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Ideological and Political Classroom Assistant Teaching System Based on Big Data Mining and Machine Learning

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Abstract: *In order to make efficient use of the effective teaching time in the classroom, students' learning of Ideological and Political (hereinafter referred to as IP) courses has been strengthened. At the meanwhile, students' understanding of IP curriculum knowledge has been deepened to cultivate students' logical thinking ability, so as to strengthen the teaching effect of IP curriculum. This paper clarified the collection, processing, mining, analysis and other processes of big data mining by analyzing the elements of big data mining. At present, the problems existing in IP classroom assisted instruction were analyzed in multiple dimensions. Big data mining technology was utilized for the IP classroom assistive teaching system and wireless communication technology was utilized for the design of the assistive teaching system application. Then, BP neural network algorithm under machine learning was used to construct the IP classroom aided instruction system. Finally, the BP neural network algorithm based on machine learning was combined with experimental investigation for analysis. The experimental investigation showed that the IP classroom aided teaching system built by utilizing the system platform of big data mining technology and the BP neural network algorithm under machine learning has improved the IP learning efficiency by 23.25%.*

Keywords: *Ideological and Political Classroom, Classroom Auxiliary Teaching System, Big Data Mining, Wireless Communication*

1. Introduction

With the coming of the network age, the application of computer information technology in classroom development and resource integration is an inevitable trend. At the same time, with the development of higher education from elite education to mass education, the expansion of school coverage and the establishment of multiple school districts, IP teachers have implemented mobile teaching in teaching practice. The contact between IP teachers and students is gradually decreasing, and students rely entirely on their own efforts to strengthen and review the knowledge they have learned.

IP course is a kind of social practice, which aims to form the necessary ideological and moral forms, so that society and society can influence its members purposefully and systematically. Malazita James W took the information security course as an example, and focused on the frontier of international scientific application. He excavated the teaching cases of information security course and formed a curriculum system that integrated IP and curriculum content [1]. Liu Guangxin believed that it was extremely urgent to further deepen the research on IP education in the context of the Internet age [2]. Liu Xiaoqing integrated IP education into the instruction of higher mathematics and briefly introduced its reform and effectiveness. Through the introduction of cases, relevant formulas and definitions were vividly drawn. In this way, they taught mathematical ideas and carried out IP education [3]. Honeycutt Nathan proposed the relationship between teaching content knowledge and politics as a framework for understanding the subtle interpretation and application of critical social research teaching methods and practices [4]. By using qualitative case study design, Blevins Brooke found that when the clarity of politics and ideology was combined with the knowledge of teaching content, teachers' teaching methods were significantly strengthened [5]. Yang Jinsuk believed that the daily practice of teachers' political teaching strategies was a complex process, involving the interrelated ideology and identity related to mother tongue doctrine, gender nationalism and professionalism [6]. Schulte Barbara hoped to raise awareness about the politics of use in teachers' work and about how teachers could mobilize a larger political narrative when practicing curricular change. To demonstrate the politics of use, the

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creativity education of school design and practice is took as an example [7]. The above research is more thorough for the IP classroom analysis, but does not involve the auxiliary teaching system.

There are two types of auxiliary teaching systems: one is to clearly express the problems difficult for teachers to understand in the form of tables or dictation, and the other is to reflect students' difficulties in the form of multimedia. These training materials are usually exemplary. Liu Yingjie constructed a classroom teaching model in a multimodal perspective through the aid of multimodal theory and multimodal teaching concepts. The model had a dynamic teaching framework as its core and an open multimodal learning environment as its comprehensive support, which gave some actionable suggestions [8]. Meng-yue Cao designed and built an intelligent auxiliary system to expand the depth and breadth of the application of modern information technology in college English culture teaching, thus opening up a new way and direction for college English culture teaching [9]. Wang Linsheng used formula modeling to tap the association between instructional behavior and pupil activities and the impact of pupil activities [10]. Yuan Luo used neural network technology to build an assessment model of art instructional quality during the epidemic, which focused on the evaluation index of art instructional quality and neural network algorithm and process [11]. Yi Suping used data analysis methods to develop a comprehensive statistical research on instructional behaviors in a classroom innovation teaching competition. The analysis showed significant differences in teacher-student interaction, group work, independent learning, and self-directed learning, as well as assessment feedback in smart and traditional classrooms [12]. Quan Yu built a classroom instructional behavior analysis and evaluation system based on deep learning, and analyzed the classroom behavior of professional courses from three points: students' side face concentration, students' head down concentration, and students' eyes concentration [13]. Woodworth, Johanathan discussed the main advantages and disadvantages of using automatic assessment in the classroom. The conclusion was that when the automatic assessment behavior in the automatic writing assessment system was used wisely and effectively to supplement teachers' feedback, it could support teachers' work [14]. The above research is more thorough in the analysis of the auxiliary teaching system, but does not involve the IP classroom.

Students lack a deep understanding of the IP curriculum, and students have a strong sense of utilitarianism, leading them to participate in the IP curriculum only for examination. Therefore, how to efficiently use big data mining technology to strengthen the tutoring of students' IP courses and improve the efficiency of ideological and political learning has become another important factor in the innovation of teaching methods of IP subjects in schools.

2. Big Data Mining Elements

(1) Definition of the problem

The purpose of clarifying operation problems and clarify excavation is an essential step to realize big data mining, which promotes the whole data collection process and largely determines its impact or even success. The scope of application is understood to prepare relevant knowledge in advance. Activity data is analyzed in detail, and the end user's goals are determined.

(2) Data collection, processing, mining

According to the problem definition and user needs, the data that is applied to all operational targets of big data mining is selected [15]. Data types should be considered when collecting data. By default, some extraction algorithms can only be used for specific data formats, so they must be converted to the appropriate format. The probability distribution of each data category must match the actual conditions, and the collected data is stated in the target database. The selected data extraction algorithm is used to extract data from the knowledge of interest, which can be expressed in general expressions. Selection of mining algorithm: Different data have different attributes, and corresponding mining algorithm must be used. At this stage, data collection is important. In order to verify the discovered knowledge, the process mainly analyzes the obtained information and determines the decision of the end user. The most valuable information is distinguished, mainly through interaction with computers and through expert biological experience evaluation. Therefore, the acquired knowledge must be easy to understand and delivered to decision makers through decision support tools. This operation not only displays the results, but also filters the information, as shown in Figure 1.

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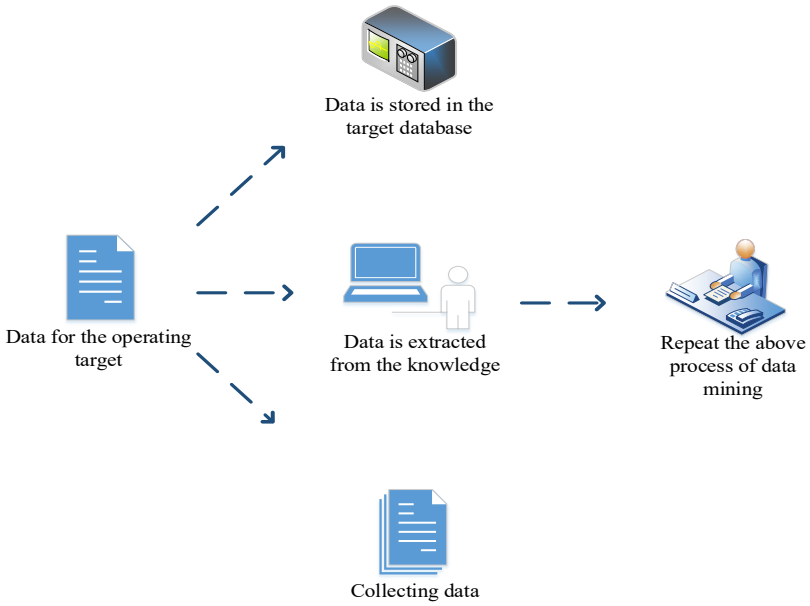

Figure 1: Data collection, processing, mining, and analysis

(3) Significance of big data mining research in IP assisted education

Big data mining technology has been widely used in finance, manufacturing, marketing and other fields, but rarely used in education [16]. In schools, the auxiliary teaching system has been popularized, but the utilization rate is still very low. Due to the lack of capacity to analyze and process data, a large amount of useful information provided by the system and its applications cannot be used. At the same time, there are some difficulties in establishing the IP assisted instruction system. The use of assisted learning systems, especially assisted examination and testing systems, generates a lot of information. In the learning process, when students practice, errors, practice time and other information are generated. According to the time of teacher training and students' mistakes in each chapter of the class, it is determined according to the corresponding analysis sequence. With the development of the curriculum, the order of knowledge points in the curriculum can be determined. Through this sequence, the system can derive some knowledge points that students are prone to make mistakes and do not understand in practice. During student learning, the system extracts unlearned parts and questions of interest based on previous information and learning reports. The analysis of current students' practice can help predict the mistakes that students may make in IP course learning, and remind teachers to pay more attention to these factors in class. The use of exams or tests to record student performance not only helps to assess the quality of teachers' teaching, but also helps to alert teachers to some of the issues that arise. In short, data mining technology is applied to the subject of ideology and politics as a complement to the learning system, not only to enhance students' motivation and create a study environment, but also to provide a leading role in improving teachers' teaching. The data mining method of IP teaching system is not only a necessary condition to ensure teaching quality and improve teachers' teaching level, but also a necessary means for the intelligent and personalized development of IP assisted teaching system [17].

(4) The application of wireless communication technology in assisted instruction system

With the advancement of wireless technology, the use of wireless technology in the learning process has been a key element of the new learning paradigm [18]. Wireless feedback learning systems usually use mobile phones, maps, etc. The wireless feedback learning system is faster than the traditional feedback method, which greatly shortens the feedback cycle and pays more attention to teachers and students' finding and solving problems in the classroom. The wireless feedback of the network is used to learn the topology of the system. Each student in the classroom can use this device to pass problems on the network platform [19]. Therefore, the wireless feedback system collects more classroom information than conventional classroom registration and discussion approaches, which objectively reflects the students' learning level and provides teachers and students with a clearer and clearer way, as shown in Figure 2.

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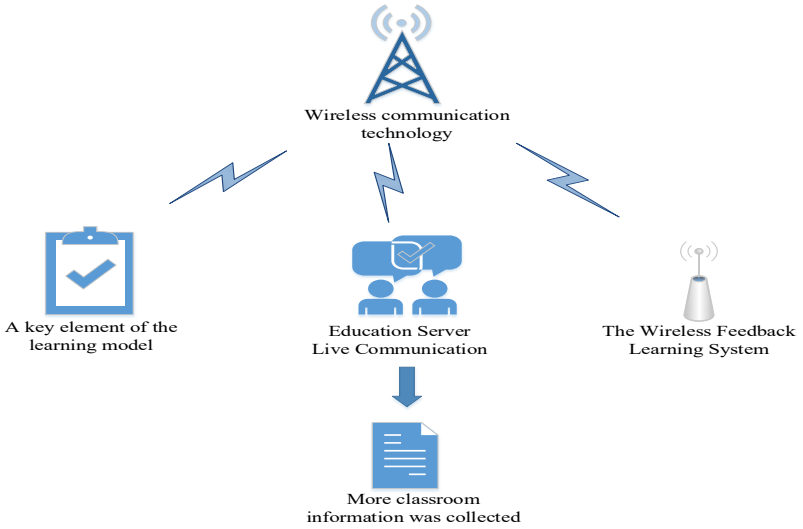

Figure 2: Application of the wireless communication technology in the auxiliary teaching system

3. Problems in IP Assisted Classroom Teaching

Compared with traditional learning methods, the IP classroom aided instruction system using big data mining technology has the advantages of resource sharing, rich pictures, time saving, convenient access to training courses, etc. However, there are also problems that cannot be ignored.

(1) Enriched instructional content and quick instructional speed

Teachers use big data mining technology to widely collect relative information, greatly enriching the teaching content. However, the use of multimedia technology has brought new challenges while improving teaching efficiency. The content of the courseware is too numerous and the amount of information is too large. The students' learning rhythm cannot keep up with the teacher's teaching rhythm. In class, the teacher can play the teaching content by clicking the mouse. Although this speeds up the learning process, it ignores the acceptability of learning and increases the visual pressure on students. When the teaching content is complex and students lack preparation, it is easy to question the teaching quality. With the passage of time, students' enthusiasm gradually lost. In practical teaching, students often report that the teaching speed of data mining technology is very fast and dazzling. It is difficult to take notes in class. There is no case to check after class review, and the classroom is chaotic, as shown in Figure 3.

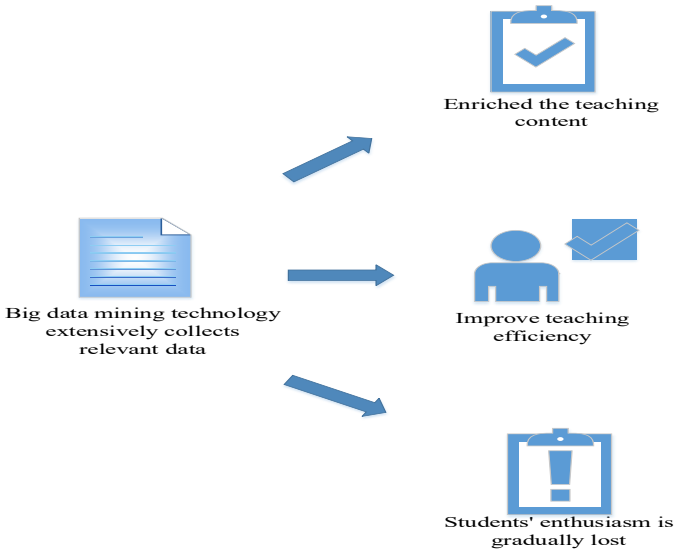

Figure 3: Rich teaching content and fast teaching speed

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(2) Excessive reliance on electronic courseware

Teaching is an interactive activity. Only when students and teachers interact with each other can they produce desired results. In fact, each teacher has his own unique teaching style, and each class has a different classroom style. To stimulate students' enthusiasm for studying, teachers must adjust their teaching methods to adapt to the curriculum, so as to flexibly adopt different teaching methods to improve teaching efficiency. However, after using big data mining technology, the courseware is made in advance, and the concept and content of the course determine the teaching method, teaching method and even the order of preparing the course. Therefore, teachers can simply use computers to control the progress of courses. For this reason, teaching has become a screening courseware. Under the guidance of teachers, computers have become real teachers.

(3) Poor courseware making

A good textbook is a prerequisite for IP education, and the compilation of textbooks is an important part of multimedia learning. Although there are a large number of free textbooks on the market or on the Internet, it is difficult to find textbooks that fully conform to specific teaching contents and concepts. Most teachers write their own teaching courseware. Due to differences in computer operation, some teachers only give 50-60 slides in 45 minutes in class. There is no standard font size and color on each page. It is full of symbols, just like celestial script.

4. IP Classroom Aided Teaching System Using Big Data Mining Technology

(1) Purpose of system design

The purpose of building an IP network-assisted teaching system is to take advantage of the campus network to enhance the sharing of IP education teaching resources and the quality of IP education in schools, thus providing a platform for communication and learning. Teachers and students support each other in the classroom and extracurricular activities, which make up for the deficiencies in school education. Therefore, the system design should follow the following principles. The auxiliary education platform should have a clear structure. The user's prompts must be clear and definite when students are testing. At the same time, the navigation map of the website must be adjusted accordingly to make it convenient for users to find relevant knowledge. The system must have good compatibility and usability, which not only is limited to IP subjects, but also can adapt to other subjects. The platform is an open platform based on the school network, which requires appropriate service mechanisms to secure the school system and network, such as authentication, firewall and privacy protection, as shown in Figure 4. The system is designed to ensure extensive information exchange. Therefore, managers need to speed up the management and maintenance to enhance the efficiency of the system.

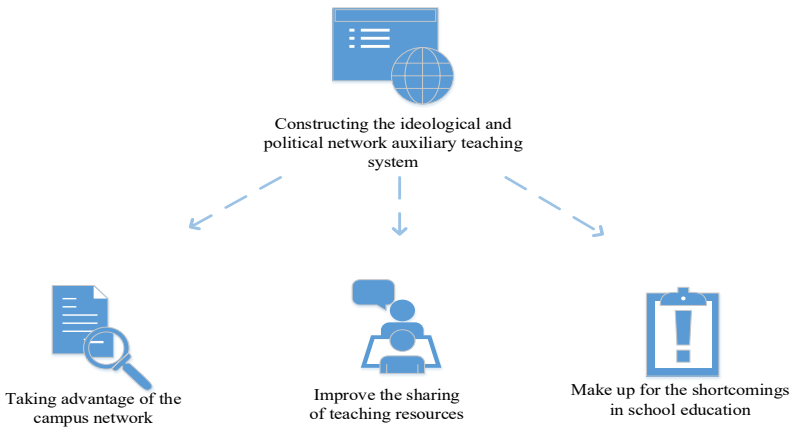

Figure 4: The Purpose of the system design

(2) System function and database design

The main functional modules of the teaching assistant system based on data mining technology include: 1) system input and maintenance module. This module mainly allows teachers or administrators to enter various types of IP information data in the system to offer support, thus ensuring the system is functioning properly by maintaining it. This module also allows teachers or administrators to store information about teachers, students, courses, textbooks, test results, etc. The system should be

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designed and implemented with due consideration to the effectiveness of data collection and error validation techniques to support data collection in different formats. 2) The data mining and database module allows the creation of student information tables, teacher information tables, examination information tables, etc. to provide support for data storage and data mining.

(3) System function design

The training modules include course content, highlights and challenges, multimedia materials and videos on IP video. The use of static text technology allows for varying text needs of various students to be considered. The benefit of this technology is that the text can display various learning elements and various choices can be made for different nodes to satisfy individual student needs. The main responsibility of teachers is to assign tasks, review courses and record the results in students' personal files. Students submit assignments or study reports in time according to the teaching requirements of teachers. System management includes user registration management, information sharing, questionnaire management, video download, etc. Information exchange is mainly for the benefit of system administrators, who share relevant ideas, policies, information, etc. The videos are mainly downloaded by teachers and administrators. The IP videos can be transferred to the web site for repeat viewing and downloading.

5. Construction of IP Classroom Aided Teaching System using BP Neural Network Algorithm under Machine Learning

Data on educational outcomes include information inside and outside schools. The internal information of the school includes information about students, examination results, etc. External information refers to various teaching resources, data sources and other information. It is necessary to classify these massive and scattered data information according to certain standards, and use the following functions to display this information:

$$M = \begin{bmatrix} m_{11}, m_{12}, ..., m_{1m} \\ m_{21}, m_{22}, ..., m_{2n} \\ ..., ..., ..., ... \\ m_{n1}, m_{n2}, ..., m_{nh} \end{bmatrix} \tag{1}$$

n teaching objects are set as a set:

$$X = \{x_1, x_2, ..., x_n\} \tag{2}$$

M teaching is selected as:

$$M = f(w) \tag{3}$$

The teaching result is:

$$Y = \{y_1, y_2, ..., y_n\} \tag{4}$$

Among them:

$$W = \{w_1, w_2, ..., w_n\} \tag{5}$$

W represents the weight of each indicator, so large volume information can be classified and classified under this function. In order to transfer classification information, BP neural network must be embedded in software design. The selection of activation function of neuron is subject type n function, and its expression is:

$$net = x_1 m_1 + x_2 m_2 + ... + x_n m_n \tag{6}$$

Among them: $x_1, x_2, ..., x_n$ represents the input of neurons; $m_1, m_2, ..., m_n$ represents the corresponding connection weight value. The formula for the number of hidden layers is:

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$$n_h = \sqrt{0.43nm + 2.54m + 0.12n + 0.35 + 0.51} \tag{7}$$

n represents the number of neurons in the output layer. m represents the number of neurons in the input layer. n_h indicates the number of hidden layers.

6. BP Neural Network Algorithm and Experimental Investigation Combined with Machine Learning

To further understand the students' evaluation of IP classroom teaching, students from four comprehensive universities are investigated and interviewed, including: A, B, C, D. The form of questionnaire is adopted, and the survey contents are mainly summarized as follows: teaching method, courseware content, teaching style, and curriculum concept. From these four points, the direction of students' current IP classroom teaching is investigate, and the number of samples is 400. The survey is shown in Table 1.

Table 1: Students' direction of the current IP classroom auxiliary teaching system

	A	B	C	D
teaching method	48%	49%	55%	44%
courseware content	43%	56%	64%	52%
teaching style	51%	48%	57%	46%
curriculum concept	58%	43%	45%	53%

As shown in Table 1, the students in the four comprehensive universities are not satisfied with the current IP classroom teaching methods, courseware contents, teaching styles, and course concepts. Among them, students of School A are 48% satisfied with teaching methods, 43% satisfied with courseware contents, 51% satisfied with teaching styles, and 58% satisfied with curriculum concepts. The students of School B are 49% satisfied with the teaching method, 56% satisfied with the courseware content, 48% satisfied with the teaching style and 43% satisfied with the curriculum concept. The students of School C are 55% satisfied with the teaching method, 64% with the courseware content, 57% with the teaching style and 45% with the curriculum concept. The students of School D are 44% satisfied with the teaching method, 52% satisfied with the courseware content, 46% satisfied with the teaching style, and 53% satisfied with the curriculum concept.

In order to improve students' enthusiasm for learning IP courses, the system platform of big data mining technology is used in the IP classroom aided teaching system built with BP neural network algorithm under machine learning. To test the impact of the IP classroom auxiliary instructional system on students, this paper investigates four comprehensive universities for evaluation and testing, to test the degree of recognition of students in universities for the IP classroom auxiliary teaching system and the evaluation results. The evaluation results are specifically reflected in the effect of the IP classroom aided teaching system on students' learning of IP courses. The sample number is 1200. The evaluation results are divided into three levels: satisfactory, average and dissatisfied. The specific effect is shown in Figure 5.

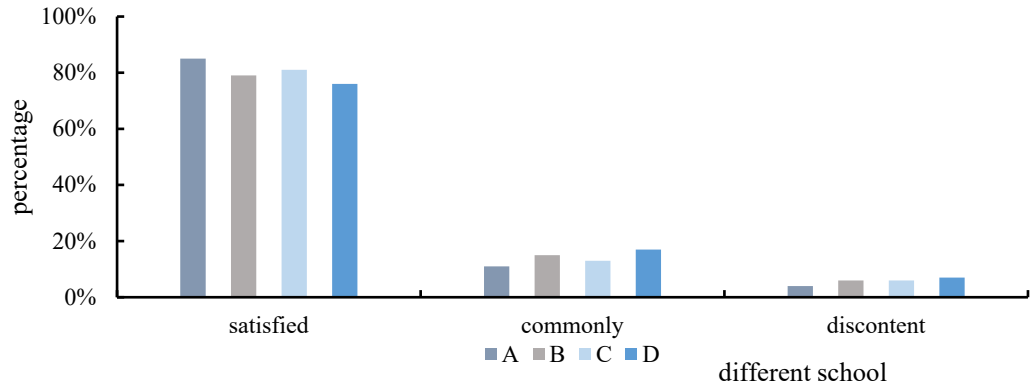

Figure 5: The effect of the IP classroom auxiliary teaching system for students' learning of IP courses

In Figure 5, the students of the four colleges and universities have a high degree of recognition for the IP classroom aided teaching system that is built by utilizing the system platform of big data mining

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technology and the BP neural network algorithm under machine learning. Satisfaction accounts for the majority. Among them, the satisfaction of School A is 85%, that of School B is 79%, that of School C is 81%, and that of School D is 76%.

In order to test the difference between the IP classroom aided teaching system constructed by using BP neural network algorithm under machine learning and the traditional IP classroom teaching system, the satisfaction of a comprehensive college under two IP classroom teaching system modes is investigated. There are 400 students surveyed, and the survey results are three grades: satisfied, average and dissatisfied, as shown in Figure 6.

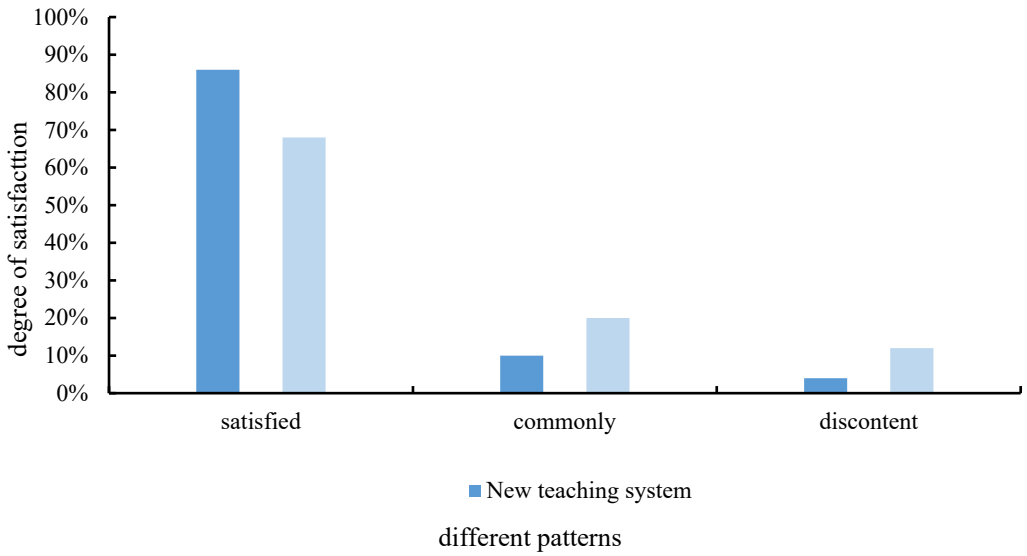

Figure 6: Satisfaction of a comprehensive college under two IP classroom teaching systems

It can be learned from the histogram in Figure 6 that the satisfaction of both IP classroom teaching systems is quite different. Among them, the satisfaction of the new IP classroom aided teaching system is 86%, generally 10%, and the dissatisfaction is 4%. The satisfaction of traditional IP classroom teaching system is 68%, generally 20%, and the dissatisfaction is 12%. Compared with the two kinds of IP classroom teaching systems, the traditional IP classroom teaching system has a more traditional teaching method, and the students' recognition of the traditional IP classroom teaching system is relatively low. The new IP classroom aided teaching system can help students understand the relevant knowledge of IP courses more efficiently, so as to improve the learning efficiency, and students' recognition is higher.

The development of anything needs a process. Figure 7 shows the specific statistics of students' comparison of teaching methods, courseware contents, teaching styles and course concepts between the IP classroom aided teaching system built by a comprehensive college in 2021 using the system platform of big data mining technology and the BP neural network algorithm under machine learning and the traditional IP classroom teaching system. The specific findings are shown in Figure 7.

According to Figure 7, students have different satisfaction evaluations on the new IP classroom aided teaching system and the traditional IP classroom teaching system. Among them, the satisfaction of teaching methods in the new IP classroom aided teaching system is 86%, 27% higher than that in the conventional model. The satisfaction with the courseware content is 79%, 23% higher than that of the conventional model. The satisfaction with teaching style is 74%, 16% higher than that of the conventional model. The satisfaction with the curriculum concept is 88%, which is 27% higher than the conventional model. After investigation and experiment, the IP classroom aided teaching system built by utilizing the system platform of big data mining technology and BP neural network algorithm under machine learning can improve the IP learning efficiency by 23.25%.

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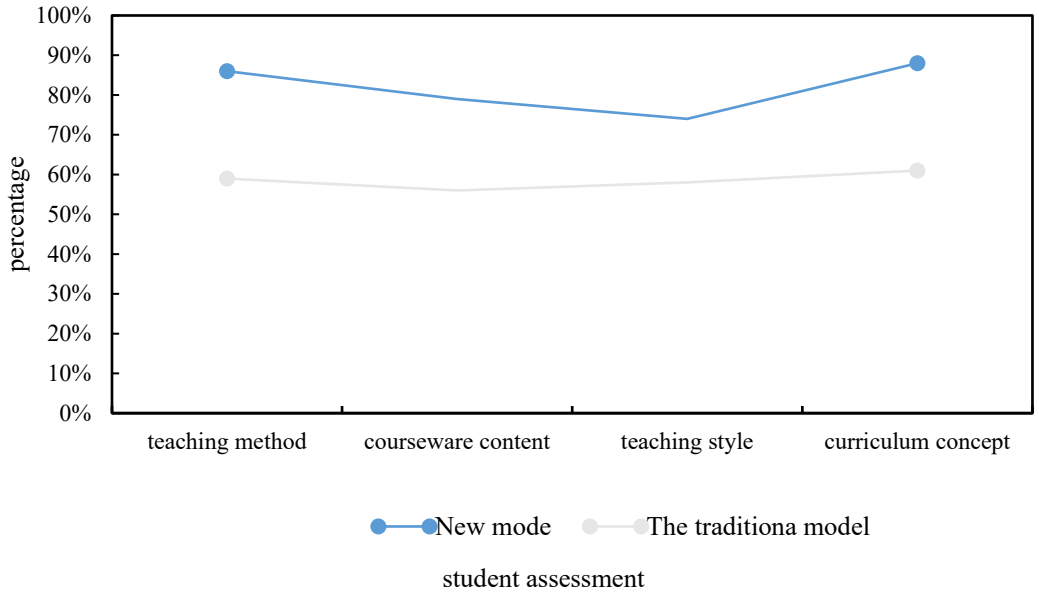

Figure 7: Evaluation of students in the two teaching models

7. Conclusion

By using big data mining technology to conduct real-time analysis on students' IP education courses, it has been provided with a wide range of audio materials, videos and text materials, which has played a valuable role in big data mining. The motivation of students to learn the IP curriculum has been mobilized, and the school learning links have been enriched to activate the classroom atmosphere. In the IP theory course, teachers should not only master solid theoretical skills, but also actively participate in the reform and innovation of the IP theory course. The good IP education system has laid a solid foundation for all IP theory courses.

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