

A Technology-Enabled Concept of Open Educational Resources Development in Primary and Secondary Schools

-- Intelligent Aggregation and Personalized Recommendation of Educational Resources

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Abstract: With the rapid development of technology, education is facing unprecedented changes. The development of technology has led to a new era in educational resources for primary and secondary schools, providing students with richer, more flexible, and more personalized learning experiences. In this paper, we will elaborate on the strategies of technology-enabled primary and secondary education resources in terms of digital education resources, quality course resources, teacher training and development, teaching tools based on IT application, education resource sharing, innovative laboratory construction, home-school cooperation resources, and education equity resources. This is in order to achieve intelligent aggregation and personalized recommendation of educational resources, so as to optimize the allocation of educational resources, improve the quality of teaching, and stimulate students' interest in learning. Through the implementation of these strategies, it is expected that the efficiency of primary and secondary school educational resources will be improved, enhancing the results of teaching, meeting the personalized needs of students, and promoting the modernization of education.

Keywords: Technology-enabled; Primary and Secondary Schools; Open Education; Teaching and Learning Resources.

1. Introduction

David Perkins, senior Professor at the Harvard Graduate School of Education, wrote in *Future wise: Educating our children for a changing world*:

Perhaps we need a new perspective on education, one that focuses on both the known and the unknown. Perhaps we need a more "future-wise" educational perspective that strives to foster curiosity, inspire wisdom, enhance autonomy and responsibility in a complex and changing world, and lead students to pursue meaningful learning actively, broadly, and with vision. [1]

The deep integration of the new generation of artificial intelligence (AI) within various areas of society has created a new intelligent environment, which has changed the way people behave and think and reshaped the concept of time and space for communication, which profoundly affected people's life, work and learning.

With the increasingly richer application of AI, every member of our society not only needs to know how to use more intelligent tools, but also needs to understand and creatively solve problems with a mindset that is in line with the current era while possessing the ability to collaborate and innovate with these intelligent tools. Therefore, in primary and secondary education, it has become a new task for educators to improve the AI competency of all students and enhance their adaptability and creativity in an intelligent environment. With the increasing abundance of educational resources, how to effectively integrate and utilize these resources has become an important issue for schools. At the same time, with the growing demand for personalized education, how to meet the personalized needs of different students has also become an important goal of educational resource development. Therefore, this paper proposes strategies for technology-enabled primary and secondary

educational resource development, which aims to realize intelligent aggregation and personalized recommendation of education resources, effectively improve the effect and quality of open education resources in primary and secondary schools, and provide students with better quality education resources and services. It can also promote cooperation and sharing among educational institutions and promote the balanced and universal development of education.

2. Content of Open Educational Resources Development in Primary and Secondary Schools

2.1. Teaching Content Resources Building

Teaching content resources are an important part of the development of open educational resources in primary and secondary schools, mainly including curriculum materials, teaching courseware, experimental and practical training resources, subject competitions and other resources. These resources are integrated and shared through digitalization, networking, multimedia and other means to form an open teaching content resource base that meets the teaching needs of different disciplines and levels.

2.2. Teaching Aid Resources Building

Teaching aid resources mainly include resources such as teaching equipment, experimental and training rooms, libraries, online learning platforms and so on. These resources, through optimized allocation and sharing, provide a full range of support and services for teaching activities and improve teaching quality and efficiency. For example, with the development of science and technology, the carrier, presentation mode and application scene of teaching materials have undergone great changes, from paper-based teaching materials to electronic teaching materials (e-textbooks, e-

bookbags) and digital teaching materials, with new kinds of teaching materials being introduced steadily (as shown in figure 1). In addition, teachers are also a key factor in the development of teaching aid resources, which mainly include human resources such as excellent teachers, backbone

teachers and subject leaders. These resources are shared and upgraded through training, exchanges and cooperation to promote teachers' professional development and educational quality.

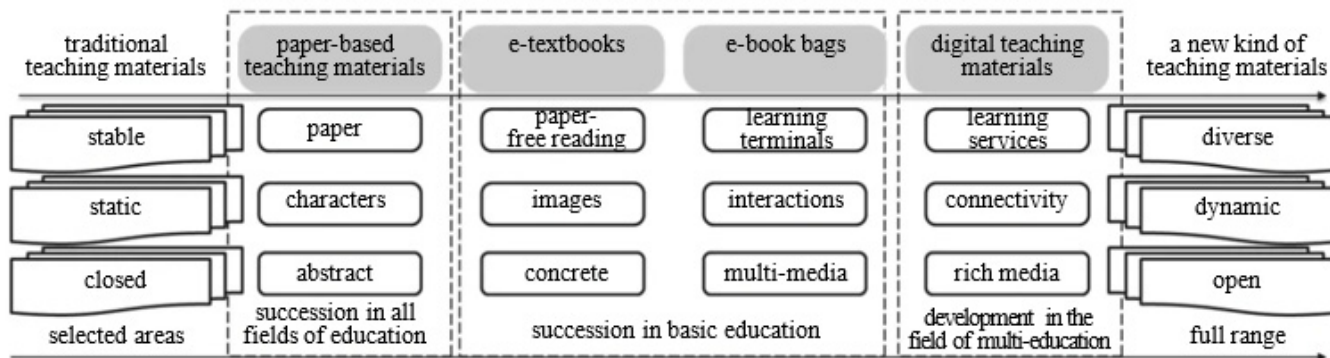


Figure 1. Different stages in the development of teaching materials [2]

2.3. Faculty Management Resource Building

Faculty management resources are an important guarantee for the development of open educational resources in primary and secondary schools, which mainly include resources for school management, teaching management, student management and other aspects. These resources are optimized and upgraded by means of IT application and intelligence to improve management efficiency and provide a strong guarantee for teaching activities. Meanwhile, parents are also an important participating force in the development of teaching management resources, which mainly include resources on parents' participation in school management and cooperation between families and schools. These resources are shared and exchanged through a variety of forms and channels to promote effective articulation and interaction between family education and school education, and jointly promote the healthy growth of students.

2.4. Educational Research Resources Development

Educational research resources are an important form of support for the development of open educational resources in primary and secondary schools, which mainly include

educational teaching research, educational technology research and educational reform. These resources, through sharing and exchange, promote innovation and development in education and teaching, and promote the improvement of the overall level of daily school operations. [3]

2.5. Resources for Building Campus Culture

Campus cultural development resources are an important part of the development of open educational resources for primary and secondary schools, mainly including resources for campus cultural activities, arts and cultural competitions, sports competitions and so on. These resources are promoted and exchanged through a variety of forms and channels to create a positive, healthy and lively campus cultural atmosphere and to promote the all-round development and comprehensive quality of students.

3. The Significance of Engaging with Technology for the Development of Open Educational Resources in Primary and Secondary Schools

3.1. Optimizing the Allocation of Resources

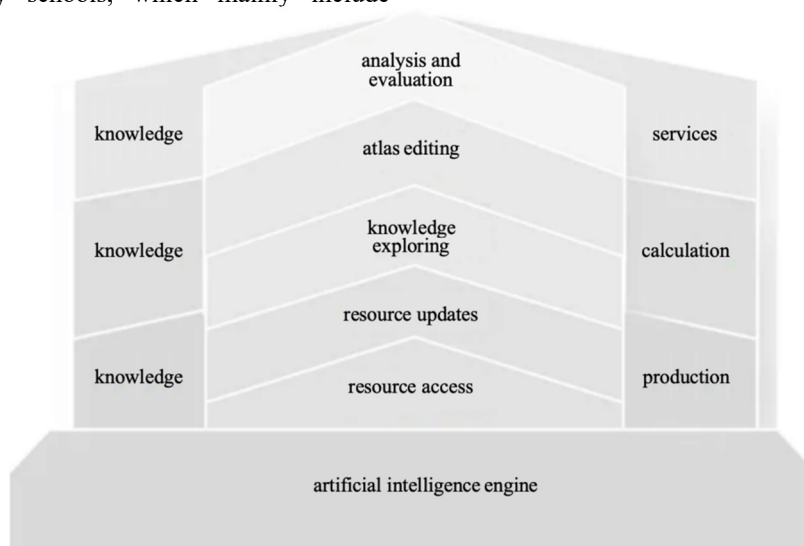


Figure 2. Key technologies in teaching and learning resources allocation [5]

Engaging with technology can help primary and secondary schools optimize the allocation of educational resources and improve the efficiency of resource application. Through digitalization, networking and other means, various educational resources can be integrated and shared, avoiding duplication and waste of resources. At the same time, engaging technology can also achieve dynamic updating and optimization of resources, ensuring the timeliness and availability of educational resources. This not only improves the quality and efficiency of teaching, but also reduces the cost of education and improves its effectiveness. [4]

3.2. Promoting Equity in Education

Technology engagement has provided more equitable opportunities and platforms for the development of open educational resources in primary and secondary schools. Through digitalization, networking and other technological means, high-quality educational resources can be replicated and disseminated, enabling more students to enjoy quality educational resources and services. At the same time, engaging with technology can also provide personalized learning plans and resource recommendations for students in different regions and at different levels, so as to achieve tailor-made education. This will not only narrow the education gap between urban and rural areas and between regions, but also create more opportunities and possibilities for students' future development.

3.3. Stimulating Students' Interest

Technology engagement can provide students with colorful learning resources and experiences through multimedia, virtual reality and other technological means. For example, through virtual laboratories, interactive games and more, students can acquire knowledge in an enjoyable atmosphere, adding fun and enjoyment of learning. At the same time, engaging with technology can also provide students with personalized learning paths and challenging learning tasks, stimulating students' desire for knowledge and innovation. This not only cultivates students' hobbies and specialties, but also improves their independent learning ability and innovative thinking.

3.4. Enhancing the Quality of Teaching and Learning

Engaging with technology can provide intelligent and personalized teaching assistance and support for primary and secondary schools. By analyzing students' learning behaviors and interests, teachers can use AI technology to provide students with personalized learning plans and resource recommendations to achieve tailored teaching. At the same time, engaging with technology can also provide teachers with high-quality teaching resources and tools, such as digital libraries, online courses, interactive teaching platforms, etc., to help teachers improve the efficiency of lesson preparation and quality of teaching. This not only stimulates students' interest and motivation in learning, but also improves teaching effectiveness and the overall quality of the student.

4. Strategies for Technology-enabled Primary and Secondary Educational Resources Building

4.1. Strengthening the Integration and Utilization of Educational Resources

(1) Digital Educational Resources

Digital educational resources are one of the main manifestations of engaging with technology, which include a variety of electronic teaching materials, online courses, multimedia courseware, interactive learning software and so on. Through the development of digital educational resources, it can break through the limitations of traditional educational resources, allow for the sharing and reusing of resources, and improve the efficiency of education. In the development of teaching, various types of educational resources, such as texts, pictures, videos, audios, courseware, etc., can be collected from the Internet, educational institutions, teachers and other channels, and can be categorized, labeled and integrated. Then, through the analysis and mining of data on the use of educational resources, data-driven decision-making support and teaching aids can be provided for educational institutions and teachers to improve the effects of teaching and learning experience of the student. [6]

(2) Quality Curriculum Resources

Quality curriculum resources are an important element in the development of educational resources for primary and secondary schools. With the help of technology engagement, more targeted and effective curriculum resources can be developed, such as micro-courses, online courses and virtual laboratory courses. At the same time, the sharing of high-quality courses can be realized through online platforms to improve the quality of courses and the quality of teaching. It is also possible to continuously optimize the quality and services of educational resources based on users' feedback and usage, provide better quality course resources, and improve users' satisfaction and the results of learning.

(3) Home-school Cooperation Resources

Engaging with technology can provide more resources and means for the cooperation between schools and the families of students. For example, the establishment of a parental app or online platform can facilitate parents' timely understanding of their children's learning and living conditions; at the same time, parents can also provide opinions and suggestions for the school's education and teaching through the platform, promoting effective communication and cooperation between home and school. [7]

(4) Educational Equity Resources

Engaging with technology can provide more resources and means for educational equity. For example, through online platforms and digitized educational resources, more students can be exposed to high-quality educational resources, reducing geographical and urban-rural disparities in education and promoting the equitable development of education.

4.2. Big Data in Education Driving Personalized Teaching Strategies

(1) Data-driven Teaching and Learning Process

Driven by big data in education, primary and secondary education must develop in the direction of data-enabled

teaching processes. In this process, it is first necessary to collect and organize the existing educational resources, including texts, pictures, videos, audios, courseware and more. These resources can come from different channels, such as the Internet, educational institutions, teachers, etc. By classifying, labeling and integrating these resources, a structured and ordered educational resource library is formed. The next step is to build an intelligent recommendation system in order to realize personalized recommendation. The system can provide students with personalized learning resource recommendation services by analyzing information such as students' learning behaviors, interests and learning goals, and using recommendation algorithms and machine learning. At the same time, the system can also continuously adjust the recommendation strategy according to the students' learning progress and feedback to improve the accuracy and effectiveness of the recommendation. The dynamic updating and maintenance mechanism of resources is established again. Through real-time monitoring and tracking of the update of educational resources, the educational resource database is updated and supplemented in a timely manner to ensure the timeliness and accessibility of the resources. At the same time, it is also necessary to carry out regular maintenance and management of the resource base to ensure the stability and security of the system. Finally, an open cooperation and sharing platform is established to promote the sharing and optimal allocation of educational resources. Through cooperation and communication with other educational institutions, experts and teachers, the source and coverage of educational resources can be expanded, and the resources will be more diverse and richer. At the same time, the building of a sharing platform can also promote cooperation and exchanges between educational institutions while also promoting the balanced and universal development of

education.[8]

(2) Targeted Teaching Methods

Targeted teaching is more conducive to enhancing the efficiency of personalized learning. Information-based teaching tools are products of engaging with technology, which provide teachers with more diversified and efficient teaching means. For example, the intelligent teaching system can provide personalized learning plans and resource recommendations according to the students' learning performances; the virtual laboratories allow students to perform experimental operations in a simulated real environment, which improves the learning effects. Innovative laboratories are a new direction in the development of educational resources for primary and secondary schools in the context of technology engagement. Through the establishment of technology-themed labs, more opportunities for practice and innovation can be provided to cultivate students' sense of innovation and practical ability, and improve the quality of education. With the help of an open platform, resource sharing and cooperation with other educational organizations, experts and teachers can be carried out to expand the sources and coverage of educational resources and improve the diversity and richness of resources. By monitoring and tracking the updating of educational resources in real time, the educational resource base is updated and supplemented in a timely manner to ensure the timeliness and accessibility of the resources. For example, when applying educational big data methods to the classroom, the classroom is used to design different teaching activities and start special experiments on each dimension in a targeted manner, which can accurately analyze and find the scoring points of each dimension and the corresponding functional applications (see Fig. 3), effectively realizing accurate teaching.

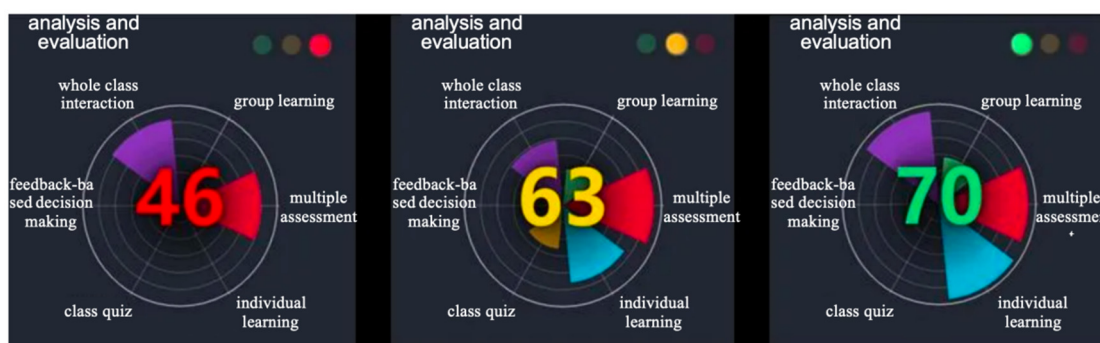


Figure 3. Data on the dimensions of pedagogical application [9]

(3) Personalized Learning Styles

In open learning driven by educational big data, valuable information is automatically discovered and extracted from massive educational resources through advanced search engines and natural language processing technologies, and the information is classified, organized and stored according to certain rules and standards to form a structured and ordered educational resource base. And then by analyzing students' learning behaviors and interests, as well as their learning goals and needs through recommendation algorithms and artificial intelligence technology to provide students with personalized educational resource recommendation services. In addition, engaging with technology provides strong support for the development of open educational resources in primary and secondary schools, which can promote the rapid development of educational IT application, integrate and

share various educational resources, realize barrier-free communication and exchange in education, thus making the teaching mode more targeted, providing intelligent and personalized services and support for education management, teaching and the development of the student, and promoting educational modernization. This will not only improve the quality and efficiency of education, but also lay a solid foundation for the future development of students.

(4) Diversified Evaluation Methods

Teaching evaluation is an important part of the development of open educational resources in primary and secondary schools, mainly including teaching quality evaluation, students' comprehensive quality evaluation and teachers' professional development evaluation. In the evaluation process, with the help of the open platform, resource sharing and cooperation with other educational

institutions, experts and teachers, it will expand the sources and coverage of educational resources and understand the teaching effects from various aspects in an all-round way, so as to enhance the diversity and richness of educational

evaluation (as shown in figure 4). The evaluation results are collected and analyzed in a scientific manner, providing reference and basis for school management, teaching improvement and student development. [10]

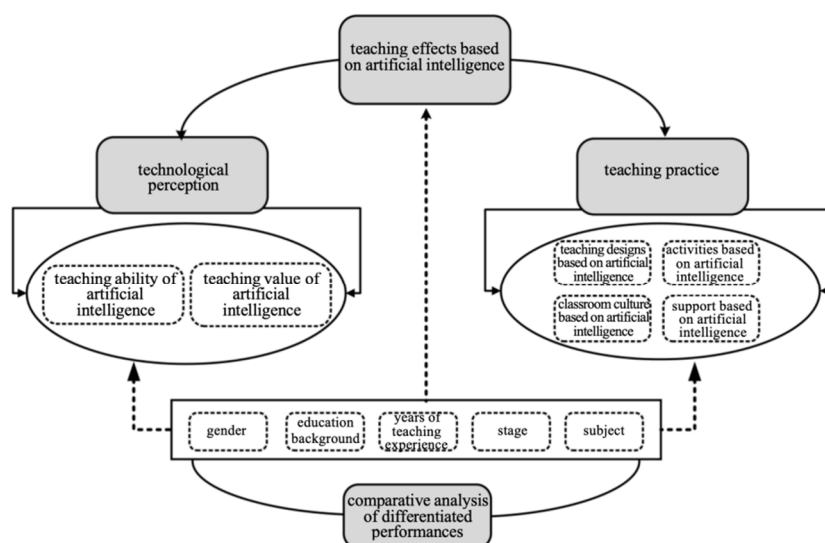


Figure 4. Artificial intelligence assessment of teaching and learning analysis

5. Conclusion

Engaging with technology can help meet learners' individualized learning needs, and through implementing big data analysis technology, the immediate and rapid collection, organization and analysis of learners' learning data can occur. Technological education resources have a wide range of application prospects and can be applied to all aspects of primary and secondary education, such as curriculum learning, experimental teaching, and extended learning. It can also be combined with other educational information-based technologies, such as online courses and virtual laboratories, to provide students with a more comprehensive and enriched learning experience. In the future, the implementation method and effect evaluation of the strategies can be continuously improved through further research and practice to provide more scientific and effective support for the development of educational resources in primary and secondary schools. In conclusion, the support of big data and other technologies has greatly facilitated the in-depth development of intelligent education, and it is believed that in the future, intelligent education will definitely benefit more learners and teachers, and effectively promote and enhance the quality of teaching and learning.

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