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Practical Analysis of Optimizing Smart Education Management System Based on Multimedia Image and Artificial Intelligence

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Abstract Intelligent education based on multimedia images and artificial intelligence (AI) has broken through the traditional teaching mode. This can provide students with a new way of spanning time and space, sharing resources, and interactive learning, and it has attracted more and more attention, and people's expectations of smart education (SE) are also increasing. This paper combined multimedia image with AI technology to optimize the smart education management system (SEMS), so as to make it personalized, targeted and intelligent. This can better make up for the deficiencies of the current education form and give full play to its advantages. With the rapid development of information technology (IT), more and more multimedia images and AI were used in smart education at present. How to make SE management information and networking was very important. The experimental results showed that the system security rate was 87% when the number of tasks was 100. The highest system security rate was 99% when the number of tasks was 500. Overall, the security of the system was very high.

Index Terms Multimedia Image, Local Threshold, Artificial Intelligence, Smart Education Management System, Filtering Noise Reduction

I. Introduction

Smart education is an inevitable product of the development of modern IT. It is the inevitable requirement of IT in teaching, and also the inevitable requirement of improving teaching quality, solving problems, and promoting the innovative development of teaching reform. Especially in China, due to the influence of traditional exam-oriented education for a long time, there are many problems in educational concepts, educational methods and methods. Today's society has an increasing demand for the quality of talents. To solve these problems, people need to constantly improve the current education situation in development and practice, and improve the quality of talents to meet the needs of social development. This can provide a strong talent guarantee for the development of the socialist cause in the future.

At present, with the development of AI and multimedia images, a new SE and teaching system is moving forward in a new direction. Applying AI in teaching practice can not only describe knowledge objectively, but also realize the intellectualization of teaching process, and also realize intelligent accompanying reading, simulated teaching, emotional perception and evaluation in talent training, knowledge dissemination, theoretical design and other aspects. This can make the knowledge learned by teachers match the social needs, cultivate students' innovative and practical ability and improve their comprehensive ability.

II. Related Work

It has become an inevitable trend to integrate smart education into teaching activities. Demir, Kadir Alpaslan found that the development of IT has led to new educational practices and new tools, which are also encouraging the modernization of teaching methods. He developed the framework of SE and found that it would be an effective way to guide the future SE system [1]. Bhaskar, Preeti tried to describe the application of blockchain technology in SE. He pointed out the advantages, challenges and current application of blockchain technology in SE. He believed that blockchain technology has great potential in promoting SE [2]. In order to investigate the factors that affect teachers' willingness to use the management system, Buabeng-Andoh, Charles planed to create and test a SE management system, and the research results showed that society affects teachers' willingness to use the management system [3]. The researchers believed that SE should be integrated into the current teaching mode. Only in this way can traditional teaching methods be changed and new teaching concepts be introduced to improve teaching standards.

Due to the rapid development and continuous popularization of IT, the SE management system would undoubtedly rely more on advanced technical tools and huge Internet. In order to increase the number of students receiving e-learning in the SE environment, Gunasinghe, Asanka's research aimed to evaluate the effectiveness of SE management system in the use of e-learning. By improving the learning experience of students and teachers, he found that technological platforms such as e-learning have advantages [4]. Chen, Nian-Shing found that modern SE was not limited by time or space. Learning can be carried out in a virtual environment, and its value was increasingly obvious [5]. Leem, Junghoon said that smart mobile devices (such as smart-phones and smart ipad) should be introduced into the field of SE, such as AI-based adaptability and multimedia images, including rich educational resources [6]. According to the researchers, SE is a necessary decision in the information age to promote contemporary students' learning and cultivate students' creativity.

Education is also gradually becoming intelligent. This change not only provides a lot of human and material resources for the development of SE management system, but also brings new challenges to the construction of future education management system [7], [8]. This paper analyzed the application of SEMS based on multimedia image and AI, found out the existing problems of traditional education and people's actual needs, and put forward the corresponding design scheme of SEMS.

III. Smart Education Management System

III. A. Smart Education

Education is an important part of human society, which is produced with the development of human society. From traditional education to education informatization, and to the continuous innovation of today's SE industry, China's education reform and innovation are gradually maturing [9], [10]. The traditional one-to-many teaching method restricts students' personality development to some extent, which is also an urgent problem to be solved. The difference between SE and traditional education is displayed in Figure 1:

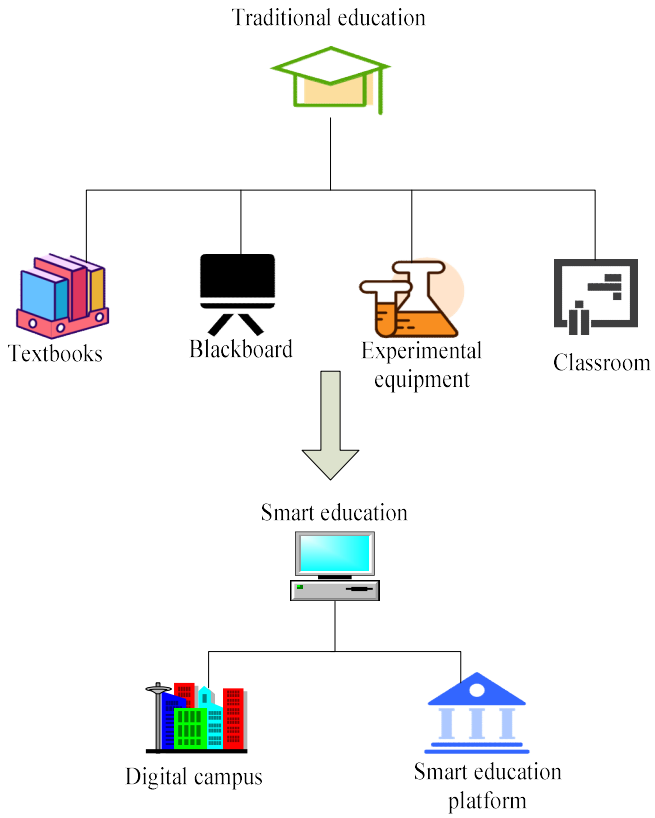


Figure 1: The difference between SE and traditional education

As displayed in Figure 1, traditional education includes classrooms, textbooks, blackboards and experimental equipment, while SE includes SE management system and digital campus. There are many differences between SE and traditional education. Smart education is based on informatization, modern teaching methods and teaching

models to better promote education informatization. Smart education is an innovative mode of educational thinking. It can make teachers pay more attention to students' innovative ability, so as to achieve better teaching results [11].

To make the SEMS intelligent, it must be closely combined with multimedia images, and then optimized by AI technology. The SEMS can observe the user's learning status through the electronic eye during the whole learning process, analyze the user's behavior and facial expression, and evaluate it through the intelligent platform [12]. According to the overall learning situation of users, students should carry out periodic review so as to better stimulate the learning enthusiasm of users. This can achieve real learning, but also solve the problem of repeated teaching by teachers.

III. B. Design of SEMS

(1) Establishment of SE management system

In this process, AI is a comprehensive technology that can realize basic conditional reflection and advanced logical thinking. It can be used to optimize the SEMS. This can enable educators to transmit knowledge and concepts more completely and quickly, and make them consistent with students' cognitive activities. Multimedia images can promote the improvement of SE and teaching management system, so that students can better grasp images and natural language, and can use the knowledge learned. In short, the SE management system is based on the Internet, multimedia images and AI. The establishment of SE management system is displayed in Figure 2:

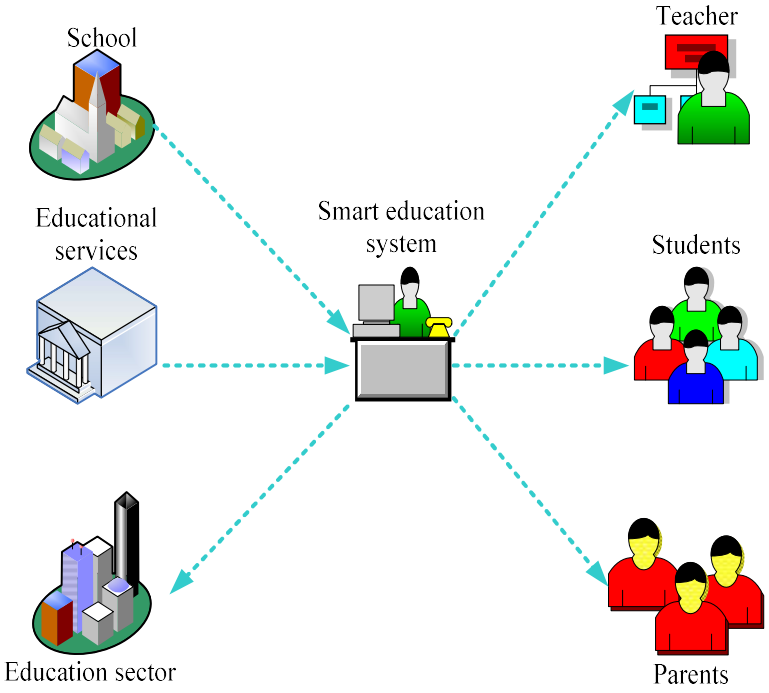


Figure 2: Establishment of SEMS

As displayed in Figure 2, in the SE management system, schools, educational institutions and educational departments use relevant management systems, data servers and other equipment to realize the interconnection and sharing of various resources, thus maximizing the storage mode of educational information resources [13]. Moreover, mobile communication technology and the Internet are integrated, users and administrators of SE management system can connect with each other anytime and anywhere through smart phones and other smart devices. This can facilitate access to the SE management system [14].

(2) Smart education management system framework

In the process of SE management, governments and educational institutions all over the country should assume the supervision function to keep pace with the national education development [15]. Universities, educational institutions, scientific research institutions, associations and other institutions are important components of the education management system. They use the management system and application software of SE management system to provide effective support for various education management services. This can integrate education management and application. The technology applied by the system is displayed in Figure 3:

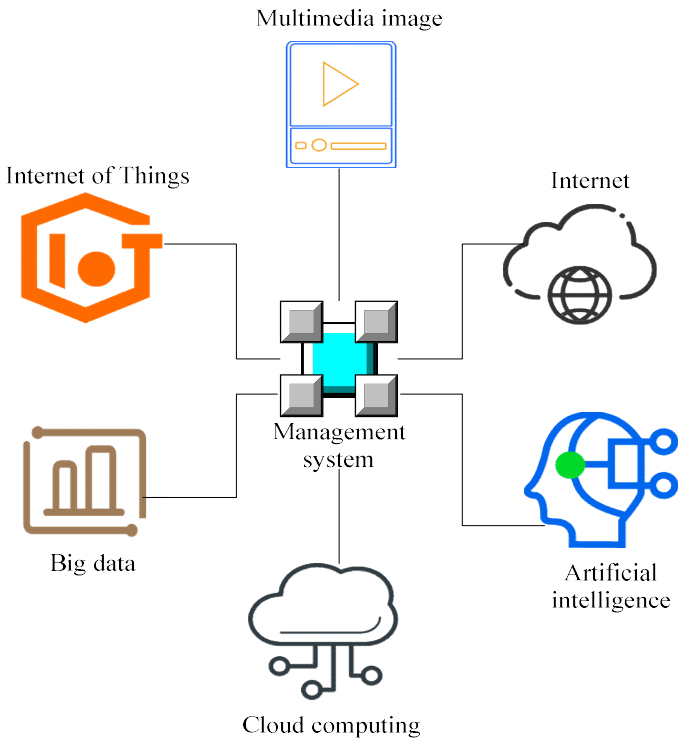


Figure 3: Technologies applied by the system

AI can manage, track and report specific user information, courses, various learning projects and various online learning resources through designated management personnel. In this way, the management system can be effectively improved, which enriches students' learning resources and learning environment, thus improving the management efficiency, and further improving the teaching quality of the SEMS. The functional diagram of the education management information system is displayed in Figure 4:

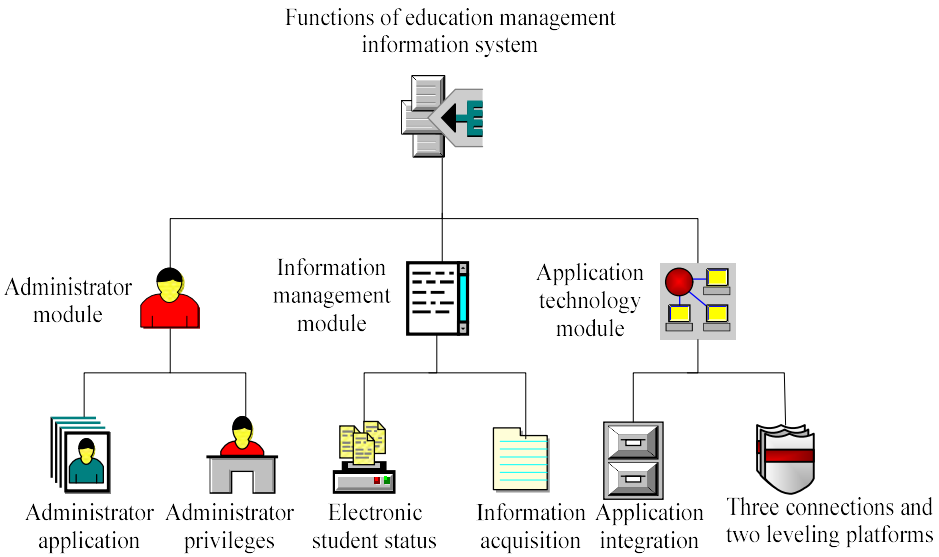


Figure 4: System function diagram

As displayed in Figure 4, the system functions include administrator module, information management module and application technology module. The administrator module includes administrator application and administrator

permissions. The SE management system has a wide range of applications, including not only primary school, junior high school, high school and university teaching, but also learners who need to learn in society. Information management module: the information management module includes electronic student status and information collection. The flat information management system mainly carries out scientific analysis and management from various aspects such as learning content, learning progress, learning effect, enthusiasm of learning and communication, and selection of learning resources.

Application technology module: application technology module includes application integration and three supplies and two flat platforms. Application integration refers to a SE management system that integrates and optimizes multimedia images on the basis of mobile internet to make it quickly and comprehensively applicable to mobile internet.

III. C. Multimedia Image Processing

The proper use of multimedia images in the teaching process can better handle the information in teaching and cultivate students' creative thinking ability and personality characteristics. This can help to change from teacher-centered education to student-centered teaching, so as to improve students' learning ability. Multimedia images provide education with rich pictures and texts, and create a dynamic, intuitive, interesting and enlightening classroom environment. It can not only meet the age characteristics of students, but also promote students' understanding of knowledge, stimulate their imagination and cultivate their observation and thinking ability.

In the process of multimedia image acquisition and transmission, it would inevitably be affected by various noises. Therefore, it needs to be de-noised, and the most common de-noising method is filtering. On this basis, this paper proposes an algorithm based on mean filtering. In order to reduce the amount of data, the image is first processed in gray scale, and then the noise is filtered.

Set the pixel in the image as (a,b), and the neighboring pixel $g(a,b)$ of the pixel as:

$$g(a,b)=\frac{1}{m}\sum_{f\in s} f(a,b) \tag{1}$$

Mean filtering can also be divided into four mean and eight mean methods. To determine the maximum and minimum values of each pixel point, the middle point of the image should be used as the discrimination threshold, and the image binarization $f(i,j)$ should be performed using the following formula:

$$f(i,j)=\begin{cases} 0, f(i,j)\le T \\ 255, f(i,j)\succ T \end{cases} \tag{2}$$

When the pixel value of (i,j) point is lower than the set threshold limit, the gray level of the point is set to black. This method has the characteristics of simple calculation and less computation.

Compared with the global threshold, the local adaptive threshold method does not use a unified threshold, but determines its binarization threshold by the distribution of pixels near the pixels. Binary threshold processing is to process the original image into a binary image with only two values. The advantage of this algorithm is that it changes with the change of pixel position, and the binarization threshold depends on the information of adjacent pixels.

In this paper, a method based on local threshold is proposed, which is used to determine the threshold by averaging the maximum and minimum values of each point in the local area. Take pixel point (a,b) as the adjacent area, and calculate the threshold value by the following formula:

$$T(a,b)=\frac{Z_{\max}+Z_{\min}}{2} \tag{3}$$

In this paper, people need to binarize the image. Because of the different features to be extracted from the image, the binarization processing methods are also different.

Multimedia images are easily affected by various factors. The deformation of the same kind of image is often greater than the difference between the same kind of image and other images, thus causing some interference to the subsequent images. Here, histogram equalization method is adopted.

First, people get normalized histogram, that is, classify images according to different gray frequencies. The frequency of gray level r_k pixels can be obtained from the digital image:

$$p_r(r_k) = \frac{n_k}{n}, k = 0,1,2,...,L-1 \tag{4}$$

n_k is the number of pixels with gray level r_k, n is the total number of pixels in the image, and L is the total number of possible gray levels in the pixel. Then perform histogram equalization s_k on the image. In this process, its discrete form is:

$$s_k = T(r_k) = \sum_{i=0}^{k} p_r(r_k) \tag{5}$$

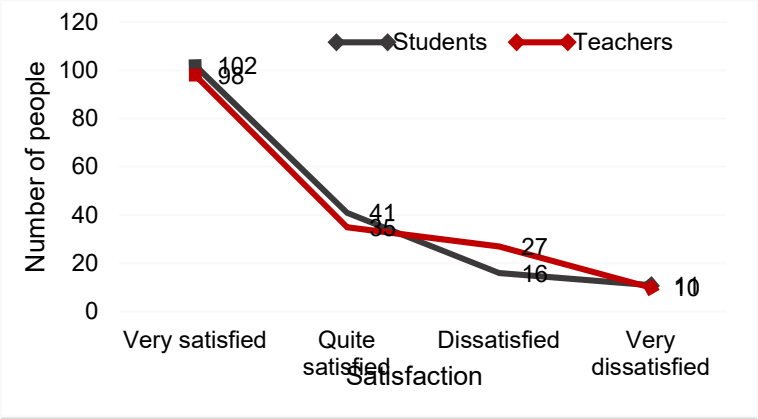
The image to be processed according to the corresponding relationship is the uniform histogram. For images with different contrast and brightness, histogram is used for equalization. There are differences between the histograms of the two images. When the two images are different in structure, an almost identical image can be obtained by histogram equalization.

IV. Current Situation and System Test of Smart Education

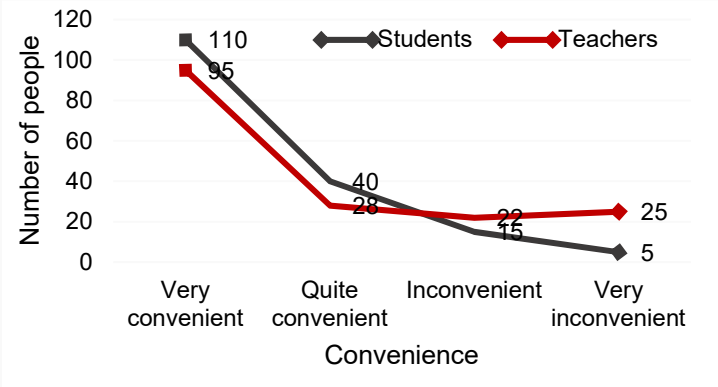
IV. A. Impact of Smart Education

(1) Satisfying the reasonable needs of teachers and students

The more students need, the higher their enthusiasm for learning. Smart education not only imparts students knowledge and problem-solving methods, but also cultivates students' moral quality. This paper surveys 170 teachers and 170 students in a university in a city. The development of SE cannot be separated from the development of students and teachers. The development of SE must satisfy their needs. This would have a positive and effective impact on the development of teachers' teaching ability and students' knowledge ability and ideological and moral character. The satisfaction and convenience of teachers and students' needs under SE are displayed in Figure 5:



(a) Demand satisfaction



(b) Convenience

Figure 5: Demand satisfaction and convenience

As displayed in Figure 5 (a), it is found that 102 students and 98 teachers think SE can meet their needs very well. There are 41 students and 35 teachers who believe that SE can meet their needs, and 16 students and 27 teachers who believe that SE can not meet their needs. There are 11 students and 10 teachers who believe that SE does not meet their needs.

According to Figure 5 (b), 110 students and 95 teachers showed that SE is very convenient, and 40 students and 28 teachers showed that SE is relatively convenient. Fifteen students and 22 teachers said that SE is not convenient, and five students and 25 teachers said that SE is very inconvenient.

Smart education is a new teaching mode developed on the basis of traditional education. This model can deeply integrate all kinds of education-related data and applications, and provide users with free or paid services as needed to satisfy the needs of educational users in teaching, learning, research, management, social and other aspects. It can also complete teaching activities for users, such as publishing education information, acquiring teaching resources, conducting teaching interaction, statistical education data, making scientific decisions, implementing education evaluation, and carrying out collaborative scientific research.

(2) Arouses the enthusiasm of students

In the process of smart education, learners can not only learn actively, but also develop conscious learning habits. Smart education respects students' personality, explores students' potential, cultivates students' creativity, and guides students to carry out creative learning under the correct and reasonable premise. In order to maximize the value of students and lay a solid foundation for the development of students, the people-oriented moral concept runs through the whole education process.

Enthusiasm is the creativity of learners in learning activities. Smart education is student-centered, so cultivating students' enthusiasm is the core of its goal. The enthusiasm of students in learning under SE is displayed in Table 1:

Table 1: Students' enthusiasm for learning

Positive degree	Students	Teachers
Very positive	47	54
Quite positive	50	52
Generally positive	43	44
Inactive	18	11
Very inactive	12	9

As displayed in Table 1, 47 students felt that they had a very positive learning attitude under SE, and 54 teachers felt that students had a very positive learning attitude under SE. There are 50 students who feel that they have a positive attitude towards learning under SE, and 52 teachers who feel that students have a positive attitude towards learning under SE. 43 students felt that their learning attitude was generally positive under SE, and 44 teachers felt that their learning attitude was generally positive under SE. There are 18 students who feel that their learning attitude under SE is not positive, and 11 teachers who feel that their learning attitude under SE is not positive. There are 12 students who feel that their learning attitude under SE is very negative, and 9 teachers feel that their learning attitude under SE is very negative.

Students are the core of SE. In SE, people should try to cultivate their enthusiasm so that they can realize the value of their education on the premise of giving full play to their own value. Smart education should not only provide educational resources for learners, but also pay attention to students' inner needs, guide and help students achieve common development in academic and ideological and moral aspects.

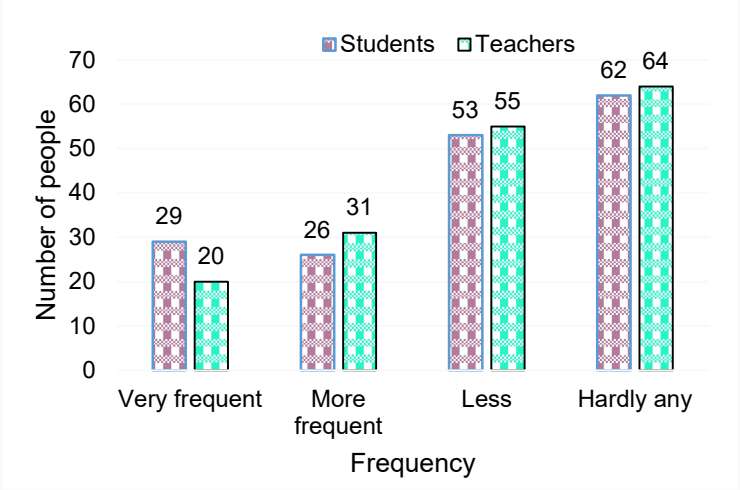
IV. B. Problems in Smart Education

With the development of intelligence education in the world, China also realized the importance of education reform, so it introduced the concept of "intelligence education" to China, and combined it with the current education situation, finally forming China's "intelligence education". However, there are still many problems in the implementation process.

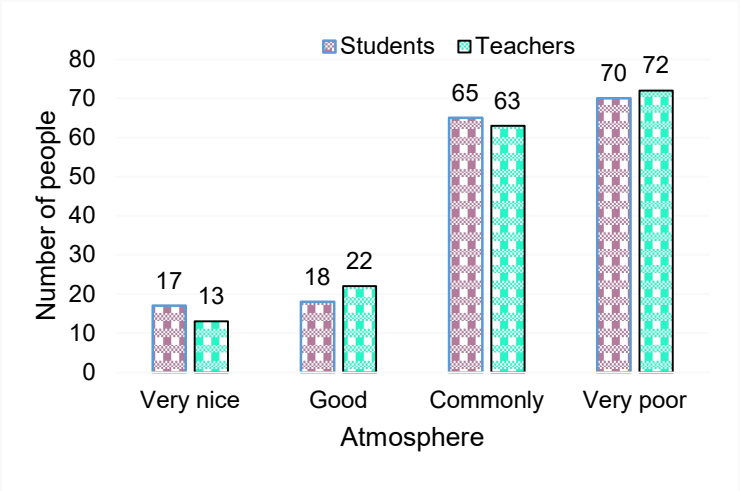
(1) The authenticity of education is weakened

However, SE is likely to go to the other extreme, transforming the teaching process into a one-way production. Smart education is the rational planning and packaging of resources through specific processes according to the established plan, and then displayed through online video. In this case, the teacher's role as a guide in education has been gradually replaced, the students' questions and answers have been stripped in the classroom, the interaction between students and students has been weakened, and there is no interaction between teachers and

students. The frequency of communication between teachers and students and the classroom atmosphere in SE are displayed in Figure 6:



(a) Communication frequency



(b) Classroom atmosphere

Figure 6: Communication frequency and classroom atmosphere

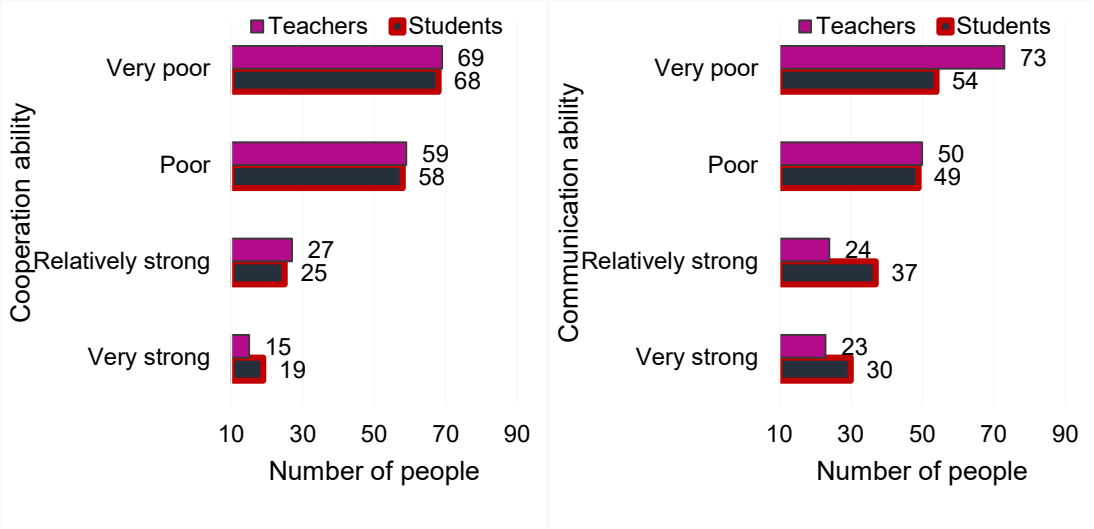
As displayed in Figure 6 (a), only 29 students and 20 teachers think that the exchange between teachers and students is very frequent under SE, while 26 students and 31 teachers think that the exchange between teachers and students is relatively frequent under SE. There are 53 students and 55 teachers who believe that there is little communication under SE, and 62 students and 64 teachers who believe that there is little communication between teachers and students under SE.

From Figure 6 (b), it can be seen that only 17 students and 13 teachers show that the classroom atmosphere under SE is very good. Eighteen students and 22 teachers said that the classroom atmosphere under SE is good, and 65 students and 63 teachers said that the classroom atmosphere under SE is average. 70 students and 72 teachers said that the classroom atmosphere under SE was very poor.

True education should not only be the judgment of right and wrong, but also enlighten students. If people can only make judgments mechanically, it would only lead to the alienation of their relationship, making it difficult to carry out SE effectively for a long time. The truly efficient teaching should be communication, questioning and discussion, which is the successful education. However, the virtualization of SE is difficult to establish an interactive atmosphere in the classroom.

(2) The spirit of cooperation has been diluted

Communication and cooperation between students is very important in traditional Chinese teaching. In traditional education, with more and more communication and cooperation between students and students, they would help and encourage each other. In cooperative learning, learners can feel their progress and motivation, thus making them more active and closer to success in future learning. In the development of society, communication ability has become more and more important, but SE is based on the virtual characteristics of the Internet. The complex changes of the Internet have weakened the students' cooperation ability and communication ability. Cooperation ability and communication ability are displayed in Figure 7:



(a) Cooperation ability (b) Communication ability

Figure 7: Cooperation ability and communication ability

As displayed in Figure 7 (a), 69 teachers and 68 students found that students' cooperation ability under the SE model was very poor. 59 teachers and 58 students felt that students' cooperation ability was poor under the SE mode, while 27 teachers and 25 students felt that students' cooperation ability was relatively strong under the SE mode. Only 15 teachers and 19 students felt that students' cooperation ability was very strong under the SE model.

According to Figure 7 (b), there are 73 teachers and 54 students who think that students' communication ability is very poor under the SE mode. There are 50 teachers and 49 students who think that students' communication ability is poor under the SE mode. There are 24 teachers and 37 students who think that students' communication ability is relatively strong under the SE mode, and there are 23 teachers and 30 students who think that students' communication ability is very strong under the SE mode.

In traditional education, students can improve their social skills through mutual communication and cooperation, thus accumulating rich experience for future social interaction. In the learning process, students' cooperative learning method can not only improve students' academic performance, but also enhance students' emotional communication and enhance their communicative ability. However, in SE, the relationship between students is based on virtual network. Students pay more attention to learning experience and practical operation, but neglect cooperation and communication, which makes communication and cooperation between students become a formal and virtual relationship.

While fully guaranteeing students' right to independent learning, SE would also unconsciously weaken students' sense of responsibility and sense of teamwork. This can thus make students break away from the main purpose of SE, that is, to focus on and develop students' team spirit and problem-solving ability.

IV. C. System Test

Due to the poor hardware conditions of the laboratory, this paper deployed on the virtual machine, and the test environment is virtual machine. The main test contents include the security of the system. In this paper, the number of 500 tasks is stored in the test environment, and the resulting security is displayed in Table 2:

Table 2: System security

Number of tasks	Number of tasks completed safely	Safety rate
100	87	87%
200	182	91%
300	276	92%
400	392	98%
500	495	99%

As displayed in Table 2, when the number of tasks is 100, the number of tasks completed safely by the system is 87, and the security rate is 87%. When the number of tasks is 200, the number of tasks completed safely by the system is 182, and the security rate is 91%. When the number of tasks is 300, the number of tasks completed safely by the system is 276, and the security rate is 92%. When the number of tasks is 400, the number of tasks completed safely by the system is 392, and the security rate is 98%. When the number of tasks is 500, the number of tasks completed safely by the system is 495, and the security rate is 99%. It can be found that the security rate of the system is 87% at the lowest and 99% at the highest. The system has high security.

The difference between the test environment and the actual operation environment is the hard disk space, so the system designed in this paper can also meet the actual application requirements. The SE system based on multimedia image and AI makes full use of the computing and storage resources in the system cluster, reduces the funds required for the construction of the system, and provides new solutions for it.

IV. D. Development Measures of Smart Education

(1) Scientific planning of SE is needed

Smart education is a new form of education, which has brought great changes to traditional education. Therefore, there must be a specific plan when implementing it, so that it can be carried out step by step. So when planning SE scientifically, people should start from the following points: First, people should continue to promote the economic development of remote areas, so that people can survive and better participate in education. Therefore, if China wants to develop SE, it must first solve the problem of people's food and clothing. Second, people can establish some SE demonstration areas, compare the demonstration areas with traditional education, and make relevant education experts and scholars aware of its great effect. At the same time, people also hope that the demonstration effect of the demonstration area can provide reference for the promotion and development of SE, so that it can develop in the right direction.

(2) Excellent teachers should be trained

It also needs to strengthen the training of teachers' informatization ability, so that they can better use information resources, better carry out related work, and truly realize the content of SE. It should cultivate relevant intelligence education researchers, conduct in-depth research and evaluation on China's intelligence education, find its advantages and disadvantages, and find the right path for the development of China's intelligence education.

V. Conclusions

As the most advanced form of educational informatization with the characteristics of the times, SE has had a huge impact on today's education. Smart education management system is a concrete embodiment of modern education in the actual development process. Therefore, it would have a very important impact to vigorously develop SE management system to better satisfy to the learning and life of today's society. Multimedia images and AI have gradually been widely used in educational practice, which has greatly improved teaching methods, methods and environment. This can improve students' learning enthusiasm. However, in the process of applying SE, many problems also arise. These problems can not only play on the advantages of SE, but also hinder the quality of teaching. The article have experimentally investigated the problems it faces and given solutions.

Funding

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