Research on the System Technology and Integration Path of Smart Education

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Abstract. Smart education is the product of the integration of technology and education, and is a new form of education in the context of the internet of everything. Taking educational technology as theoretical basis, on the basis of analysing the definitions and functions of smart education, education and technology, the article constructs implementary plan of smart educational technology system; at the same time, based on educational practice, a specific integration path of smart educational technology is proposed, aiming to comprehensively improve overall level of education. The driving core of smart education is smart educational technology system, and driving force is the integration of education and technology. The environment, resource system, and functional modules being the platform, relying on the internet of things, virtualization, big data, and face recognition technology, smart education can be rapidly developed by creating a linkage mechanism, improving the quality of courses and making good use of external resources.

Keywords: Smart education · Technology system · Technology integration

1 Introduction

Smart education is the product of the integration of technology and education. Although the concept of smart education has not been proposed for a long time, the research on the integration of technology and education has a long history. In the course of the development of science and technology, the relationship between education and technology has gradually become closer. The optimization and promotion of educational technology has also become increasingly prominent, and has taken on different forms in different periods, such as electronic education, educational technology, information-based education and today's smart education. From the above development process, it can be seen that educational form in various historical periods actually reflects the degree of integration with technology. In the stage of smart education, the application of a series of advanced technologies such as the internet of things, virtualization, artificial intelligence, and big data in educational practice has brought about great changes in the form of education, and intelligent trend of the technology will inevitably lead to the intelligentization of education. It can be seen that key role played by the technology in intelligent education requires a more thorough analysis of intelligent education from the perspective of technology.

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2 The Concept and Characteristics of Smart Education

The combining existing research literature on wisdom education, there are two mainstream views on the interpretation of the concept of wisdom education: one is to educate for the existence of wisdom, and the other is to educate in wisdom way. The wisdom education concerned in this paper is education in a smart way.

As mentioned above, integrated development of technology and education has so far experienced four stages: electronic education, educational technology, smart education and smart education. Among them, informationized education that supported by advanced technologies such as the internet of things, virtualization, and big data is a new educational form. With horizontal analysis, smart education is a derivation of the concept of a smarter planet. The concept of a smarter planet was first proposed in 2008, in the keynote speech of "A Smarter Planet: The Next Leadership Agenda" delivered by IBM CEO Palmisano, regards the smart earth as the development trend of future society, and proposes its three basic characteristics: the tool evolution of the world, the interconnected evolution of the world, intelligent evolution of all things [1]. Since then, the concept of smart earth has been integrated into various fields, and its integration in the field of education has given birth to smart education. The application of advanced technology in smart education has made education itself no longer strictly limited by time and space. It is no longer static, and experiential, immersive, and interactive education emerges. Such new educational models and methods are generally welcomed by contemporary students, playing a significant role in such aspects: the stimulating learning motivations, strengthening learning experience, increasing learning depth, and improving learning effects.

In terms of the characteristics of smart education, Huang Ronghuai summarized the characteristics of smart education as perception, adaptation, care, fairness and harmony [2]. From the extraction of the characteristics of wisdom education by different scholars, it can be seen that the characteristics of wisdom education are highly related to the characteristics of modern science and technology. Due to high penetration of science and technology in education, wisdom education shows the characteristics of various advanced technologies. Because of the high penetration of science and technology in education, intelligence education shows the basic characteristics of various advanced technologies. This is the reason that after a long period of development, the education is now in the form of intelligent education.

3 Analysis of the Relationship Between Technology and Education

3.1 Function Relationship

At each stage of the development of education, technology is used as a tool to integrate into educational practice; then, with the upgrading of technical levels and the enrichment of technical forms, it plays a role in promoting the creation of educational environment and the reform of educational methods and the relationship between becomes more and more obvious [3]. Especially in the information age, the information technology develops at an unimaginable speed, and the influence and effect of technology on education also rise. In the process of integration of education and technology, it greatly absorbs the

practical advantages of technology itself. And it makes improvements and innovations in different aspects of education. For example, the use of multimedia equipment in classroom teaching enables the presentation of knowledge to be extended to animation, images, sounds; etc. The computer interaction function enables students to interact with different forms of knowledge. In conclusion, technology has become one of main driving forces of educational development, and promotes education to present a step-by-step development process.

3.2 Effect

As the latest education form at present, smart education largely eliminates the drawbacks of traditional education, solves some of the problems left over from the history of traditional education, and enables educational practice to have more choices to actively adapt to the current educational needs.

3.2.1 Promoting the Development of Thinking

Thinking drives the development and change of behaviour. Combined with the development law of human society, the development of thinking is often manifested as a momentary leap, but the generation of this change requires a lot of accumulation in the early stage. In traditional education, educational goal adopts an overall the goal, although it also emphasizes the development of differentiated education according to individual characteristics, but limited by educational models and methods, and it is difficult to achieve universal differentiated education. Therefore, in the traditional education stage, the cultivation of students' thinking needs to follow objective laws and the accumulation of volume to complete, which also leads to the long-term nature of education.

Entering the stage of smart education, advanced science and technology make the original abstract, complex, solidified knowledge be easy to accept for students in a direct, concrete, and vivid and other way, and it can perceive the learning status of different individuals. Through data analysis, mastering individual learning habits and characteristics, and then it match the best self-learning and educational guidance programs. Relying on technologies such as virtual reality and artificial intelligence, learning itself is no longer the analysis and acquisition of ready-made knowledge. Students can participate in the formation process of knowledge, and more the senses receive knowledge signals, perceive every nuance contained in the knowledge. It guides students to think step by step, and stimulate qualitative change of their thinking. The accumulation process of the amount of education is greatly compressed, and the efficiency of education and learning is naturally improved accordingly.

3.2.2 Improving Teaching Effectiveness

In educational practice, smart education has completely broken the previous education method of one-way transmission, fully mobilizing students' thinking, emotion, and behaviour into learning activities to achieve efficient and in-depth learning. Compared with new teaching methods such as inquiry-based learning, smart education is more dominant in terms of efficiency, autonomy and personalization. A large number of

teaching experiments have shown that smart education is conducive to the improvement of teaching effectiveness, and the improved effect is more significant than the general method.

Traditional education takes teachers as the core, with blackboards, textbooks, pen and paper, etc. as the main tools. The indoctrinated knowledge transfer makes the learning itself out of the real life situation. Due to the lack of learning motivation, students' learning emotions cannot be fully satisfied, which in turn leads educational effects to poor performance. With the help of advanced teaching tools, smart education makes learning no longer limited by time, space and form, and educational content is presented in various modes such as the combination of dynamic and static, sound and light. Especially the current virtual reality technology makes educational environment simulation function has been further upgraded to create a more realistic knowledge learning situation, so that students can learn knowledge, feel knowledge, and explore knowledge in the interaction with the environment. Outside the classroom, students can also use various intelligent learning tools to develop their own autonomic learning activities. As an extension of classroom teaching, teachers can reasonably intervene in students' autonomous learning process. Students can choose learning content and methods independently according to their own learning needs, and conduct online communication and interaction with teachers to achieve ubiquitous learning. Enhanced learning pertinence and better planning of time resources will undoubtedly allow greater room for improvement in educational effectiveness.

3.2.3 Guiding Education Reform

Educational change is not simply equivalent to the change of educational concept, cognition or method. It involves very complex content, which refers to the change of educational system and the people and things that are directly or indirectly related to the educational system, including the educational guiding theory, educational concepts, educational models, evaluation methods, educational environment, family and social participation, etc.

In the past, the innovation in education and teaching was limited by actual conditions. However, in the context of smart education, the level of educational technology is sufficiently developed, and educational hardware facilities are constantly being improved and updated, enabling a large number of innovative educational programs that could not be realized before to be put into practice, and the enthusiasm for educational reform is unprecedented high. Under the multiple support of technology, theory, facilities and other elements, educational demands can be satisfied to the greatest extent, and at the same time, it will promote the frequent development of educational innovation and upgrading activities.

From the perspective of individual learning, the popularization and application of intelligent tools is changing people's learning concepts and habits, causing changes in the demand side of education. The matching of educational supply and demand is the core of educational reform, and the changes in learning demand caused by intelligent education are also in turn promoting the deepening of educational reform.

4 Construction Plan of Smart Education Technology System

4.1 Smart Education System Architecture

The smart education system architecture is the carrier of smart education technology, and the advantages of various technologies need to be transmitted and played through this carrier, and finally applied to educational practice. Now, the smart education system architecture is divided into command centre, smart environment, resource system and function module, which respectively introduce its characteristics and construction methods.

4.1.1 Command Centre

The command centre is the smart education centre. As the core of the smart education system, it is the key to promoting the smart development of education in a country or region, and it is conducive to breaking the difficulties of financing, sharing, and promotion in the development of smart education. In view of the command centre's important, it takes its construction as the primary task of the development of smart education.

The service scope of the command centre is at national or regional level, providing a unified portal website, identity authentication rules, data centres and other basic services. It can centrally integrate existing data and software and hardware resources to provide comprehensive educational resource services for each educational unit. We realize the centralized management and on-demand distribution of educational resources. In addition, the command centre integrates various educational software, strengthens the interconnection between various software platforms, and forms a data environment and intelligent platform serving the entire smart education system for the majority of learners to provide educational services. The construction of the command centre requires the coordination and cooperation of multiple social departments, and requires a lot of time and human, financial and material costs. In order to ensure the utilization of various resources, the planning and design of the centre construction must be reasonable and appropriate, and can meet the requirements of educational data calculation, storage, sharing and network management and other functional requirements.

4.1.2 Smart Environment

The smart environment is basic place for the implementation of smart education. The environment integrates various advanced technologies such as the internet of things, virtual reality, big data, cloud computing, etc., and is divided into smart campus environments for school education and smart urban environment for life-long education according to different service objects and service stages.

The smart campus environment includes smart classrooms, smart libraries, smart laboratories and other multi-functional educational places. During the constructional process, it is necessary to gradually complete the upgrading and transformation of the existing educational equipment and facilities in the school to achieve full coverage of high-speed wireless networks in the campus. Smart education equipment with sensing technology and RFID technology must meet the interaction and interconnection between different species [4]. Among them, sensing technology is mainly used for experimental

teaching, student learning status monitoring, and student health monitoring; RFID technology is mainly used for school management, including library management, access control management, student location tracking, etc.

The service objects of smart city are not limited to students in school. Anyone in the society who has learning needs can enjoy the smart education services provided by the smart city. Combining educational informatization facilities with distance education means, on the basis of smart campus, it creates smart museums, smart public libraries, smart communities and other environments, and provides the necessary material conditions to lifelong learn for the public.

4.1.3 Resource System

To put it simply, the resource system is the database of the smart education system, which is used to carry theoretical materials, teaching resources, teaching and scientific research results related to smart education, etc.

4.1.3.1 Learning Resource Library

The learning resource library mainly serves teachers' teaching and students' self-learning activities, and is the basic source of smart education resources. The construction of the resource library will be guided by practical applications, and resources will be allocated according to the current educational system curriculum settings. The sources of resources include self-built and purchased methods, and their content should meet the requirements of the new national curriculum standards. Due to the existence of the construction form, innovative teaching schemes from different regions and school teaching staff can be effectively integrated and shared, so as to realize the continuous updating and expansion of the learning resource library.

4.1.3.2 Shared Repository

The resources in the shared resource library are open to the society, and its attributes are similar to MOOCs. High-quality educational resources from education, scientific research and other units are shared into the resource library, and shared according to specific mechanisms and rules. The construction of the shared resource library should meet the following requirements: first, build an efficient, applicable and fair educational resource sharing mode; second a distance course with large-scale and super-large-scale interactive participation; third, gradually improve the co-construction and sharing system, and the breadth of the resource library service scope makes it more difficult to build, and needs to be obtained from various social departments, such as publishing houses, training institutions, public schools and other departments [5]. At the same time, the resources in the current mainstream open education platforms are integrated into the resource library to ensure that the shared resource library can cover a wider range of services and meet the diverse learning needs of the public.

4.1.3.3 Management Information Base

The management information base is used to store a large amount of data information related to management business, involving student management, teacher management, educational affairs management, scientific research management and other aspects. The management information base serves the macro management level of smart education,

and its construction must ensure the degree of standardization of information, enables it to seamlessly connect with educational resource libraries in various places, forming a unified information system for smart education management standardization from top to bottom.

4.1.4 Function Module

4.1.4.1 Smarter Teaching Module

Smart teaching is an educational activity carried out in a smart environment with the help of various advanced technologies and rich educational resources. The direct service target of smart teaching is the group of teachers, which helps to improve the level of smart teaching, promote teachers' professional development, and classroom teaching modes and methods innovation, etc., and then indirectly affect the educated. The change of teaching environment and the innovation of teaching tools have put forward strict requirements on teachers' informatization and intelligent teaching ability. Therefore, when building the system, we should focus on the improvement of teachers' professional ability. Through professional technical training, it enables the majority of teachers to master the necessary smart teaching technology, and then can flexibly use the smart environment and smart education resources, in order to innovate the classroom teaching model and create a smart classroom.

4.1.4.2 Smart Learning Module

Smart learning takes students' autonomous learning as the service object. Students can obtain resources and services related to their learning needs in a smart environment, and customize their learning plans to explore learning characteristics, stimulate learning enthusiasm, and achieve high efficiency and autonomy learning. The successful realization of smart learning requires students to have sufficient autonomous learning ability, including knowledge mining, understanding, inquiry, creation, and application ability.

4.1.4.3 Smart Management Module

Judging from the current development situation, education management seems to have a higher degree of informatization than education. However, some efforts are still needed to improve the system and improve the level. In the past, the education management involved a lot of repetitive and inefficient data entry and statistics. The degree of automation of education management is not high. And because the statistical analysis technology is too simple, it is difficult to dig deep into the education data. In order to improve the level of education management, the management itself must gradually transition from informatization to intelligence, to automate those repetitive and inefficient tasks, so that managers have more time and energy to devote more time and energy to status monitoring, decision making, remote guidance and other work.

4.1.4.4 Smart Evaluation Module

With the help of big data, cloud computing and other technologies, the education data is regularly counted. Through data digging, a more systematic and objective evaluation of education work is made, and the problems existing in smart education can be improved. Based on this function, the process of smart education needs to build students and teacher

files, and permanently store the file data in the cloud, build an appropriate education evaluation model, and analyse and evaluate the teaching and learning situation.

4.2 Core Technology of Smart Education

4.2.1 Internet of Things Technology

The internet of things technology uses sensors and electronic tags as the basic tools, and plays a technical supporting role in classroom teaching, autonomous learning, education management, etc. [6]. For example, the smart classroom that mentioned above needs to be built on the basis of the internet of things technology, which can provide attendance management, asset management, environmental adjustment, video monitoring and other functions to optimize the smart teaching environment. In addition to the creation of smart environment, IoT technology can also provide students with health monitoring, learning data collection, and education security monitoring, and teaching equipment management to provide technical support. For example, wearing special health monitoring sensors for students, it accurately collect students' body temperature, heart rate, blood pressure and other health index information, and build a national or regional student physical health database to understand the changes in students' physical conditions at various stages in our country, to assist moral, intellectual, physical, and aesthetics to comprehensively improve the realization of educational goals. For example, in equipment management, sensors or RFID tags are installed for various smart educational equipment, and special personnel conduct unified management and regulation to understand the running status of smart equipment in real time.

4.2.2 Virtualization Technology

The virtualization technology supports the integration of smart education data resources, and provides safe, reliable and convenient data centre infrastructure for campus users. The virtualization technology integrates computing resources of multiple physical machines, builds virtual resource pools, and allocates them reasonably to different virtual machines, to effectively solve problems such as poor resource allocation and insufficient data security. At the same time, the virtualization engine makes management more convenient and efficient, and can provide remote maintenance functions. In terms of storage virtualization, it builds a resource pool to integrate the storage resources of a single application to centrally manage, according to the system characteristics, provides various access modes with IP, FC, and SSD. The storage virtualization uses advanced pre-allocated virtual capacity technology to adjust it, according to the actual use of resources to realize educational resources optimized configuration.

4.2.3 Big Data Technology

The advantages of big data technology have been brought into full play in the fields of education management, demand analysis, and education evaluation. We develop educational information as an information resource, and realize efficient analysis and mining of massive data, find out the general laws and potential problems of educational activities,

and use it for high-quality development of educational management, analysis, evaluation and other work. For example, we dynamic collect student growth information, combine with the relevant evaluation index system, and refine students' deficiencies in a specific ability, literacy or subject, so as to formulate more targeted growth plans. For another example, with the help of big data technology, we collect students' releasing and acquainted information in the various internet platforms, track and supervise the development of students' main stream ideology, and guide educational public opinion in real time. The application of big data in this module is of great importance for the improvement of modern education quality and the extension of educational tentacles. Under the background of smart education, network technology and information technology are highly developed, and Weibo, WeChat, and forums have become the main social tools for students. The informational composition in the network environment is complex, which broadens students' horizons and makes them more vulnerable to bad information. The interference and even the temptation sway its mainstream ideology. It is the choice that the education system and smart education must make to adapt to the development of the times.

4.2.4 Face Recognition Technology

Face recognition technology verifies the identity of the target object through the extraction and comparative analysis of facial feature information. The technology uses a camera to collect face image information, and locates and tracks the face in the image. Face recognition technology in smart education is mainly used in personnel attendance management. The following takes intelligent non-perceptual attendance as an example to illustrate its specific application.

Intelligent non-perceptual attendance builds a student face feature information database, and completes the information collection of students in the whole school. Presenting attendance time for various teaching activities on the face recognition service platform, it activates the intelligent non-perceptual attendance module before class, and dynamically captures face information, and form attendance records. After data aggregation and statistics, corresponding reports are output to intuitively reflect students' attendance [7]. Based on the uniqueness of human identity verification information, face recognition technology effectively solves the problem of students' sign-in, class, etc. for attendance management that the troubles brought about. The whole process of tracking and management of students' participation in teaching activities, their truancy, late arrival, early departure and other behaviours will be accurately recorded by the camera equipment, which will play a more effective restraint role on students. Compared with swiping cards, fingerprints and other attendance in this way, the efficiency of non-perceptual attendance is higher, and it can be realized without additional human resource investment.

5 The Specific Integration Path of Smart Education Technology

The previous article gives a detailed introduction to the relationship between technology and smart education, as well as the composition of the smart education system and

technical support system. The construction of the smart education system is based on the deep integration of education and technology. In order to better promote the development of smart education, the following will discuss detailed analysis the fusion path:

5.1 Creating a Linkage Mechanism

The audience of smart education is not limited to schools, teachers and students, and its participants include schools, governments, scientific research institutions, and other relevant social departments. In order to effectively integrate the development resources of smart education, it is necessary to create a three-in-one linkage mechanism of government, schools and enterprises, and cooperate with each other to carry out the construction of smart education [8]. For example, with government departments' leading role, it promotes the construction of smart classrooms at all stages of education; develops national or regional smart education centres and improves related supporting facilities and management theories, creates an excellent external environment for smart education technology integration. Taking schools as the core, we carry out the smart educational characteristic curriculum and educational research work. Focusing on the advantages of educational talents, we jointly complete the update and supplement of smart education resource base, classic course template design, classroom education process and mode optimization and other work. With the assistance of enterprises, we maintain an efficient information exchange relationship with schools and government departments, and timely transmit the talent needs reflected in social production practice to schools, in order to guide the targeted design of curriculum optimization and education program innovation. In addition to the guiding role of education, various advanced technical resources involved in smart education are mostly provided by social enterprises, passing the technical needs of smart education development to enterprises, and urge them to make sufficient efforts in cutting-edge technological innovation in the industry, so as to bring more advanced technologies are integrated into the smart education system.

5.2 Improving the Quality of Courses

Although smart education shows many advantages and advancements compared with traditional education, it is still a form of education in essence, with the educated as the service object and the educator as the main user. In many smart educational service projects, curriculum resources are the most important service medium; at the same time, they are also one of the key indicators to measure the level of smart education.

In terms of improving the quality of curriculum resources, the following tasks must be done: first, accurate curriculum positioning and curriculum planning. Second, excellence in curriculum resource development work, providing teachers with enough time and resources so that they can focus on invest in curriculum development, and continuously output high-quality educational resources. Third, we pay attention to user services, introduce user needs, and guide the development process of curriculum resources; at the same time, we provide a simpler way of resource indexing.

5.3 Making Good Use of External Resources

5.3.1 In-Depth School-Enterprise Cooperation

Enterprises play a very important role in the development of smart education. Educational informatization and intelligence have spawned a large number of technologically innovative enterprises. Through school-enterprise cooperation, the joint development of schools and enterprises will be brought into play, and cooperation will be carried out in accordance with the country's forward-looking requirements for smart education. Under technological optimization and educational innovation work, we gradually cultivate a perfect and in-depth smart education industry chain [9].

5.3.2 Cooperation with Smart City Construction

Smart education and smart city are both extensions of the concept of smart earth, and there is a relationship between inclusion and inclusion. Smart city is the development platform and space of smart education. New technologies, new services, and new concepts formed in urban construction are the development of smart education provides better resource support. In turn, the development level of smart education reflects the level of smart city construction. Therefore, in the process of the technology integration, smart education should make good use of various macro resources in the context of smart city construction, including talent support, policy support, etc., to strive for better development conditions for smart education.

6 Conclusion

Smart education is a complex and systematic project, and it is the highest form of education at this stage, and its essence of education has not changed. Therefore, we can analyse the development characteristics of education through the law of technological evolution, and then find out more accurate and scientific ideas for the development of smart education and technology integration. In the future, the development of smart education will be also necessary to take the improvement and optimization of the smart education system as the core, and combine the practice of smart education to form a corresponding technical implementation plan; and by creating a linkage mechanism, improve the quality of courses, and make good use of external resources to promote the integration of education and technology, develop and popularize the form of smart education, and comprehensively improve the overall level of education.

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