes the high concentration of individual cognition, and the meaning construction of knowledge by individual learners is no longer the end of learning, but the generation of collective intelligence and thus the innovation of individual cognition. The main creator of digital educational resources is each individual learner, and individuals in the

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group can not only promote the sharing of high-quality educational resources, but also realize the creation of high-quality educational resources.

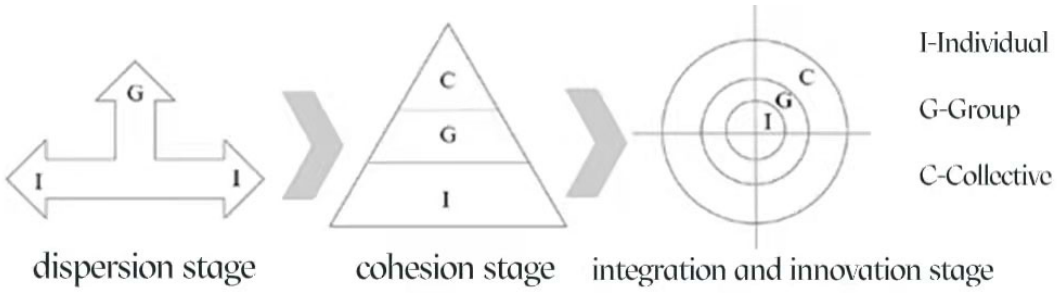

Figure 1. The three stages of Collective Intelligence formation

2.3. The Importance of Collective Intelligence in the Construction of Digital Educational Resources

(1) Collective Intelligence can realize the diversification of resource construction subjects. By collecting ideas from the crowd and sharing knowledge and energy individually, we can both enrich the supply body of digital educational resources and mobilize the demanders of resources, bridging the gap between resource suppliers and users. Wikipedia, for example, is a multilingual, free encyclopedia edited by countless contributors from around the world, emphasizing group cooperation and intelligence rather than individualism [8].

(2) Collective Intelligence can improve the quality of digital education resources. Quite a lot of resources in the existing platform are in ruins, for example, Zhaojie Hao found through his research that many national fine courses are in a submerged state after the construction is completed and are not effectively used [9]. From the perspective of collective intelligence, group voting can be used to improve the quality of resource construction. When it is necessary to judge a certain topic, group voting can be adopted. For example, in Zhihu and Douban, for a certain educational question or book review, the crowd can either cooperate with each other to answer or express their own opinions, and the answers are sorted and displayed by the high or low likes [10].

(3) Collective Intelligence can solve the problem of single mode of resource supply. The current supply mode of digital education resources is relatively single, mainly using a top-down approach, lacking subsequent resource updates and maintenance. Therefore, the supply mode of digital education resources needs to be optimized. collective intelligence can combine top-down and bottom-up supply methods, making resource construction closely integrated with market demand and giving full play to learners' motivation as users for resource construction. For example, the largest group-created textbook project ever undertaken in the United States was done through collaborative book management, with 1,000 co-creators from nearly 90 countries. Creating digital educational resources through collective intelligence can create more products or services for those in need at low cost and high quality [11].

(4) Collective Intelligence can enhance the sharing and feedback of resource building. The current digital education resource platforms have a low degree of sharing and lack of post-service. For the low degree of sharing, it is mainly because government-led resource platforms are available at national and provincial levels, and different enterprises in the market have also built their own resource platforms, and the number of resources interconnected between different platforms is small, which cannot realize resource sharing in a large scale. In the post-service of digital education resources, there is a lack of feedback to learners, and most of the resource construction is one-time, rarely involving later additions, modifications, and improvements. Although a large number of resources are provided, the support services are in urgent need of solution. Collective Intelligence can bring together resources from different

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platforms and facilitate learners' participation in the construction of digital education resources.

3. Problems in the Construction and Development of Digital Education Resources in China

To promote the education informatization 2.0 action plan, China's public service platform for education resources adopts the strategy of "building and improving while promoting application" to promote the normal development of digital education resources application. However, there are still problems in the construction, development and application stages of digital education resources, such as "construction, no application, difficult to share".

3.1. Resource Building "Resource Silos" Phenomenon

At present, the platform resources used by many regions or schools are relatively independent, and there are problems such as scattered distribution of resources and duplication of construction, insufficient construction of special educational resources, low-level duplication of construction of the same content, and self-contained system of resources on each platform, which neglects the common construction and sharing of digital educational resources and makes it difficult to realize the integrated construction of resources. Many resources have become "information islands", making the bridge between resource creators and consumers cut off and unable to achieve cross-regional and cross-institutional sharing of high quality, which to a certain extent limits the interoperability and mutual sharing of digital education resources. Developing a sustainable platform conducive to digital education resources is a realistic problem to be faced by the construction of digital education resources at present. Only in this way can we eliminate the isolation and dispersion of digital education resources and promote the development process of education informatization.

3.2. Lack of Focus on Learners in Resource Applications

Learners are the most important users of digital education resources, and the effect of their application of digital education resources can not only directly reflect the quality of digital education resources construction, but also provide a vane for the updating and iteration of digital education resources in China. However, in the construction of digital resources, most of them are built from top-down, led by the government and assisted by enterprises, and the active participation of learners is low, resulting in the production of resources that cannot meet the needs of learners. There are different types of learners who participate in online learning, such as collaborative learners, passive learners, and active learners. Different types of learners have different motivations and requirements, and the online resources they need also differ greatly. Therefore, in the construction and application of digital education resources, the needs of learners should be fully considered, and learners should become one of the main subjects of resource construction. Only by allowing learners to actively participate in the construction of digital education resources can the problem of unbalanced supply and demand of digital education resources be fundamentally solved.

In addition, the collective intelligence generated by learners in the process of using digital educational resources can provide valuable references for researchers to dissect the teaching and learning process. For example, by analyzing behavioral data related to group discussions of digital educational resources, the psychological, emotional, and cognitive states of learners can be inferred, which provides powerful insights into the learning process of learners.

3.3. Lack of Precise and Personalized Push in Resource Applications

With the increase in the number and expansion of digital educational resources in the network, learners have richer digital resources, but there are still more problems in the application. For

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example, when digital educational resources are applied, they mainly target most beneficiary groups and can meet the needs of most learners for resources, but they cannot effectively meet the individual needs of learners, and each learner needs to search for a huge amount of educational resources in order to complete resource allocation[12]. Secondly, learners need a lot of time to obtain information because their ability to collect information is relatively weak, and when they collect different kinds of resources, it is especially important to find the resources they want from a wide range of information, and obviously many learners do not have such ability, and the resource recommendations of some learning websites are not accurate, so accurate personalized recommendations are especially important.

3.4. Lack of Unified Standards and Standardization Mechanism for Resources Integration

The lack of unified standards and specifications in the construction and integration stages of digital education resources is the main reason for the scattering of resources. The development subjects of digital education resources are mainly scientific research institutions, universities and enterprises, etc. Different interests provide resources, so there is no unified standard and normative mechanism that requires digital resources to be constantly updated during construction and integration. In addition, with the development of technology, resources of different forms and attributes are constantly emerging, and the resources cannot be shared in a standardized space, resulting in the existence of a large number of digital education resources of different types and low values in the network. In developed regions, digital resources are affected by local protectionism, and high-quality digital education resources cannot be disseminated and used on a large scale [13]. Therefore, it is especially important to establish a unified standard and specification mechanism to effectively improve the application of digital education resources.

There are two main reasons for the above problems. From the macro level, there is a lack of theoretical research and top-level design for designing high-quality digital education resources. It requires comprehensive coordination, systematic promotion and scientific management. From the micro level, resource producers lack deep consideration for educators and learners in the production process, that is, the actual needs of learners in educational practice activities. Effective ways of building digital education resources can be sought from the group wisdom perspective.

4. Measures for the Construction and Development of Digital Education Resources under the Perspective of Group Wisdom

4.1. Establishing a "Public Build and Share" Digital Education Resource Construction Model

At present, digital education resources construction mode is mainly divided into spontaneous construction mode and common construction and sharing mode, both of which are not conducive to the construction of learning society and scientific development of lifelong learning, and a new digital resources construction mode must be re-established, that is, "public construction and public sharing mode" [14].The digital education resource allocation model has been changed from common construction and sharing to public construction and sharing [15]. It emphasizes the government's role in coordinating and coordinating, and focuses on the extensive participation of learners and the collective wisdom of the public, which is conducive to the construction of digital education resources close to the actual application needs of learners. What is different from the previous "public construction and sharing" is that "public construction and sharing" is funded by the government to organize the construction of learning resources, which can be used as public basic resources for lifelong learning by all people.

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However, "public construction and sharing" is funded by certain organizations, and is generally limited to the use of members within the organization or in a small area, and cannot be used by the whole people. The "public construction and sharing" is a nationwide selection of learning resource development teams, which not only develops high-quality learning resources for all people to receive high-quality education, but also promotes the sharing of high-quality resources in universities. The "public build and share" resource construction model can lead the construction of high-quality resources nationwide, eliminate the production of bad resources, and form a high-quality resource library group, which facilitates the use and scientific management of learning resources.

4.2. Building Crowdsourcing of Digital Education Resources to Enhance Monitoring of Learners

By collecting crowdsourcing tasks related to digital educational resources and using these tasks to build digital educational resources crowdsourcing provides learners with real-world hands-on experience in educational activities. Learners can also access the knowledge of the group through resource crowdsourcing. Learners and groups can share their knowledge with each other and can express their opinions about problems they have encountered to help others learn better. The group can also address individual learners' questions and provide solutions or relevant tips. Through crowdsourcing learners' interactive learning activities, learners learn and teach each other, creating a learning community together and increasing learner engagement.

4.3. Investing in Personalized Positioning and Precise Push Services

The services of digital education resources emphasize on providing digital resources that meet the personalized needs of different users. Among the personalized services provided by digital educational resources, the more mature ones include collaborative filtering recommendation, content-based recommendation and knowledge-based recommendation[12].Collaborative filtering recommendation uses the past browsing and retrieval characteristics of the registered user groups of the resource library to predict the resources that are most likely to interest the current users. Content-based recommendation, on the other hand, matches resource features with user preferences and requires two types of information for implementation, i.e., descriptions of resource features and personal records of user interests. Knowledge-based recommendation is a recommendation method that calculates the similarity between user needs and resources and selects the resources with high similarity to recommend to users. Accurate positioning and pushing of digital education resource services refers to collecting users' data, extracting their personal characteristics, identifying their teaching and learning scenarios, pinpointing their teaching and learning needs, and pushing the required digital education resources for them. The precise positioning of digital education resource services focuses on combining learners' historical data and records of individual characteristics in the database to push personalized resources for them.

4.4. Develop Integration Standards and Practice Group Governance of Digital Education Resources

Standards are activities that establish rules for potential or actual problems that can be commonly and repeatedly used in order to achieve the best order within a certain range. Establishing a unified integration standard standardizes the governance of digital education resources emerging from collective intelligence. Learners can share resources in a standardized space so that high-quality digital education resources can be disseminated and used on a large scale. The establishment of unified integration standards allows for better practice of group governance of digital education resources.

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5. Conclusion

Digital education resource construction is an important foundation for building a new education system and promoting the development of education informatization, and expanding the production and sharing of high-quality digital education resources is an important way to achieve high-quality development of education. Educational resources should be oriented to the group, and the group can participate in the construction of digital educational resources and then serve the group, practicing the process of resource construction and resource service of knowledge and action. Innovate new network channels for digital education resources allocation, improve the construction quality of education resources, meet the personalized needs of learners, promote education equity, optimize education resources allocation, and lay the foundation for the stable and sustainable development of education informatization.

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