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Smart Classroom Teaching System in Rural Primary and Secondary Schools Based on Data Mining Technology

Wei Na*

Normal College, Hunan University of Arts and Science, Changde 415000, Hunan, China
276677761@qq.com
**corresponding author*

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Abstract: Data mining technology can analyze a large amount of data accumulated by the teaching system, and obtain useful rules and patterns from it, which can effectively improve the intelligence and practicability of the teaching system, and stimulate students' interest in learning to the greatest extent. Through the in-depth integration of information technology and classroom education, the cultivation of intelligent talents is the focus of educational innovation. Therefore, this paper designs a smart classroom teaching system for rural primary and secondary education with sports data mining technology, aiming to improve the teaching level in rural areas. The system uses the data mining method to evaluate students' performance, and can mine the correlation of students' learning behavior through association rule algorithm. Through the evaluation experiments of rural primary and secondary school students on the use of the system and the comparison of mathematics scores before and after the system is used, it is found that the students are satisfied with the smart classroom teaching system designed in this paper, and the students' academic performance has improved significantly after using the system to teach.

1. Introduction

Primary and secondary schools cover primary schools, junior high schools and senior high schools. Primary and secondary school students are the main body of compulsory education and the basis for talent training. As far as the current education model is concerned, students are in a teaching environment in which they passively receive knowledge. In order to give full play to students' initiative in learning, it is necessary to improve the teaching model. Smarter classroom teaching provides students with an interactive teaching environment. Students can freely discuss the learning content and actively think about problems, forming a good learning atmosphere.

So far, many scholars have conducted in-depth research on the design of smart classroom

teaching systems in rural primary and secondary schools based on data mining technology, and have achieved good research results. For example, a researcher analyzed primary and secondary education in rural areas and found that students' performance in class was not positive. In a class, students basically did not speak, but only received information from teachers, which would reduce students' interest in class and distract students from Therefore, it is necessary to reform the current situation of rural education and innovate the teaching mode [1]. In response to these problems, some scholars have developed a smart classroom teaching system based on data mining algorithms. The system can apply all functions on the basis of the mobile Internet. Students can use this system to view the courseware uploaded by teachers, and teachers do not need to spend time using the system. During lesson preparation, and the system has functions such as class sign-in, exercises, and chapter evaluation, students can test their learning outcomes at each stage [2-3]. Although there are many applications of data mining technology in the design of smart classroom teaching system, teachers should learn to use the mining function of the system to analyze student learning data to make teaching more intelligent.

This paper first briefly introduces the concept of data mining technology, then analyzes the value of implementing smart classrooms in primary and secondary schools, and then uses data mining technology to design a smart classroom teaching system for rural primary and secondary schools. Finally, the system is applied to the teaching of a rural primary and secondary school, and it is verified that the system can meet the needs of students through the evaluation of the performance of the system, and then compare the students' scores before and after the system is used to find that the system application in this paper can improve academic performance.

2. Data Mining Technology and Smart Classroom

2.1. Data Mining Technology

Data mining has always been a research hotspot of scholars, and can be applied to various information management systems and decision support systems to provide support for user decision-making. The content of data mining includes: classifying data sets, analyzing the inherent association rules of data, discovering abnormal points, discovering available sequence patterns, analyzing the interdependence between data, etc. [4]. Data mining is to discover new knowledge, new patterns and new rules that can produce certain benefits for our work from a large number of data sets. The objects it mines are massive amounts of historical data that seem worthless, but the results they mine are golden ideas that are of great significance to our work [5].

The Apriori algorithm vividly embodies the connotation of the two-stage frequent set idea. It is often used to mine association rules and detect frequent itemsets based on plot-down closure. Its function is to fully analyze and mine the correlation between data, so as to clarify what role the mined data plays in decision-making [6].

2.2. Value Analysis of Smart Classroom in Primary and Secondary Schools

(1) Inspiring students' minds and cultivating learning wisdom

Primary and secondary school students are at an age where they love to play and play, and the traditional single-line knowledge transfer teaching model is actually not suitable for the acquisition of classroom knowledge. Smart classroom emphasizes interactive education and vivid education. It tells the teaching content to students in a vivid form, stimulates students' curiosity, inspires students' minds, and achieves the goal of wisdom development [7]. In this way, the effect of learning is more significant, the memory of the acquired knowledge is deeper, and it is easier to grasp.

(2) Encourage thinking training and cultivate innovative quality

Although my country's education system is constantly improving and the education model is constantly innovating, due to the pressure of competition in entrance examinations, the traditional "cramming" is still the main method. If there is no continuous learning and memory, you may forget what you have learned. My country is a big country in education. Although participating in international competitions can always win great prizes, once the ability to innovate and adapt to emergencies is used, it is far inferior to that of foreign students. The new curriculum reform is also an all-round educational reform based on this phenomenon. The implementation of smart classroom is to start from children, first to cultivate innovative qualities, and to receive thinking training. As long as students become smarter and wiser, learning knowledge is a natural, relaxed and pleasant process [8].

(3) Advocating diversified teaching and cultivating comprehensive ability

Diversified teaching is not the diversification of knowledge content, but the diversification of teaching forms. The traditional language and mathematics must be learned, but it is not a scripted study. Such classrooms lack vitality and agility. The smart classroom advocates interactive teaching. Teachers and students have an equal relationship. The classroom communicates in multiple directions. Students communicate with teachers in a timely manner, and students and students communicate at any time [9]. In the classroom, group cooperation is a common method. Students first form groups freely, and each group elects a group leader. The group leader is responsible for assigning work, making plans with everyone, and working together to complete works. After the work is completed, you need to introduce and show it to others, and how to sell your creation reasonably. During the whole process, students played multiple roles in it, and their hands-on ability and expression ability were improved, especially their communication and cooperation ability. Diversified teaching forms promote the cultivation of students' abilities in many aspects. With the development of intelligence, both the physical coordination ability and the psychological and mental state have been comprehensively developed [10-11].

(4) Innovative teaching methods

The teaching methods and forms advocated by the smart classroom are not only helpful to students' learning, but also of value to teachers' teaching work. Interactive classroom mode, advanced teaching concepts, and intelligent teaching equipment help teachers maximize their classroom effects [12-14].

3. Design of Smart Classroom Teaching System for Rural Primary and Secondary Schools Based on Data Mining Technology

3.1. System Development Environment

The development operating system is Windows 7 64-bit Professional Edition. The system database uses Mysql-5.6.24-win32. 1432006610 as the database system. At the same time, considering the compatibility of accessing the relevant data of the external file question bank system, the system needs to be compatible with the ORACLE10G database resources, and use heterogeneous data technology to exchange and process data. Use ODBC ORACLE to access external data. Use ODBC ORACLE to access external data. The smart classroom teaching system in rural primary and secondary schools based on data mining technology, in addition to the conventional classroom teaching function, is the key to use data mining technology. As shown in Figure 1, this system will interact with the student status management system, curriculum management system and teacher information management system.

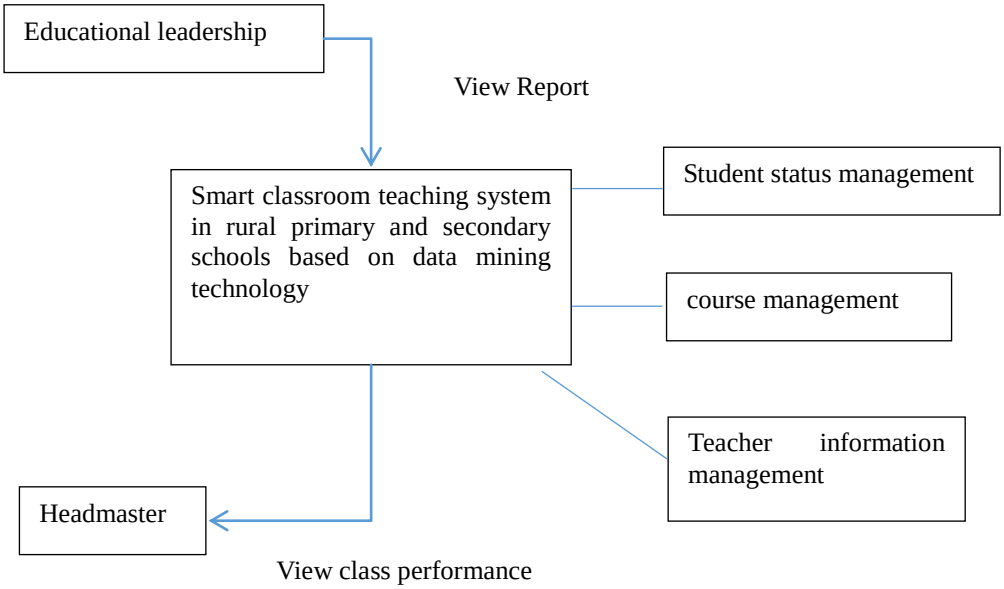

Figure 1. System environment diagram

3.2. System Function Module Design

The system function design is divided into the overall design and the design of each subsystem. This multi-self system design method can better provide corresponding services. The functional module diagram is shown in Figure 2.

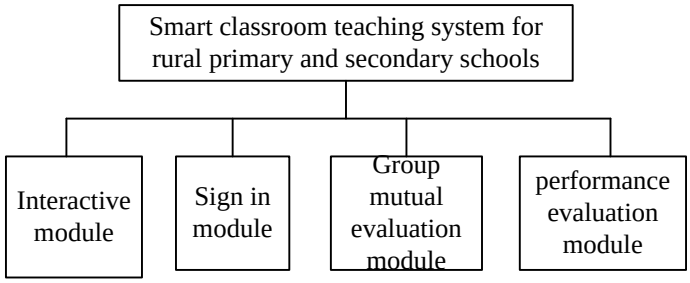

Figure 2. Schematic diagram of system modules

Interactive module: Smarter classroom increases the frequency of communication between students and students and between students and teachers. For primary and secondary school students, it is necessary to cultivate their communication skills, activate the classroom atmosphere through interaction, and improve students' enthusiasm for participating in the classroom. Through the Apriori algorithm of data mining technology, the interaction behavior of students is mined, and the correlation between student interaction and grades is analyzed.

Check-in module: Design modules in the system to improve adaptability. By using the check-in function, you can save the time for teachers to check in before the official class. The smart classroom teaching system mainly includes a face-scanning sign-in module.

Group mutual evaluation module: The smart classroom hopes that students can increase communication opportunities in teaching, and also hopes to concentrate students' wisdom, creativity and thinking ability through group study. Evaluation.

Achievement evaluation module: The achievement evaluation function provides a query module where teachers can simply, intuitively and objectively view students' classroom learning behavior. Based on the data generated by the students in the classroom, the grades can be assessed through the method of data mining, and the quantitative data results can be used to rank the students.

Assume that the number of students in a course C is n, and the total number of classes in course C is i, then the set of grades of student x is $A_x = (Score_1, \cdots, Score_i)$, and the set of grades of students with the corresponding kth class is $B_x = (Score_1, \cdots, Score_n)$, then there is a matrix of student scores in class C:

$$C = [A_1 \cdots A_n] = \begin{bmatrix} B_1 \\ \cdots \\ B_i \end{bmatrix} = \begin{bmatrix} Score_{11} \cdots Score_{1n} \\ \cdots\cdots \\ Score_{i1} \cdots Score_{in} \end{bmatrix} \tag{1}$$

$Score_{jk}$ denotes the grade of the kth class of the jth student. It is assumed that there are y interactive behaviors in the Kth class. Each interactive behavior will calculate an evaluation value. The value of the pth interactive behavior is recorded as V_p. The algorithm will be different due to different behaviors. The grades $Score_{jk}$ for the second class are:

$$Score_{jk} = \frac{\sum_{p=1}^{y} V_p}{y} \tag{2}$$

The difficulty coefficient refers to the difficulty coefficient of a certain test paper. The relative difficulty of this paper in different test papers in the current examination of this department can be calculated by the following formula, which is counted as ND:

$$ND = \frac{\sum_{\text{Each class book}} \text{Reference qualified number}}{\sum_{\text{This volume}} \text{Total number of subject references}} \tag{3}$$

4. Systematic Review and Application

4.1. Systematic Review

The system designed in this paper is aimed at primary and secondary education, and is aimed at rural teaching. Therefore, the smart classroom teaching system is put into use in a rural teaching process. The first class evaluates the system designed in this paper, and the evaluation scores range from 1 to 5. The higher the number, the more satisfied the students are with the system. The system can be operated on a mobile device terminal, and students can log in to the system to learn.

Table 1. Evaluation test results

	simplicity	compatibility	Extensibility	fairness
Primary school	4.3	3.6	4.6	4.2
Junior high school	4.6	3.5	4.8	4.0
High school	4.7	3.7	4.5	3.8

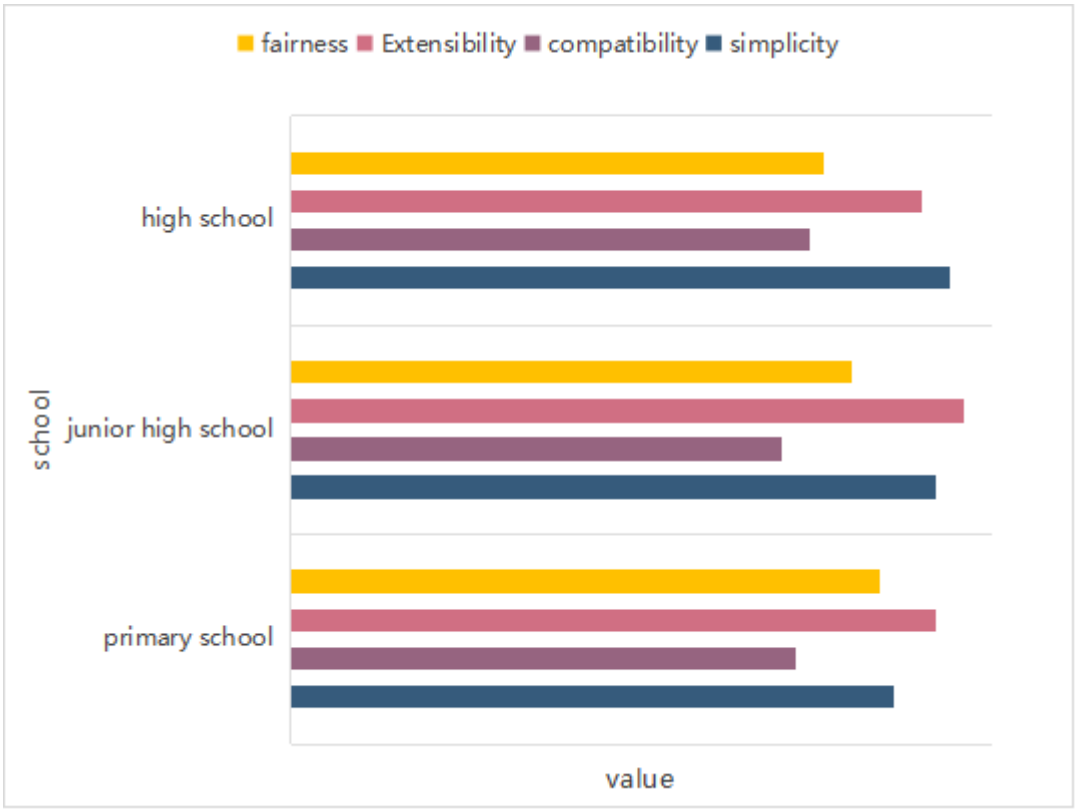

Figure 3. System evaluation

As shown in Table 1 and Figure 3, primary and secondary school students evaluate the simplicity, compatibility, scalability, and fairness of the smart classroom teaching system, and the evaluation results take the average score. Simplicity originally means that the system usage process is simple, so simplifying the usage process during design becomes a crucial point. Compatibility means that different users determine the compatibility. For the mobile device operating system of unknown users, use a common method to develop software as much as possible. Scalability means that the system not only needs to solve a scene of class interaction, but also needs to call external service interfaces to solve chat, check-in and other scenarios, to meet the expansion requirements of adding service software and hardware equipment in the future, and to integrate new technologies to meet the overall needs. Fairness means that it is extremely important to pay attention to the performance of every student in the classroom and to evaluate and reward in a timely and effective manner. According to the statistical results in Table 1, the higher the grade, the higher the student's evaluation score for the simplicity of the system, which is related to the age, and the older the student, the easier it is to operate the system. For the compatibility, scalability and fairness of the system, the average scores of primary and secondary school students are all above 3.5 points, indicating that the students are satisfied with the system and the performance of the system meets the needs of students.

4.2. System Application

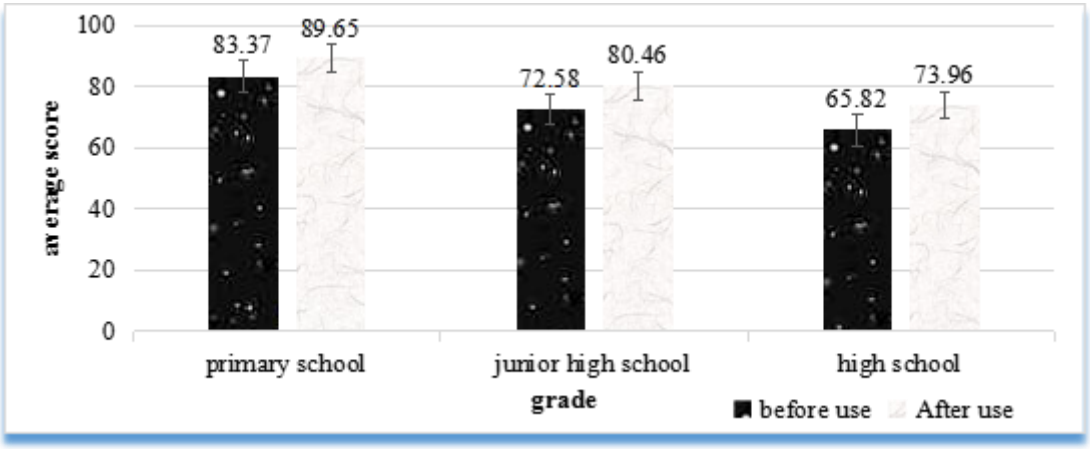

Figure 4. Comparison of mathematics achievement of primary and secondary school students

Figure 4 shows the comparison between the average grades of primary and secondary school students in mathematics before using the teaching system and the average grades after using the teaching system. The total test score is 100 points. Through the comparison, it can be clearly seen that the academic performance of the students in the three grades has improved, which shows that the smart classroom teaching system designed in this paper can help students improve their academic performance. This is because in the process of using the system teaching, students' The attention is more concentrated, and the enthusiasm of students to participate in the classroom is mobilized through interactive teaching.

5. Conclusion

This paper puts forward the theory of data mining technology, and uses the function of mining information to develop a smart classroom teaching system for rural primary and secondary schools. The system uses data mining technology to analyze student performance data. In the practical application of the smart classroom teaching system in rural primary and secondary schools, this paper obtained the evaluation scores of primary and secondary school students on the system performance. Students' grades have improved compared to before. Therefore, the smart classroom teaching system designed in this paper has teaching feasibility.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] *Acharya M , Acharya K P , Gyawali K , et al. Discussing Professor Yin Kejing's Drug Use Law for Mammary Hyperplasia Based on Data Mining Technology. International Journal of Clinical and Experimental Medicine, 2021, 5(3):403-407.*

[2] *Chagovets L O , Chahovets V V , Didenko A S . The Data Mining Technology Applications for Modeling the Unevenness of Socio-Economic Development of Regions. Business Inform, 2020, 3(506):82-91.*

[3] *Hanny, Calache, Bradley, et al. An epidemiological study of dental caries and associated risk factors among primary school children in the Aileu Municipality, Timor-Leste.. Rural and remote health, 2019, 19(4):5322-5322.*

[4] *Palanisamy P , Paavizhi K , Saravanakumar A R . Techno Pedagogical Skills For Teaching-Learning Process In Smart Class. Talent Development and Excellence, 2020, 12(1):4984-4994.*

[5] *Hitchens M , Tulloch R . A gamification design for the classroom. Interactive Technology & Smart Education, 2018, 15(1):28-45.*

[6] *Phoong S Y , Phoong S W , Moghavvemi S , et al. Effect of Smart Classroom on Student Achievement at Higher Education. Journal of Educational Technology Systems, 2019, 48(2):291-304.*

[7] *Naqli F A , Wan S , Rahman R A . The Role of the Smart Learning Environment in Advancing the Smart Learning Process: Review. International Journal of Advanced Science and Technology, 2020, 29(9):6113-6130.*

[8] *Huda Y , Faiza D . Desain Sistem Pembelajaran Jarak Jauh Berbasis Smart Classroom Menggunakan Layanan Live Video Webcasting. Jurnal Teknologi Informasi dan Pendidikan, 2019, 12(1):25-32.*

[9] *Palanisamy P , Saravanakumar A . Development of a Module on Smart Classroom Teaching Competency for Primary Teacher Trainees. Turkish Online Journal of Qualitative Inquiry, 2021, 12(7):3132-3139.*

[10] *E A, Anumudu N , Yemi A I . Improvisation as a means of enhancing the teaching and learning of mathematics in secondary schools in enugu state. International Journal of Advanced Research, 2021, 9(4):506-511.*

[11] *Khan M S , Jan M I . Assessing the Role of Pedagogy in Performance of Schools in Rural Islamabad. Sir Syed Journal of Education & Social Research (SJESR), 2020, 3(4):62-70.*

[12] *Col L , Ahmed H , Asaduzzaman A . A Study on the Impact of Information and Communication Technology on the Secondary and Higher Secondary Students' Education: On the Basis of Bangladeshi Students' Opinion. International Journal Of Advance Research And Innovative Ideas In Education, 2020, 6(6):472-482.*

[13] *Zhang C , Xiaonan W U , Wang H , et al. Research on the Law of Professor Yang Shaofeng's Drug Use in the Treatment of Cervical Spondylosis Based on Data Mining. Chinese Journal of Ethnomedicine and Ethnopharmacy, 2019.*

[14] *Duan S , Cai S , Yang Q , et al. Multi-arm polymeric nanocarrier as a nitric oxide delivery platform for chemotherapy of head and neck squamous cell carcinoma. Biomaterials, 2012, 33(11):3243-3253.*