Retraction

Retracted: Application Research of Advanced Intelligent Big Data Analysis Based on Intelligent Sensor Network in the Design of Personalized Education Management System and the Construction of Innovation System

Journal of Sensors

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Deng, J. He, X. Duan, and Y. Liu, "Application Research of Advanced Intelligent Big Data Analysis Based on Intelligent Sensor Network in the Design of Personalized Education Management System and the Construction of Innovation System," *Journal of Sensors*, vol. 2022, Article ID 7113098, 8 pages, 2022.

Research Article

Application Research of Advanced Intelligent Big Data Analysis Based on Intelligent Sensor Network in the Design of Personalized Education Management System and the Construction of Innovation System

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With the continuous innovation and development of information technology and communication technology, human beings have entered a huge data center. In terms of big data, in-depth discussion on the in-depth application of big data is the current situation and development direction. Based on the intelligent sensor network, this paper conducts theoretical and empirical analysis combined with the application of individualized teaching in teaching and provides some reference opinions for the future development of individual pedagogy. On the basis of the research, the meaning of big data is explained from multiple perspectives. In the empirical research part, based on big data, based on real big data, and using relevant technologies in data mining, the relevance of each training program is analyzed. Mining was carried out using the FP-Growth method to analyze the correlation of each training scheme and optimize the FP-Growth method accordingly. The results of this experiment show that the use of big data can not only help teachers understand their students' daily life, study habits, and consumption records but also make teachers' work more dynamic, early warning, and subsidized. The research results are of great significance for guiding colleges and universities to formulate educational programs that are beneficial to students' development, keep pace with the times, and cultivate modern educational technicians with modern significance.

1. Introduction

The era we live in is an era of information explosion. Sensors and microprocessors are everywhere. They continuously quantify the operating status of machines, social behaviors, and institutional activities [1]. These structured and semi-structured data, either shared and exchanged on the Internet or merged with data from other media such as intelligent electronic devices and satellites, will rapidly generate more data at an unimaginable rate [2]. With the development of society, the rapid development of information and communication technology, the rapid expansion of information technology in all walks of life, and through the rapid increase

of data collected and stored more data can be processed, explored, and used by us; that is, in the era of "big data", we need to deeply explore the internal information and core value of the data [3]. The concept of "big data" has set off a wave of technological innovation worldwide. Thomas H. Davenport, a visiting scholar at Harvard Business School, said: "In the next decade, big data and its Analytics will radically impact business functions in all walks of life [4]. Any organization, when it comes to big data, can have a large market share."

Promoting the application of big data in teaching is both the current need and the future development direction [5]. The use of big data in education is an urgent need for the

current education development. At present, my country's education development is facing many constraints, such as the education system needs to be improved, teaching is unequal, the distribution of educational resources is unbalanced, and the quality of teaching needs to be improved; in terms of education investment and output, my country's financial expenditure is not effective in utilization. The investment and output are relatively low; in terms of teaching organization, it follows the standardized teaching content, teaching methods, examination system, subject setting, and personnel training methods during the industrialization period, while ignoring the development of individual characteristics and cognitive ability. New ways of thinking, new methods, new education methods, new teaching modes, new learning methods and new teaching methods, and promoting the combination of new generation information technology with thinking and teaching are the inevitable choices for the development of education in our country.

At present, most of the applied research in big data teaching at home and abroad is based on the Knowledge Network database and Google's academic search engine [5]. In the first search page, "subject" is a premise of retrieval, and in this index, two keywords "education" and "bigdata" are included, with a total of 1963 queries (as of December 3, 2019). After secondary filtering, it is limited to " education field", and the total number of remaining papers is 817; in this query page, using "big data" and "education" as keywords, there are a total of 1,660,000 papers (as of December 31, 2019). This paper believes that in the application of big data education in education, foreign research in the field of big data education has been at the forefront of the country. For example, in 2008, an article proposed that data will lead to the reform of biological science and education. The United States officially released a series of major achievements in "Promoting Teaching and Learning through Educational Data Mining and Learning Analysis" (Educational Data Analysis) [6]. At present, most of the research work in big data teaching in China is based on the dissertation database of CNKI. In the search webpage, select "Advanced Search", use "Subject" as the search criteria, and use "Big Data" including "Education" as the keyword to search, and a total of 2375 items are obtained (as of 2020) [7]. Using a second contrived approach, a search of the "field of education" resulted in 1554 conclusions [8]. It can be seen from this point that although the United States has attracted global attention in 2012, due to a series of measures taken by the United States, domestic academic circles have not carried out corresponding research on it so far. With the publication of a number of academic papers, people have gradually realized the potential of big data in education, and in my country, the educational application of big data has just started. Since then, the growth rate of scientific research literature has been increasing year by year, and the application of big data in teaching is also developing rapidly.

The purpose of this paper is to explore the relevant theories and practices used in individualized teaching and to provide some reference opinions for the development and construction of individualized teaching management systems in China. In the empirical research on the application of big data teaching, from the actual point of view, the appli-cation in big data teaching is discussed. The development and change of education and the problems encountered in its implementation and the social problems brought about by it were analyzed, and through empirical research, it was verified that big data analysis was used in the construction of study style, students' psychological early warning, and student funding.

2. Introduction to Related Theories

2.1. Smart Sensors. A smart sensor is a sensor whose function is to process data [9]. It has been applied in many aspects such as aerospace, national defense, science and technology, industry, and agriculture [10]. For example, it has great potential for the development in robotics, allowing robots to possess the functions of human facial features and brains, to sense various things, and to achieve different behaviors; compared with ordinary sensors, its advantages lie in the use of software. The technology can obtain high-accuracy data, and the cost is low; it has certain automatic program design capabilities and a variety of functions. Its working principle is to convert the subtle changes of various signals measured into electrical signals. Then, the signal processing device is converted into a digital or analog signal and sent to the execution program for operation. Intelligent sensors can store different substances and operate according to instructions to generate new data. These intelligent sensors can transmit information to each other and can judge by themselves the data to be transmitted, discard abnormal data, and perform analysis and statistical calculations. This paper takes the intelligent sensor as the core and focuses on the application of advanced intelligent big data analysis technology in the teaching management system.

2.2. FP-Growth Algorithm. This method is based on Apriori's FP-Growth method, which uses the tree structure in the data structure, so that there is no waiting for selection when searching for frequent items, thus reducing the search for the database, so that the efficiency and speed of the search are greatly improved. FP-Growth only needs to scan the database twice to compress the data, and the prefix of the data has the same path, thus realizing the data compression of the data. Apriori requires that the support degree of each candidate set be calculated by searching the database, so as to determine the frequency of use of the candidate set. To this end, we choose an efficient FP-Growth method to find relevant rules.

The algorithm of FP-Growth consists of two parts:

(1) Construct an FP-tree, that is, compress a data set

(2) Frequent item mining based on FP-tree

FP-tree is a compact data structure, similar to a tree in a computer; except that FP-tree connects similar elements with a chain (link), such a unit item is called a linked list. The FP-Growth method concentrates the data in the FP-tree, which greatly reduces the cost of scanning and storing the database. Figure 1 is an example of an FP-tree.

It can be seen in the FP-tree that an item can be displayed in the FP-tree multiple times, and the value after each item is the frequency of occurrence on the route, such as $q->O->p->1->$. The element term of n in n has a frequency of 1; and in $q->o->p->m->n$, the frequency of n is 2. If the path prefixes remain the same, items with the same preposition will share this segment of the tree, while subsequent items will branch. Similar elements are linked to quickly find where similar items are located.

2.3. Practical Approaches to the Application of Big Data in Education

2.3.1. Educational Data Mining. In "Promoting Teaching and Learning through Educational Data Mining and Learning Analysis," the concept of educational data mining is defined as using machine learning, mathematical statistics, data mining, and other technologies and techniques to process a large amount of educational data. Analyze and construct a mathematical model, so as to study the relationship between learning outcomes and learning content and learning resources and teaching activities, so as to make reasonable judgments on students' future learning tendencies [11]. Based on interviews with experts in educational data mining, this report summarizes four main topics: first, the use of learner knowledge, metacognition, motivation, learning attitude, and other aspects of knowledge to establish a learner model and predict its future learning development; second, establish a mathematical model to make the teaching objectives and sequences of the course more reasonable; third, investigate the auxiliary role of various teaching software on teachers; and fourth, establish students and teachers' teaching mode to improve students' learning efficiency. The research purpose of this paper is mainly accomplished by five technical means: prediction, which refers to the comprehensive analysis of various factors such as classroom operation behavior, online discussion, test scores, and other factors in online teaching to judge whether the students' learning process is possible or not. Classification refers to dividing a data into multiple subsets with similar characteristics according to the characteristics of the data, such as dividing students into several groups according to their personality characteristics, cognitive level, and interaction methods and according to their characteristics; it can be tailored to the individual characteristics and behavior characteristics of students [12]. Association exploration refers to the association analysis of various variables in the data set and using it as a norm, such as exploring the relationship between students' learning behavior and academic performance in the online learning environment. Relevance to regulate the form and sequence of learning, human judgment is a simple, well-understood way to describe data that can be quickly identified, such as the use of data analysis techniques to show students' online learning process. Pattern construction refers to the establishment of a phenomenon description pattern that can be used for future analysis in terms of cluster analysis of data and mining of relevant relationships [13].

2.3.2. Learning Analysis. At the Society for Learning Analytics, "Learning Analytics and Learning" Symposium in 2011,
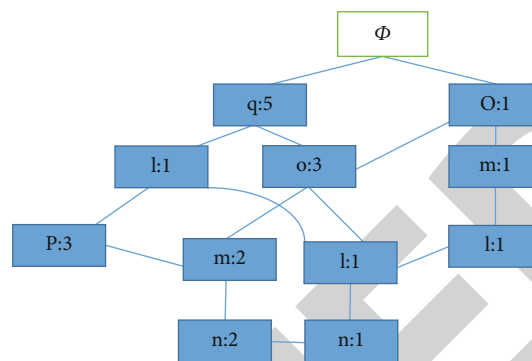

Figure 1: An FP-tree.

experts defined "Learning Analytics" as measuring, collecting, analyzing, and reporting on students and their learning environments in order to understand and optimize their learning environments [14]. The New Media Association defines learning analysis as the use of loosely coupled data collection and analysis techniques to analyze data on learning participation, learning performance, and learning progress, so as to achieve real-time correction of curriculum, teaching, and assessment. This paper points out that learning analysis is to use various analysis methods and data models to interpret students' learning materials and to use the interpretation of materials to discuss students' learning behaviors and situations, so as to find students' learning rules, or based on data interpretation, in-depth understanding of students' learning behavior and give corresponding feedback to improve students' learning efficiency [15]. In the article "Promoting Teaching and Learning through Educational Data Mining and Learning Analysis," the basic concept of learning analysis is summarized as: "Using the principles and methods of information science, sociology, computer science, psychology and learning science and other disciplines, using a large number of It uses the existing mathematical models and methods to study the main problems existing in the students' learning process, evaluate the students' learning, and give artificial adaptive feedback." Based on the analysis of learning, teachers and schools adjust the content and sequence of education for those who are likely to drop out and take corresponding measures. Overall, research analysis includes five major parts: data acquisition, storage, analysis, presentation, and application (see Figure 2).

3. Build FP-Tree

For example, for the data set in Table 1, first scan all the data, count the number of occurrences of individual data items, and remove data items that will not be added to the subsequent FP-tree construction according to the minimum support level set. Due to the use of the Apriori principle, when a material item or collection of items is infrequently used, then the supercollection that contains this material item or collection of items is also infrequently used. Scan Table 2 and record the frequency of occurrence of each item, l, j, w, v, and u all appear only once. We set the minimum support value to 2, so that x, y, h, j, w, v, and u appear less frequently than the minimum support, so delete x, y, h, j, w, v, and u; these elements are not added to the construction
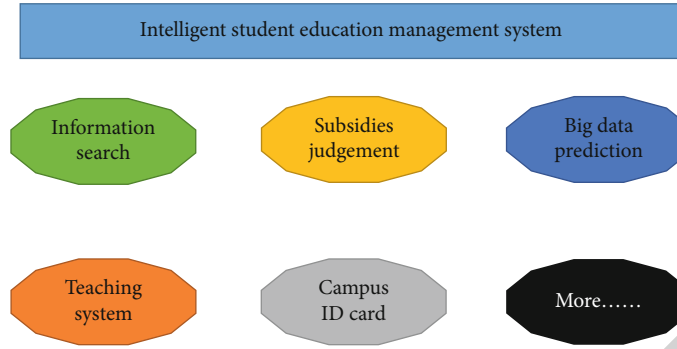
Figure 2: "Smart Student Education Management" interface.

Table 1: Data example of spanning tree FP-tree.

Transaction ID	Element item in transaction
01	1, q, h, j, y
02	Q, p, o, w, v, u, n, m
03	Q
04	1, o, m
05	P, a, o, q, x, n, y
06	P, q, o, x, m, n

of the FP-tree. We put those data that meet the minimum support level into the head table, and then classify each project according to the support threshold from high to low, as shown in Figure 3.

The first set of data is used to calculate the frequency of occurrence of each data item and filter the fewest data items. The second scanned data set may ignore fewer data items and only limit to frequent data items.

Because when constructing the FP-tree, on the path of the FP-tree, if the following items are different, the tree will be split, so the size of the FP-tree is smaller than the original FP-tree. The best case is that the FP-tree has only one way, and all scans in this way are included. Conversely, if the FP-tree has multiple channels, that is, each scanned item set is unique, then, the size of the FP-tree is the same as the original data set, because these files are interrelated and interdependent.

To construct the FP-tree, first search for the frequency in each scan, and then find the frequency item. When the frequency item is found to have a corresponding channel in the FP-tree, you can directly change the number of nodes or create a new one, and then in the FP-tree add an indication to the head table. When two identical nodes have a different channel, a connection is also established between them. Taking the data set in Table 1 as an example, the construction method of the FP-tree is as follows:

When scanning 01, h, j, and y are infrequently used data; therefore, scanning 01 is equal to {l and q}. After scanning for scan 01, the FP-tree is shown in Figure 4, where the node information of q is 1, indicating that the occurrence time of q is 1, and the occurrence of I in the previous channel with q is 1. There are two joins in the head table, one is q on the head table, one is q in FP-tree, one is i on the head table,

and one is l in FP-tree, which can make similar items be found easily.

When scanning 02, delete nonrecurring items; scan 02 becomes {q, o, p, n, and m}; the information of the q node becomes 2, and then connect the four nodes O, P, N, and m. These nodes are connected to the q node for the first time, so all the information of the node is 1, see Figure 5 below.

When scan 03 is scanned, the nonrecurring items are deleted, and scan 03 becomes {q}, so the information of the q node becomes 3, see Figure 6.

When scanning scan 04, delete nonrecurring items; scan 04 becomes {l, o, and m}, and scan 04 does not have q data items, so FP-tree will form a new channel, and the final connections are established between similar nodes, see Figure 7.

When scanning 05, delete nonrecurring items, and scan 05 becomes {p, l, o, q, and n}. Since q is included in the scan, q is also taken as the start node. The nodes of q, o, p, and n are 1; m node and n node have information difference, so the m nodes will be separated in the end, as shown in Figure 8.

When scanning 06, delete the infrequent scan, and scan 06 becomes {p, q, o, m, and n}, and there are the same channels in the FP-tree, so the nodes on this channel are all 1, and all scans are performed. Check the final FP-tree shown in Figure 9.

4. Application of "Student Management"

In this experiment, each student was assigned a school campus card. The university campus card integrates advanced technologies such as big data analysis, cloud computing, information security, and data encryption and has rich student information, such as expense records, student identity information, and loan records. Therefore, as long as there is a school card, the goal can be easily achieved [16]. As can be seen from Figure 10 above, students can see their schedule and scores, go to the store to buy necessities, go to restaurants, go to accommodation, do sports in the school gym, etc. According to a large amount of information provided by the college one-card card, a set of "smart student management" teaching system based on the school's one-card system is constructed. This article uses four practical teaching examples to illustrate how data analysis can make students' business activities more predictable, pertinent, and precise (as shown in Table 3).

Table 2: Student B's campus card data from March to June.

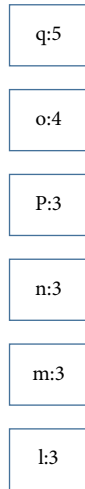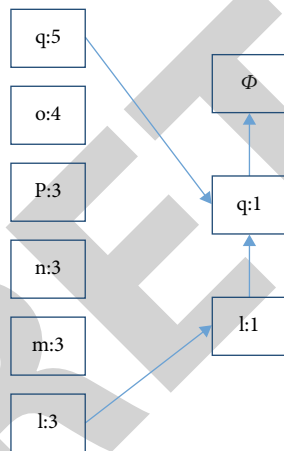| Items/month | Student B's campus ID card data from March to June | | | |
	March	April	May	June
At dorm	9.97 h _	10.54 h	10.37 h	17.16 h
Take a shower	8 times	9 times	10 times	2 times
Going to teaching	85 times	87 times	82 times	16 times
Expense at Canteen	927.6 yuan	945.8 yuan	901.5 yuan	320.7 yuan
Expense at convenient store	104.7 yuan	112.6 yuan	95.4 yuan	569.3 yuan

Figure 3: Head table corresponding to Table 1.

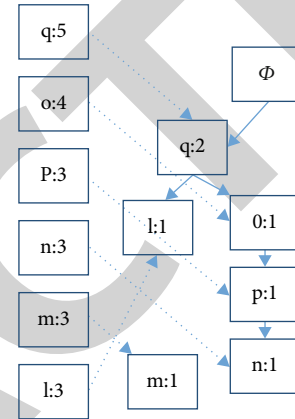Figure 5: FP-tree after scanning transaction 02.

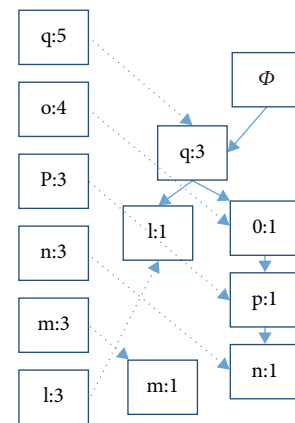Figure 4: FP-tree after scanning transaction 01.

Figure 6: FP-tree after scanning transaction 03.

4.1. Predicting Academic Warning Students and Implementing.

In this paper, 30,000 college students were investigated and counted on the use of ID cards, and it was found that there was a significant positive relationship between regular breakfast and the number of times of going in and out [17]. Comparing the statistics of the senior year and the first year of college, we can see that the most students in the first year of college are in the school, and the students in the second year go to the gym or swimming pool. Juniors and seniors are the ones who go to the library most often to borrow books. Others

are due to the psychological burden of graduation or further education.

The school calendar tells us that the university routine is well-organized—7 : 30 am and 8 : 30 pm every day. We can compare the data between the dormitory area and the teaching building to find those who are often absent from work. For example, in practice (see Figure 11), a classmate A could not leave the dormitory after nine in the morning and did not get any respite for five weeks. Next, we checked the records of classmate A entering and leaving the classroom, and the results showed that there was no record in the last class, but it was normal in the second and third classes. However, according to A's timetable, the first class on
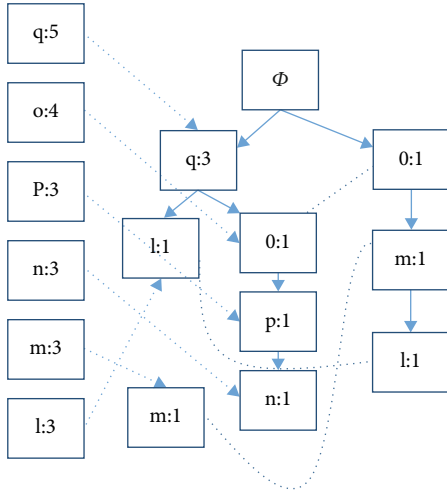
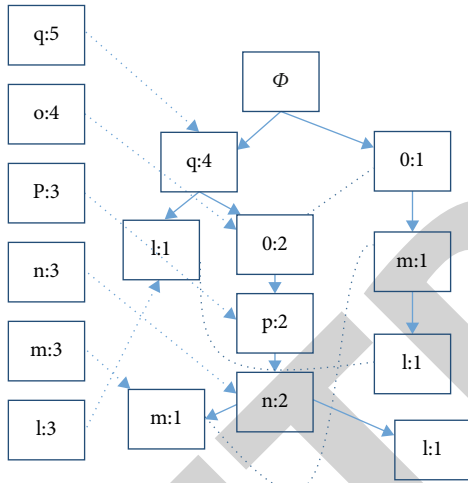Figure 7: FP-tree after scanning transaction 04.

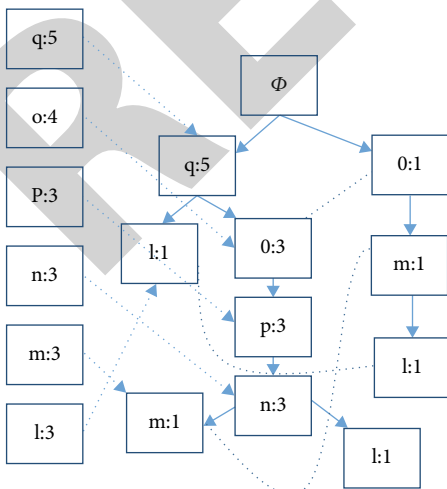
Figure 8: FP-tree after scanning transaction 05.

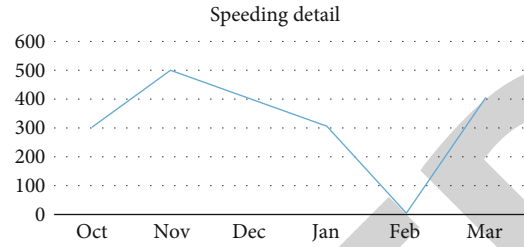Figure 9: FP-tree after scanning transaction 06.

Figure 10: Part of the campus student ID card.

Mondays, Thursdays, and Fridays is Mathematics. So, we can well foresee that classmate A is often absent, has an eating disorder these days, and is likely to fail. So, on the basis of the above, we made a personal plan for A: let him eat early every morning, arrange his life on time, build a one-on-one study team, and help him get good marks in mathematics, lest he fail the final exam.

4.2. Identify and Guide Special Students. Interfering with college students' depression and preventing suicide has become a mental health problem for college students [18]. The data obtained from previous psychological surveys and questionnaires are relatively fixed. Therefore, in the learning process, teachers cannot give corresponding information according to the change of mental state. The real, accurate, and timely massive information provides a new angle for the psychological problems of college students. Dormitories, bathrooms, teaching buildings, etc., are all undisturbed. Moreover, the system's data collection will not interfere with students' daily work. Therefore, research on the relationship between the collected data and their mental status can provide timely guidance to students with poor mental status.

We compared the expenditure of student B in each month, and the results showed that some abnormal situations occurred in June (see Table 1). Based on the above data, finding out the abnormal performance of classmate B has become the focus of the research. The dormitory information about going in and out shows that in June, classmate B stayed in the dormitory for 16 to 17 hours a day. Moreover, judging from the student's access file, student B had been absent from work recently. In the convenience store on campus, B's shopping records also show that he bought a lot of instant noodles and snacks. Canteen and restroom records show that classmate B developed an eating disorder during June and did not pay attention to hygiene. Through the cross statistics of the data, classmate B bought a drug for the treatment of insomnia—estazolam in mid-June. According to the above data, it can be inferred that classmate B suffers from loss of appetite due to lack of sleep, purchase of convenience food, lack of attention to personal cleanliness, aversion to learning, etc. Therefore, we must strengthen the observation of B and do a good job of psychological counseling for B. The case student report can count and track the school's identity information, so as to find abnormal students and take corresponding measures.

4.3. Identify and Provide Disadvantaged Students. Providing funds to poor students fully reflects the Chinese government's

TABLE 3: Curriculum.

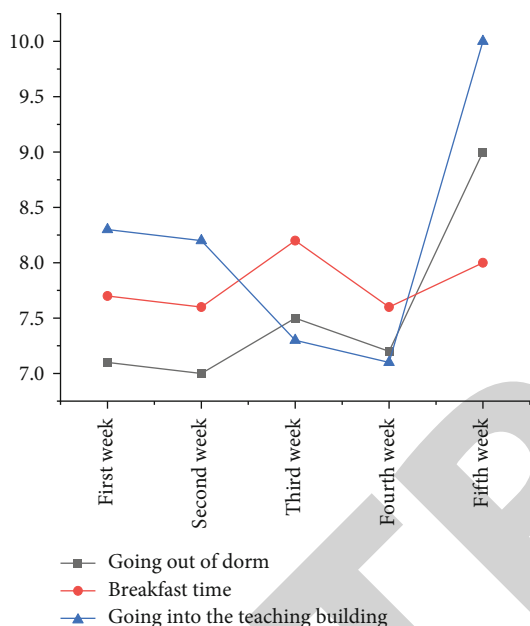| My timetable	Mon	Tues	Wed	Thur	Fri
1	Experiments				Calculus
2					
3	Calculus _	Physics	Calculus		Sports
4					
5		Circuits	Experiments	Circuits	
6					
7		Speech		Physics	
8					

FIGURE 11: Student A's campus card record.

concern for education and humanistic care for the society [19]. Clarifying funding objects, managing information, and precise assistance is an important part of the current funding work in colleges and universities. Taking advantage of the advantages of "electronic information +" and "big data", combining "thematic grouping" with "objective big data", a standardized and accurate poverty alleviation object system has been established, which has effectively increased subsidized work efficiency and effectiveness. The support of big data for poor students can not only provide an archive for each poor student but also obtain their learning information to make them more sound.

When subsidizing poor students, some schools will determine whether they are poor or need subsidies based on their monthly meal expenses, but this method ignores the different meal times in schools. It is actually more objective to measure the average consumption of main meals for breakfast and lunch (based on restaurant dining records). In the daily work of students, we can see that the average consumption of the cafeterias of classmates C and D is less than that of the general cafeteria. So we are very curious, whether these two students need subsidies. The "College

Student Management and Teaching System" of "intelligent" colleges and universities can realize multidimensional and accurate modeling and stratify and cut the charging information of each campus. On the whole, classmate D's lunch cost is higher than the school average; the meal time is less than the school average; the expenditure record in the store is average, and classmate D is not so poor. In contrast, the price of staple food in classmate C is 2 yuan lower than the school average. In addition, the fees for other parts of the school are lower than normal. In the long run, it can be used as a good indicator to judge whether a person is poor or not. We also have to keep an eye on dynamics such as illness, parental unemployment, online scams, and more. This case illustrates the pivotal role that school IDs play in identification. Use the intelligent student management platform to provide timely and dynamic financial assistance to poor students, see Table 2.

4.4. Personalized Training and Improvement. The basic job of colleges and universities is to train students. Because scientific research plays a pivotal role in the comprehensive quality of college students, giving full play to the role of scientific research is not only a prerequisite for scientific research in colleges and universities but also an inevitable choice for scientific and technological innovation in colleges and universities. The teaching reform in colleges and universities is a key stage for scientific and technological talents in colleges and universities. At present, with the continuous improvement of Internet technology, library management and other technologies, many university libraries are implementing "one-stop" online information services, that is, using network technology to provide information, navigate, and build an information-based management platform. In the network environment, students can retrieve, read, and borrow. On the basis of big data, statistical analysis has been carried out on nearly 30,000 students' borrowed materials.

Using students' personal information, such as grades and majors, to investigate the students' borrowing situation, focusing on the number, types, and time of students' borrowing, and students' reading style and habit characteristics, provides individual and diverse opinions for students' learning and development. Figure 7 shows the loan situation of student D from. Based on the literature data, this research discusses the D system mainly in energetics from the angle of literature data. And D is full of passion for supercloud

computing, C + programming, website designing, and so on. Based on the research of D, we can develop an educational program for students that is suitable for different disciplines. Such as energy Internet, smart grid, and other computer science research. In a word, statistics on the borrowing and borrowing materials of college students can meet the diversified and individualized needs of talent training and make targeted judgments on the development trend of future research.

5. In Conclusion

Based on the "Intelligent Student Management Teaching System", this paper uses the integrated database and the association rule technology in the application of data mining to mine the association relationship between the training plans and uses the FP-Growth algorithm to perform association analysis on the data. In order to adapt to this paper the characteristics of the data to be studied, the FP-Growth algorithm is appropriately improved, and the corresponding data analysis mode is constructed. Based on the intelligent sensor network, this paper conducts a theoretical and empirical analysis on the application of individualized teaching, and based on specific cases, from the construction of study style, mental health, poverty alleviation subsidies, scientific research ability improvement, etc., discussed and considered from a different angle. The main conclusions of this paper are:

(a) The application of big data in management teaching in colleges and universities is still a preliminary attempt. "Data speaking, data decision-making, data management, data innovation" is the common pursuit of every educational researcher

(b) Through the statistics of teachers' big data, it is possible to timely and comprehensively understand students' daily life, study habits, and consumption situation, and make teachers' work more dynamic, early warning, and subsidized. Teaching is more precise and teaching is more personal

(c) "University Big Data" can independently conduct independent research on the daily life, study habits, and purchasing methods of college students, which is different from the general "college student management." Using big data technology, it is easier and more accurate to grasp the learning characteristics and behavior of students and make rational predictions for future development, so as to achieve personalized teaching early warning

Data Availability

The dataset used in this paper are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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