



## Design of Intelligent Computer Aided Network Teaching System Based on Web

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**Abstract.** In traditional classroom teaching, teachers are the dominators and students are the obedient ones. Teachers often focus on the transmission of knowledge through verbal narration and behavioral indoctrination, and students' learning status is not fully released and respected, and even if they have their own views in the learning process, they often dare not express them, which seriously shackles students' enthusiasm, initiative and creative play in learning. According to the characteristics of network teaching, this selection seeks to break through the limitations of traditional teaching management mode, and designs and implements a network teaching system based on the mode of taking, building a course resource website, setting teaching courses on the website, adding course-related teaching contents, students learn online by browsing the course website, or downloading course-related materials for self-study, submitting assignments online, communicating with teachers and classmates online. Students can take online exams and check their grades. Teachers can publish related content online, check and correct students' homework, and reply to students' messages. At the same time, the system also provides a communication platform between students and teachers, students and students, breaking the restrictions of time and space, and independent learning anytime and anywhere. It is proved that the teaching management system has the basic functions of online teaching system, which improves the teaching management level and the effect of traditional teaching management.

**Keywords:** Intelligent Computer; Network Teaching System; Computer Aided; Web Interpolation

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## 1 INTRODUCTION

Recently, due to the rapid development of computer as well as network technology, it has led to the continuous innovation and progress of online education methods [1]. Teachers and students can perform all the acts that traditional teaching can do through online teaching system, and they can also teach and learn anytime and anywhere without the limitation of time and space. Due to this convenience of network teaching, many teachers and students are involved in the network teaching process, making network teaching a new form of education and the main way of learning. Online teaching and evaluation are no longer limited by space and time, and is a new way of learning. With the features of digitalization, interactivity, wide coverage, multimedia and large amount of information, it allows more learners to receive good education and contributes to the equity of education [2]. However, there are still some limitations in the actual operation of online teaching and evaluation environment, which greatly hinder and restrict the online teaching and evaluation work. Ige and Hlalele proposed that teaching quality and school quality are two complementary aspects, but in a sense, teaching quality will ultimately be reflected in the quality of student learning [3]. With the emergence of online learning, the traditional teaching model has changed greatly, gradually shifting from teacher-centered to student-centered, with the learner becoming the active party and the main subject of teaching, and the teacher's role in teaching evolving from preacher to organizer and instructor. In the teaching process, teachers and students are not aligned in time and space in order to realize the convenience of teaching, therefore, teachers are not able to monitor students' learning and answer questions in person which has been proposed by Yao [4].

Akhtar et al. [5] put forward that students learn mainly by their own control, autonomy and strong desire and motivation to learn, self-awareness and self-control. However, the reality is that students' self-control is usually not high enough, and there are various temptations on the Internet that can easily lead to ineffective online learning. In order to ensure the smooth and efficient implementation of online teaching and evaluation, and to improve the quality of teaching, students should be disciplined and monitored in the online teaching environment, which requires a scientific and reasonable design of the teaching evaluation system. To improve students' learning efficiency, Sydow et al. [6] proposed that evaluation should be made based on students' learning activities in the online teaching system; therefore, teaching evaluation mechanisms are needed. However, the evaluation system usually used has many shortcomings. How about using computers and data mining algorithms to design and develop a new online teaching and evaluation system that is reasonable, effective, and comprehensive to assess the learning outcomes of the online learning process and to inform students in a timely manner so that they can make timely and beneficial adjustments based on the evaluation results, thus increasing student autonomy. By using the Internet for learning, Lee and Park [7] proposed that students can learn the knowledge and technology they are interested in anytime, anywhere, and have more time and energy to learn more than traditional teaching methods by eliminating the labor and time expenses of traveling. With the development of society, the concept of teaching is also changing. Influenced by the idea of human-centeredness, teaching evaluation has developed deeply into a period of specialization, focusing on the psychological development of scholars and involving them in the process of co-construction, thus democratizing education. As a result, discourses and articles advocating teaching evaluation as well as evaluation organizations have emerged [8]. In some developed countries, such as Europe and the United States, online teaching evaluation systems have emerged in universities [9]. It is dedicated to solving the problem of distance education and making education easy to develop, which is the inevitable result of education modernization and informatization proposed by Bourne et al. [10]. Online teaching is a huge system that is complex and can produce many chain reactions, and evaluation for the teaching system should establish long-term formative evaluation tools [11].

Online teaching evaluation is different from traditional teaching evaluation, which mainly gives evaluation results through expert advice, which is subjective and not very objective [12]. Therefore, the traditional evaluation method requires a lot of human and material investment to collect various teaching-related information, which wastes a lot of time and costs too much overhead. Therefore, most of the current teaching evaluations use the evaluation of students or teachers based on their performance at the end or beginning of the semester. As far as the development of teaching evaluation is concerned, establishing a fair, just and transparent teaching evaluation system is the top priority of teaching evaluation. It is not only related to the improvement of teaching quality, but also to the scientific, standardization and rationalization of teaching evaluation work. The convenience of online teaching makes teachers and students attend classes at irregular times and locations, which makes teaching convenient and brings a new problem: the teaching process is not monitored. It is extremely difficult to collect students' classroom performance information by using the traditional teaching evaluation system, such as class roll call, homework review and classroom questions. Therefore, if the way of online teaching is adopted, the collection of information data that provides the basis of evaluation should be different from the way of traditional classroom. How to collect the information of students' learning behavior in the process of online teaching in a real and effective way is the basis of testing the online teaching and evaluation system, which is also an important difficulty.

## **2 OVERALL DESIGN OF WEB-BASED TEACHING AND EVALUATION SYSTEM**

### **2.1 System Requirements Analysis**

The WEB-based teaching and evaluation system is designed for three types of users, system administrators, teachers and students. Considering the functional requirements of the system according to the division of labor in the real teaching environment, teachers are mainly to conduct lectures, answer questions, examinations, mark examination papers and teaching evaluation. Students are to perform learning. Therefore, the main tasks of the system are: the system administrator manages the system and is responsible for assigning the appropriate permissions and resources to specific users; the teacher is responsible for the resources and permissions of online classes, such as online lectures, assignments, online Q&A, test evaluation, etc.; the students are responsible for attending classes, taking exams, asking questions, etc. Therefore, there are three types of users in the web-based teaching and evaluation system: system administrators, teachers and students. Various users have different access rights and functions to the system.

#### **(1) Administrator User Requirements**

The administrator is equivalent to the Dean of Academic Affairs in a real university and has the authority to manage teachers and students. The administrator user can make system announcements and manage various information and resources for teachers and students. The system administrator user of WEB-based teaching and evaluation system mainly includes the following functions.

1. User management: The system administrator can add and delete user information and other operations to manage users, and can log out users;
2. Announcement management: the system administrator has the highest authority for announcement management, which can not only manage the news and notices of the whole website, but also review and update the course announcements issued by teachers;
3. Course management: The system administrator can not only add, modify and delete courses, but also limit the number of people who can choose a course. It is even possible to cancel students' eligibility to attend a course;
4. Teaching resource management: Teaching resources mainly include homework database, test database, test paper database and courseware

database. The system administrator has the management and maintenance rights of these teaching resources.

## (2) Faculty user needs are based on

The teacher users in the web-based teaching and evaluation system of WEB can upload teaching courseware, assign homework, mark homework, organize exams, publish exam results, organize topic discussions and other functions, similar to the work done by university teachers, except that the real work is carried out in the web-based system. Only users with teacher privileges can log in to the system to perform these operations. At the same time, teachers can also publish their own course introduction and personal introduction information, publish course news, etc. The main functions of teacher users in the WEB-based teaching and evaluation system include the following.

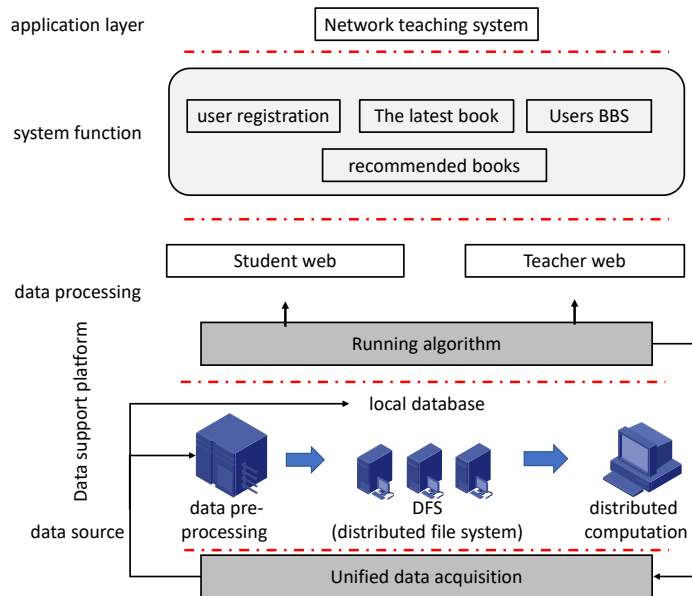
1. Posting course announcements: posting teaching-related course announcements, modifying or withdrawing announcements after logging into the system through the background;
2. Course Introduction: In order to facilitate students' understanding of the course they are going to do it, and teachers can perform editing and submission operations of course introduction through the system;
3. Syllabus: teachers develop a syllabus structure for the courses they teach, making it easy for students to follow the syllabus;
4. Teaching Arrangement: The instructor develops the course schedule for the courses taught. This includes the schedule of the course, the schedule of the course, and the schedule of assignments, etc.;
5. Course teaching: instructors upload teaching videos for students to view online for the courses they teach;
6. Course assignments: teachers assign assignments, correct assignments, and post assignment results for students to view;
7. Online tests: teachers do not finish teaching a course to organize exams, teachers create questions for students to answer, and after the exams are completed, the candidates' answer sheets are marked;
8. Learning evaluation: the student's learning evaluation is given based on the examination results of a course;
9. Online Q&A: answer questions from students.

## (3) Student user needs

Student users in the WEB-based teaching and evaluation system mainly perform learning behaviors, which are basically the same as the attributes of students, and can perform activities such as course learning, course discussion, completing assignments, asking questions, and taking exams. Only users with student privileges can perform student user operations. Student users can view teacher comments and manage personal data and information after logging into the system. The student user mainly includes the following functions.

1. View course descriptions: view the course description information of the course you want to attend, so that you can clearly understand the course and facilitate the selection of future courses;
2. Teacher Introduction: Students can view the information of the teacher, such as the teacher's personal introduction and the courses taught, teaching style and teaching characteristics, etc.;
3. Selecting courses: Students can choose courses to study after logging into the system. Students can voluntarily choose the courses they are interested in according to their preferences and the introduction of the courses and teachers;
4. Course announcements: information about course-related announcements that students can view;
5. View course syllabus: view the syllabus of the course to facilitate your own course selection operation;
6. Online learning: learning in the WEB-based teaching and evaluation system, browsing courseware, completing assignments, taking exams, etc.;
7. Course assignments: students can view the post-course assignments assigned by the instructor for students taking the course, submit the assignments after completion, wait for the instructor to review them, and view the review results after the instructor has finished reviewing them.
8. Online test: After the teacher releases the test paper, students log into the system to view

the test questions, answer them, submit the test paper when they are finished, and the test is over. Wait for the teacher to mark the test paper and then view the test results; 9. View evaluation: view the teaching evaluation given by the teacher; 10. Online Questions: If students have any questions about the course, they can ask online questions to the instructor or search for answers to their questions from previous instructor answers. The online questioning is an interactive module between students and the instructor, which stimulates students' interest in learning through a question-and-answer format and allows more students to participate in the course discussion.



**Figure 1:** System functional structure diagram.

The functional structure of the WEB-based teaching and evaluation system is shown in Figure 1. By analyzing the requirements of the three types of users involved in the web-based teaching and evaluation process, the functions of the users in the system are determined according to the different roles, and the functions are summarized and summarized to obtain the diagram shown above.

## 2.2 System Architecture

By considering both client/server and browser/server architectures and combining the introduction of the non-functional requirements of the system in the previous section, the B/S architecture was adopted considering the scalability, ease of maintenance, and portability of the system. The B/S architecture is more suitable for our needs because the B/S architecture does not require any configuration of user computers and installation of any software in the process of development and implementation, the WEB-based teaching and evaluation system has a large number of users, the administrators, teachers and students are scattered, the configuration of user computers varies greatly, and the system is updated relatively quickly. The three layers of architecture are the representation layer, the middle layer and the data layer. The representation layer is also known as the client layer, the user opens the browser to see the interface is the representation layer, receive user input, display system output; the middle layer is also known as the business logic layer, the program processing behind the business logic to provide WEB services, and is responsible for the database connection, query, modify, delete and other operations; the data layer is responsible for the storage and management of data, the database can use stored procedures, triggers, primary

keys, foreign keys, etc. The database can use stored procedures, triggers, primary keys, foreign keys, etc. to ensure the integrity and consistency of the data.

Participants are the users who participate in using the system. There are three kinds of participants in the WEB-based teaching and evaluation system, namely, system administrators, teachers and students.

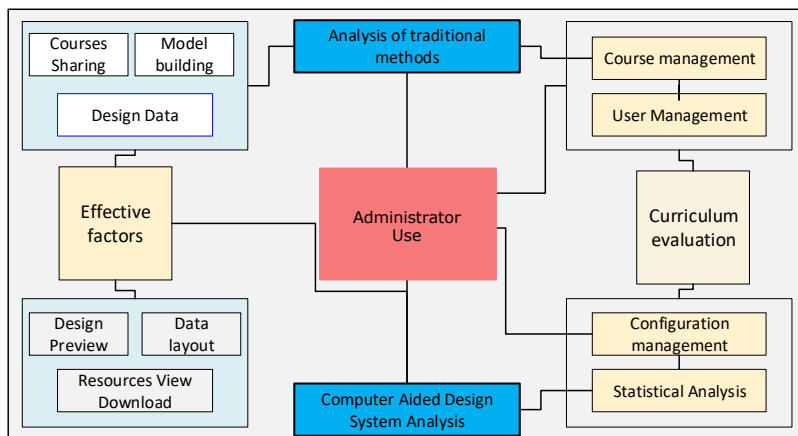
(1) System Administrator: The system administrator is the user with the most privileges of the system and has the authority to operate all functions of the system, including managing users, publishing announcements, maintaining resources, etc.

(2) Teacher: Responsible for the permissions and resources needed for teachers to teach. For example, maintaining teachers' personal information, teaching online, submitting courseware, organizing exams, publishing exam results, and evaluating students' performance.

(3) Students: You have the rights related to students' classes. For example, register personal information, view instructor and course information, view course announcements, select courses, attend courses, complete assignments, take exams, view grades and evaluation results, and participate in course Q&A discussions.

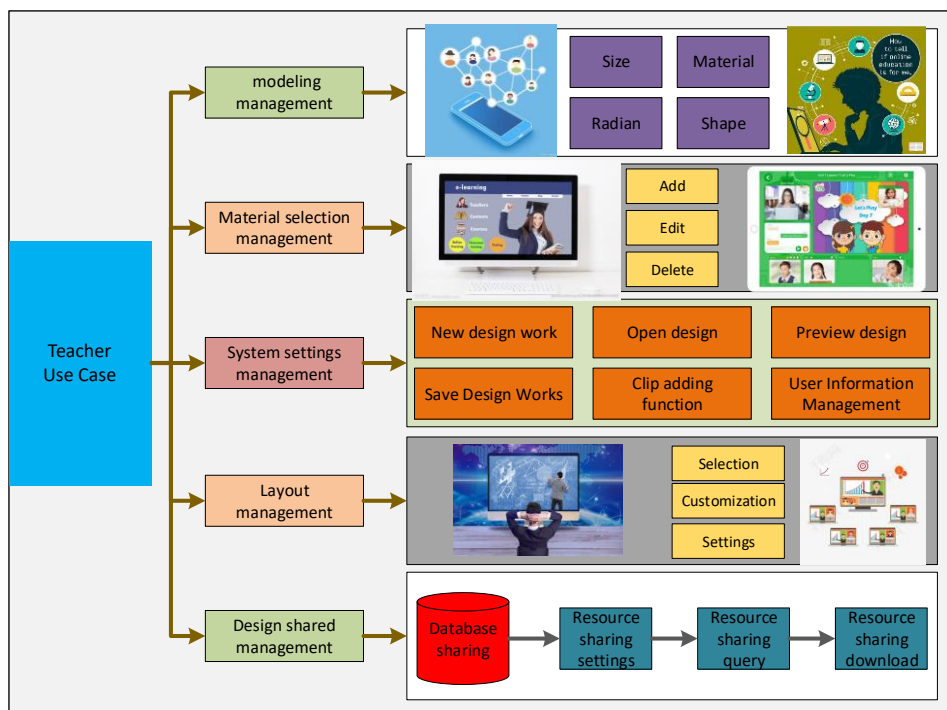
Use case diagrams can be used in the system requirements analysis phase to describe the user requirements of various participants. Use case diagrams can represent the participants and use cases of the system and the relationships between them. The purpose of use case diagrams is to model systems and classes. The following individual vignettes describe the module design for the three user classes of system administrator, instructor, and student through use case diagrams.

Use case diagrams can be used in the system requirements analysis phase to describe the user requirements of various participants. The main role of use case diagrams is to model the system and classes. The following individual vignettes describe the module design for the three categories of users: system administrator, instructor, and student through use case diagrams. The system administrator is the participant with the most authority in the system and is mainly responsible for the management of the system, the assignment of permissions, and the distribution of information. The use case diagram of system administrator is shown in Figure 2, which has the functions of logging into the system, changing password, teaching management, course management, announcement management, user management, file backup, data backup, etc.



**Figure 2:** Administrator Use Case Diagram.

With the continuous development and innovation of web technology, the needs of web-based teaching and evaluation system will also have new changes. In fact, the requirements and functions of each system cannot be consistent in the process of development and use, and will change a lot. Therefore, it is important to anticipate the changes in the system design, so that the developed system is scalable. By analyzing the functionality of the teacher module, the use case diagram of the teacher in the system is obtained. Use case diagrams can be used in the system requirements analysis phase to describe the user requirements of various participants, and the main role of use case diagrams is to model the system and classes. The following individual vignettes describe the module design for the three classes of users - system administrator, teacher, and student - through use case diagrams. Teacher users are the main participants of the WEB-based web-based teaching and evaluation system. Teacher users can perform functions such as publishing teaching courseware, assigning homework, marking homework, organizing exams, publishing exam results, and organizing topic discussions, similar to the work done by college teachers, except that the real work is carried out in the web-based system. Only users with teacher privileges can log in to the system to perform these operations. At the same time, teachers can also publish their course descriptions and personal introduction information, post course messages, etc. The teacher use case diagram is shown in Figure 3. After logging into the system, teachers can edit course introduction, publish course announcements, develop syllabus, develop teaching schedule, teach the course, upload teaching materials and course sheets, answer questions online, organize exams, assign course assignments, correct assignments, take online tests, and conduct evaluations, etc.



**Figure 3:** Teacher Use Case Diagram.

Use case diagrams can be used in the system requirements analysis phase to describe the user requirements of various participants. The main role of use case diagrams is to model the system and classes. The following individual vignettes describe the module design for the three classes of users - system administrator, teacher, and student - through use case diagrams. Student users in

the WEB-based teaching and evaluation system mainly perform learning behaviors, which are basically the same as the attributes of students, and can perform activities such as course learning, course discussion, completing assignments, asking questions, and taking exams. Only users with student privileges can perform student user operations. Student users can view teacher comments and manage personal data and information after logging into the system. whole system designs the attributes of the child class as a data table.

### **3 IMPLEMENTATION OF THE MAIN FUNCTIONAL MODULES OF THE SYSTEM**

#### **3.1 Function Modules**

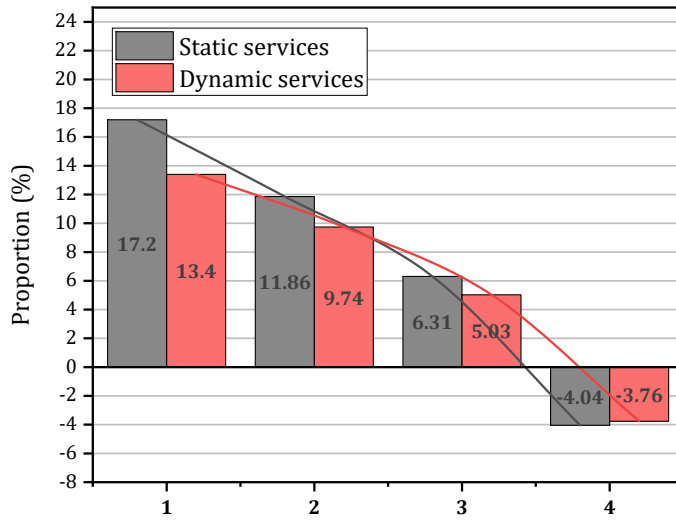
The system has three kinds of privileges for users: administrator, teacher, and student. The system administrator has the highest level of authority and manages all the users in the system, including the management of notices and announcements, the management of various resources in the system, etc. The teacher is responsible for all the authority of the teaching module, and can set the information of his homepage, set the basic information of the courses he teaches, and manage the courseware materials. The teacher is responsible for all the privileges of the teaching module, and can set up his own homepage, set up the basic information of the courses he teaches, manage the courseware materials, manage the students, assign homework, organize exams, evaluate students and a series of other functional privileges. The system adopts B/S three-tier architecture, deploying database and background business processors on the server side, and users do not need to install any software, but can access the system by opening a web browser and typing in the URL on their own personal computers. Considering that the system has three types of users, namely system administrator, teacher and student, all of whom need to log in to the system, different log-in portals are set up for each of the three types of users. The login screen is designed in a similar way, with the user name, password and authentication code being entered to login.

User registration is the basic function of the system. The system provides three user roles: administrator, teacher and student, and all three roles need to be registered before entering the system for operation. Students in school have been entered into the system by the system administrator, automatically become the system user, but has specified the user name and password, the student login the system to modify the password operation. Before teachers start the online course, they have to fill out the online course application form and send it to the administrator via email, and the administrator will assign the rights. If a teacher who has already started an online course wants to apply for another online course, he/she should also apply for it. The default setting of the online course resources started by the instructor is to allow anonymous access. If the instructor does not set any settings for the course, all students can go to the system to find the course resources and access them directly; if the instructor restricts the access to the course, such as only students who have enrolled in the course can access it, then the course resources will be visible only to the users who have taken the course.

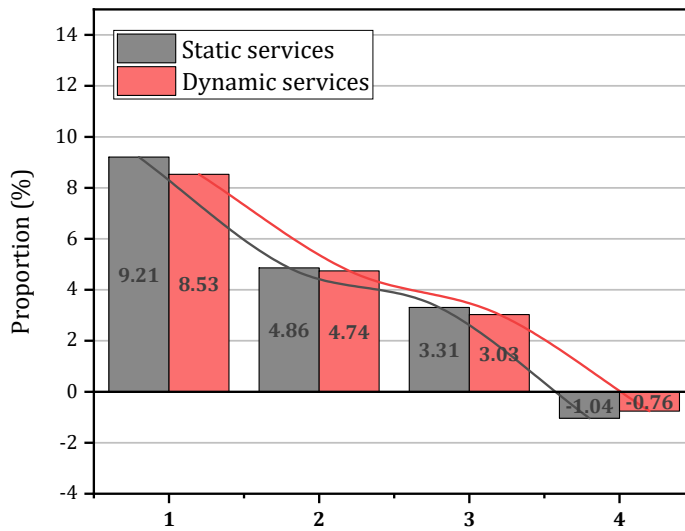
#### **3.2 Application of Algorithms in Teaching Evaluation System**

A randomly selected set of records from all students at one stage is shown in Figure 4, and the data of 9 relevant attributes of 30 students are analyzed. After clearing out 2 useless records, the remaining usable records were 28. We can consider Figure 5 as a transaction set  $D$ , then  $|D|=28$ . The words with a support count of 5 can be calculated to obtain a minimum support of 0.2 and a minimum confidence of 0.3. Table 5-5 shows the results obtained from the inductive calculation of students' online test scores, with the corresponding grade marked as 1, otherwise marked as 0.





**Figure 4:** Student attributes table.

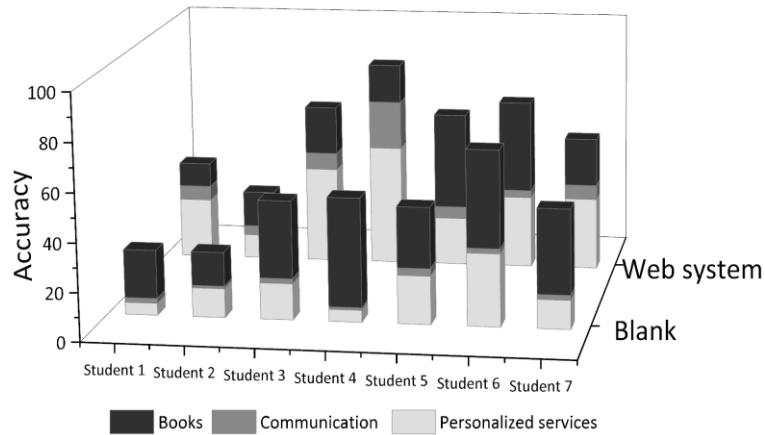


**Figure 5:** Preprocessed student attributes table.

In the first step, Figure 6 shows the attribute table of students whose data have been cleaned, while counting each candidate item to obtain the candidate frequent 1-item set C1 as shown in Table 5-6.

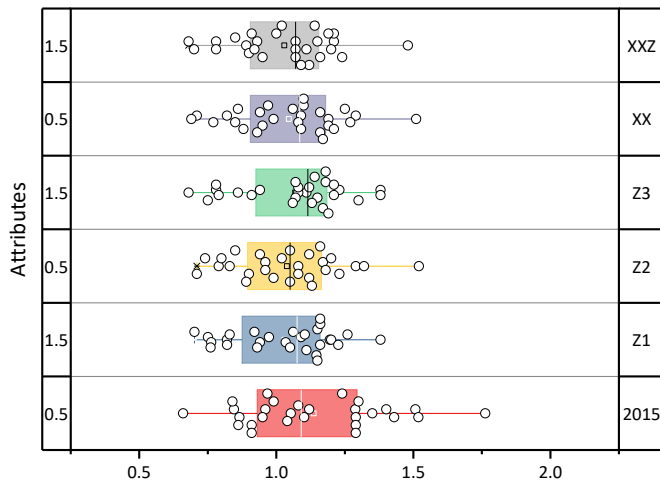
In the second step, C1 is filtered according to the rule of support counts. Here, we set the support count to 5, and the count values of support counts not less than 5 will be retained, and the other values are discarded to obtain the frequent 1-item set as shown in Figure 7.

In the third step, the frequent 2-item set is obtained from the frequent 1-item set. 136 frequent 2-item sets are obtained by this step, and the process of generating frequent 2-item sets is similar to that of generating frequent 1-item sets.



**Figure 6:** Initializing Data.

In the fourth step, similar to the second step, the frequent 2-item set is filtered based on the minimum support count of 5. The data that are not smaller than the support count of 5 are retained and the rest are deleted.



**Figure 7:** Candidate frequent data output.

In the system, we record students' behaviors through a database or logs, including the time spent in class, the number of assignments completed, the number of questions answered and discussions held, and so on. However, these behavioral data do not reflect the effectiveness of student learning. In order to solve the problem of how teachers can correlate the data of students' participation in various teaching activities with students' grades, the Apriori association rule algorithm is used to correlate students' grades with their participation in various learning activities, and to explain and evaluate the relationship between students' learning grades and their usual grades. The above findings are of great reference value for both teachers and students, and can be used to make recommendations such as "persevere in your studies, not necessarily by using a sea of questions, but by using a variety of learning methods (e.g., mutual question and answer, discussion, etc.) to improve your online test scores". The purpose of system testing is to check whether the various

functions of the system are working properly, whether the system design meets the expected goals, and whether there are bugs during the operation of the system, which is an important task before the formal operation of the system after it is designed and opened.

#### 4 CONCLUSION

With the emergence of online learning, the traditional teaching model has changed greatly, gradually changing from teacher-centered to student-centered, with the learner becoming the active party and the main subject of teaching, and the teacher's role in teaching evolving from preacher to organizer and instructor. In the teaching process, teachers and students cannot be in the same time and space in order to realize the convenience of teaching, therefore, teachers cannot monitor students' learning and answer questions in person. In this paper, the WEB-based web-based teaching and evaluation system makes full use of the advantages of campus network resources for web-based teaching and evaluation. The system enhances the utilization of teaching resources, promotes the communication and interaction between teachers and students, and uses advanced Internet technology to promote teaching and provide efficiency of teaching and evaluation. The system adopts B/S three-layer architecture, which is very practical to realize the functions of administrator management, teachers' teaching and evaluation, and students' learning. The system uses WEB technology and data mining algorithm to design and implement WEB-based web-based teaching and evaluation system, which realizes the administrator's management of teachers, students, test questions, exam settings and other information; teachers' online teaching, uploading courseware, assigning homework, answering questions online, issuing exams, learning evaluation and other functions; students' online learning, completing homework, taking exams and other functions. In order to improve the efficiency of online teaching and evaluation, to automatically evaluate the reasons of students' learning performance and to reduce teachers' workload, the thesis proposes a practical and improved Apriori algorithm to correlate students' learning performance with students' learning behaviors in the system.

#### 5 ACKNOWLEDGEMENT

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