An Intelligent Teaching System Based on Mobile Terminal for the Simulation of Legal Education Scenarios

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Abstract. The situational simulation teaching method is an effective method of legal practice teaching. It starts from the psychological characteristics of students, guides students to study actively, and cultivates students' ability to understand and apply laws and regulations in practice and work. Combined with modern mobile technology, an intelligent teaching system of law education scene simulation based on mobile terminal is designed. According to the overall design principles of the system, under the overall framework design of the system, the mobile terminal functional modules are designed, including login module, scenario simulation teaching module, evaluation module, consulting center module, personal center module and system setting module. According to the user's needs, the system database is designed, and combined with the functional module design, the method education scenario simulation intelligent teaching system is designed. The experimental results show that the system functions and performance meet the requirements through black box and white box tests, which proves that the system has application value.

Keywords: Mobile Terminal · Legal Educascene Simulation Teaching Method · Teaching System

1 Introduction

At the Fourth Plenary Session of the 18th CPC Central Committee, it was proposed to "incorporate legal education into the national education system". The importance of legal education has been pushed to a new height, and the focus of legal education has shifted to the cultivation of legal thinking. The construction of a country ruled by law requires not only leading cadres to have legal thinking, but also tens of thousands of citizens. Otherwise, the goal of building a country ruled by law will be in vain. College students will be the main force of national construction, so it is the requirement of the times to cultivate their legal thinking. In 2016, at the National Conference on Ideological and political work in Colleges and universities, general secretary Xi Jinping stressed that "all kinds of courses and ideological and political theory courses should work together to form a synergy effect." The content of cultivating college students' legal thinking is an

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important part of the ideological and political theory course, and its importance has also been raised to an unprecedented height. However, the current legal education has not achieved good results. The main reason is that the teaching tends to be theoretical and lacks practicality. The legal education classroom theory teaching is relatively abstract and difficult to understand. To combine theory with practical operation in the teaching process, you should go to the site unit to observe the actual operation. However, because the working environment is not suitable for the concentrated internship in the contract field, the seriousness of the work, the confidentiality of the work and the lack of internship funds and other conditions, the possibility and effect of practical operations on the spot are difficult to achieve. So, how can theory and practice be combined in teaching?

Relevant personnel have carried out research on this. Zhu L [1] has conducted research on intelligent teaching mode, intelligent lesson preparation, intelligent teaching and intelligent customization through intelligent system. Teachers can accurately understand the learning interest and style of each student, and formulate personalized teaching programs targeted to achieve good educational results. Liu Y H [2] first analyzed the current research progress of the intelligent teaching system, established the overall structure of the intelligent teaching system, then focused on the big data recommendation module and the teaching quality evaluation module, and finally tested the effectiveness and superiority of the intelligent teaching system. However, after the practical test of the above methods, students' satisfaction is low.

In view of the above problems, this paper designs a scenario simulation teaching system of legal education based on mobile terminal. Situational simulation teaching method is an effective way of legal practice teaching. Starting from the psychological characteristics of students, it guides students to study actively and cultivate their ability to understand and apply laws and regulations in practice and work. Finally, the effectiveness of the system is proved by verification.

2 Design of Scenario Simulation Teaching System for Legal Education

Legal education situational simulation teaching refers to the simulation or virtual reproduction of the environment and process in which events or things occur and develop by students, so that students can find and solve problems in the set situation, so as to understand the teaching content, and then in a short time A cognitive method of improving ability. Compared with traditional classroom teaching methods, scenario simulation teaching has the characteristics of novel forms, flexible methods, pertinence and adaptability. This teaching method sets up a certain simulation scenario according to the professional teaching content, allowing students to simulate the role of a professional post in a certain scenario, and use the knowledge to analyze and solve practical problems in accordance with the procedures and methods required by the occupation. So as to fully mobilize students' learning enthusiasm, enable students to deepen their understanding of professional knowledge, and cultivate their professional skills and spirit of cooperation.

As socialist builders and reliable successors, college students shoulder the important task of promoting the process of national legal construction. Therefore, how to effectively improve the cultivation of the rule of law of college students, so that they have the rule

of law thinking, advocating the spirit of the rule of law, the use of the rule of law to solve problems properly become an important issue of College Students' legal education. In this context, this paper designs a scenario simulation teaching system for legal education. According to the needs of teaching content and legal skills training, the system can select and design a case, simulate a certain environment and plot, let students respectively play a role in the scene, according to the necessary information provided by the case, students can play and develop the behavior of this role according to their own knowledge, and communicate, exchange and view through mutual cooperation the point of confrontation, collision, to solve certain legal practical problems. In the teaching of legal education, the teaching method has strong adaptability. Whether it is the substantive sector law or the procedural law, it can be carried out for a certain legal problem in the teaching process, and is not restricted by the practical teaching location and facilities. Of course, the system can not replace the off campus training activities. Compared with the off campus social training, it has many shortcomings. For example, the training effect is limited by the design cases, and the conditions are fixed and academic. It does not have the actual conflict of interests of the parties involved in judicial practice activities, the unpredictability of the development of things and the complexity of the legal relations. However, it has the characteristics of flexible mode, simple procedure, strong pertinence and operability. It is also one of the ways to solve the dilemma of legal practice teaching under the condition of lacking external conditions.

2.1 System Overall Design Principles

(1) The Principle of High Simulation

The design of the legal education situational simulation experiment teaching system should have simulation, which is mainly reflected in the simulation of the experiment subject, the simulation of the experimental data, the simulation of the experimental equipment, the simulation of the experimental environment, the simulation of the experimental role, and the simulation of the experimental program.

(2) The Principle of Combining Comprehensiveness and Importance

The design of the content of the legal education scenario simulation experiment teaching system should have a certain breadth and depth, including not only the legal common sense part, but also a set of related content such as court trials, and as much as possible the knowledge and skills of the main legal courses. Enable students to get comprehensive and systematic operation training. In addition, although the content of simulation experiment teaching comes from actual units, it is not all copied, but after careful selection and design, representative cases are selected for experimental teaching to cultivate students' ability to build a strong house.

(3) Principle of Operability

For any scenario simulation experiment design, the operability will be the first. The construction of experimental teaching system should fully consider the feasibility of the implementation under the existing teaching hardware and software conditions, whether it can carry out actual simulation under limited conditions, whether it can achieve the

expected teaching purpose, whether it is conducive to evaluation, analysis and summary. Only when the system can run stably can the design of such teaching system have practical significance.

(4) Student Centered Principle

The situation simulation experiment teaching of legal education should emphasize the students' dominant position, give full play to the students' initiative in the experimental teaching process, and embody the students' innovative spirit. Students should have a variety of opportunities to apply their knowledge in different situations, so that students can form an understanding of objective things and solutions to practical problems according to the feedback information of their own actions. In the experimental process, teachers only play the role of observation, recording, supervision, guidance and evaluation [3].

2.2 System Framework Design

(1) Development Architecture Design

In order to make the system modular, consider adopting the MVC three-tier architecture to design the overall legal education and teaching system, as shown in Fig. 1.

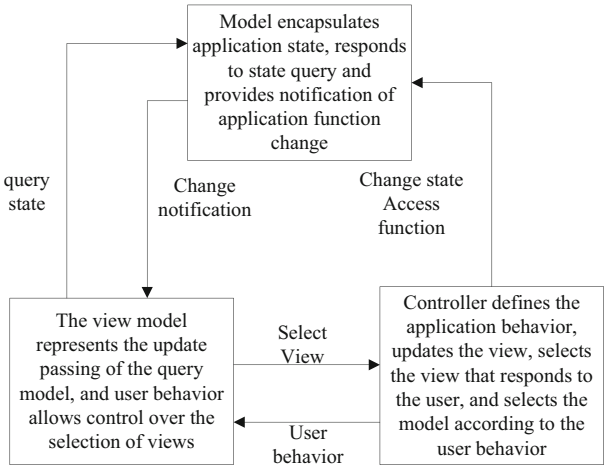

Fig. 1. Mvc three tier architecture

View: the view layer is the display layer of the distance learning system. In this system, an interface that can interact with the user is mainly formed through a browser, and at the same time, a request operation is submitted to the server. In the view layer, it is mainly responsible for processing user input and output to the user, but it is not responsible for how to implement these business functions [4].

Controller: after the user submits the request, it is necessary to encapsulate the user's data according to the requirements of business logic layer, and call the response business interface to complete the business function. But it is not complicated. The specific business processing mainly plays a role of a link between the upper and lower levels. Through the link it establishes, the page of view layer can be combined with the data of business layer. Let the business layer concentrate on the business, while the layer focuses on the presentation. It plays a role of loose coupling.

Model layer (Model): The model layer is mainly responsible for business processing, data modification, storage, and query operations. Among them, the data access function converts the data passed in by the controller into expressions that can be recognized by the data, such as SQL statements, to achieve database access [5]. In this system, the front page is provided by web browser, and the background service request is processed at the same time. In fact, the client does not communicate and interact with the database directly, but the interface is provided by the middle layer controller, and then interacts with the database through the model layer. Through this design, we can effectively avoid a large number of changes in the whole program code due to small changes in business logic. We only need to modify in the business logic layer, which can enhance the reusability and scalability of the code.

(2) Network Architecture Design

In order to improve performance, the remote legal education scenario simulation teaching system deploys the database server and the system server on two different servers. Deploy a firewall in front of the system server, and then connect the server to a local area network accessible by users [6]. When the system is in the early stage of operation, we temporarily adopt the single server operation mode. When the single server cannot meet the system requirements, and the system runs slowly or crashes, we add a separate database server to manage and process system data. When the two servers cannot meet the system requirements, multiple database servers can be added, and multiple internal program processing servers can be added to separate the data from reading and writing, and the client requests to be trained on the internal server for processing. The network architecture design is shown in Fig. 2 below.

The legal education scenario simulation teaching system is a learning platform based on the Internet. It processes data through a database server, and the Web server provides online information browsing services. The backup server performs corresponding storage and backup procedures for the generated data and information, and communicates with the Internet through the university hardware firewall, Connected distance learning system [7].

The server of legal education scene simulation teaching system based on mobile terminal adopts Windows Server 2008 operating system, and the hardware configuration is 8-core CPU, 6.0. 16 GB memory, 250 hard disk space. The server middleware used by the system is Tomcat 6.0. The database server adopts Windows Server 2008 operating system, and the hardware configuration is 8-core CPU, 16g memory and 250g hard disk space. The database adopts my SQL.

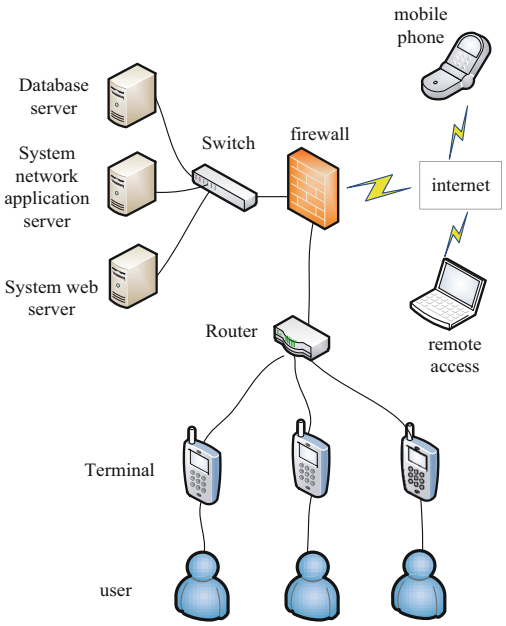

Fig. 2. Network architecture design

2.3 Mobile Terminal Functional Module Design

(1) Login Module

The user login function is the first function of the user contact system, which mainly realizes the user login to the client, through the user authentication, save the user name. The encryption technology and key are used to encrypt the data, and then the data is transmitted to the server for user verification. The user is a student registered in school. If the login is successful, it will jump to the topic page, displaying the first level columns such as course center, contact examination, discussion and answer, information consultation, personal center and more [8].

(2) Scenario Simulation Teaching Module

The complete situational simulation teaching method teaching process can include four links: situation and role design, establishment of performance requirements and scoring points, grouped role interpretation, group discussion and summary of relevant knowledge.

In the first step, in the teaching process, according to the course progress and course standards, the corresponding real events can be selected to compile cases with conflicts and implicit laws and regulations, and different stakeholders can be selected for role playing.

In the second step, teachers should establish clear performance requirements and scoring points. Since the purpose of scene simulation teaching is still to return to the curriculum standards and curriculum goals, it is necessary to pay attention to guiding

students to avoid focusing on pure deductive work. In addition, before scenario simulation, teachers should standardize the role behavior and language of the staff through detailed scoring standards.

The third step is to introduce the competition between groups in the group and role deduction to stimulate students' autonomous learning. Teachers can refer to the mode of debate and competition to carry out pairwise confrontation between groups. Because the designed scenario is ultimately in line with the students' practice and work environment, and the problems encountered in the deduction process must be solved immediately on the spot, which stimulates and mobilizes the enthusiasm and initiative of students to the greatest extent, and urges students to actively collect relevant problems and contradictory methods before playing on the stage Laws and regulations are used as countermeasures to deal with the challenges and difficulties from the "confrontation" group. Finally, in response to the performance of each on-field group's situational simulation, teachers should guide students to brainstorm together and think about whether there are better solutions and language. Through group discussion and review, each contradiction and conflict event is finally returned to the knowledge points of laws and regulations in the textbook. After that, teachers should also assist students in making summaries and refinements to consolidate knowledge points, strengthen students' ability to apply knowledge points flexibly after entering the field of work, and ultimately achieve the teaching purpose of improving students' legal literacy.

(3) Evaluation Module

The main function of the evaluation module is to train the students to make questions for the scene simulation teaching. The training methods include basic training, simulation examination and online examination. If the students choose the basic training mode, they can choose the question type for training. In the process of making questions, they can collect questions. The system stores wrong questions by default. The collected questions and wrong questions can be viewed in the personal center. At the same time, students can carry out a simulated test before the exam to be familiar with the type and time of the test. The simulation test completely simulates the online examination process and adopts the real-time timing and scoring method. When the system announces the examination information, students will participate in the test at the corresponding time [9].

(4) Consulting Center Module

The main function of the consultation module is to update news announcements from time to time so that students can keep abreast of course arrangements, exam arrangements and other matters of the college. Important information in this part of the function will remind students to prevent students from missing exam time and other important matters with sound or vibration mode.

(5) Personal Center Module

After the students log in successfully, they can also choose the question type training or simulation test through this center. The collected questions and wrong questions in the training process can be viewed in the personal Center for the next targeted training.

At the same time, the final scores of the students' examinations are also viewed in the personal Center [10].

(6) System Setting Module Design
The system setting module mainly includes whether to use only Wifi to download, whether to automatically enter the next question, sync data according to the server settings, the server settings are mainly session time management and attachment directory settings. The attachment directory is only used for the copy and transfer path of files. The session time management is used to control the automatic jump time of the answer. The working steps of the session time management are as follows:

Step 1: set the session time of a service to monitor the system all the time. When there is user operation, the session time will be timed from 0 again.
Step 2: when the user has no operation, record the time when there is no operation, and it will increase with the increase of the time of no interaction.
Step 3: check the size of the recorded time and session time. If it is less than the session time, continue to record. If it is done within the recorded time, repeat operation 1. If there is no user operation during the recording time, repeat operation 2.
Step 4: when the recording time is greater than or equal to the set session time, the client will automatically jump to the next question.

2.4 Database Design

Database is the infrastructure for the normal operation of the whole system, which directly affects the success or failure of the system design, especially the function of the system operation.

According to user needs, the design of the system database mainly involves three core businesses such as course management, evaluation management, and online communication. At the same time, according to the operating requirements of the system, it also includes operations such as system login and personal center. To this end, we must first clarify the goal of database design, abstract the data involved in daily business, and complete the database model design. According to user needs, the database of this system mainly includes the following data types:

(1) Student information: mainly includes student number (student number), student name, student gender, age, major, contact information, home address, online status and other related attributes.
(2) Course information: mainly including course number, course name, course category, specialty and other related attributes.
(3) Comment information: stores the information records of students' online communication. In the system, the course reviews are arranged in positive order by default, that is, the comments closest to the current time are arranged at the top, including the comment content, comment date, comment narration and other related attributes.
(4) Question bank information: Store questions of various question types, mainly including question number, question type, question score, question answer, etc.
(5) Examination information: the relevant data of various examinations published by the storage system, the examination information includes relevant attributes such as

examination number, examination name, examination method, examination object, examination time, examination location, and major.

(6) Answer information: The answer data in the test specified by the designated system is stored. The answer information includes the answer number, student number, question number, test number, student answer and other related attributes.

(7) News announcement information: including information number, title, content, date, publisher and other related attributes.

In the process of data analysis, the design of E-R model is the key. Through the design of E-R model, the content and relationship of data involved in the system can be intuitively reflected. On this basis, it is convenient to convert the required content into data and store it in the database. Among them, the rectangular box represents the content of each entity, the diamond box represents the relationship between the entities, 1/N represents the one to many relationship, and N/N represents the many to many relationship. The entity relationship model of scenario simulation teaching system terminal for legal education is shown in Fig. 3.

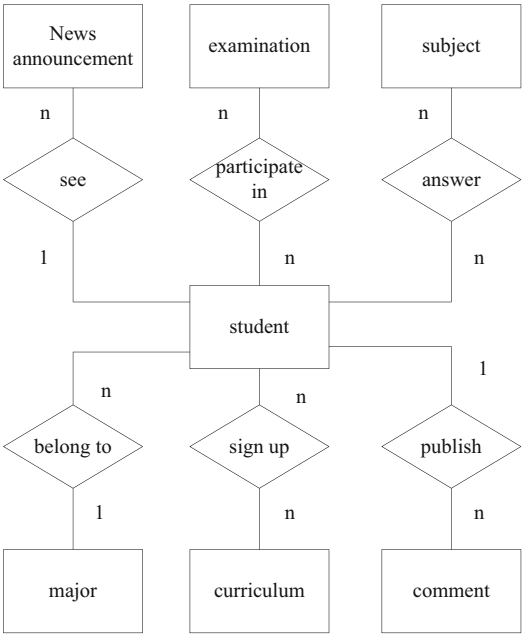

Fig. 3. The entity relationship model of the database

3 System Test

In the software development process, testing is an essential and important step. Software testing is the process of running or measuring a system by manual or automatic means, in order to verify whether the software under test meets the specified requirements or find

the difference between the actual results and the expected results. Use tests to measure the quality of the software, eliminate hidden dangers during use, and ensure the stability of the software system.

3.1 Testing Environment

The operating system of the test server is Windows 7, the development language Java uses the development environment of JDK 1.6, and the Web server uses Tomcat 6.0. The system database environment is MySql5.7. The server is deployed in the local PC.

Considering the compatibility of different models, the client is divided into Android and IOS versions. The Android model mainly used for testing is Meilan 2, the main screen size is 5 inches, the main screen resolution is 1280 * 720, and the operating system is Android 6.4; the IOS model is iPhone 6, the main screen size is 4.7 inches, the main screen resolution is 1334 * 750, and the operating system is ios10.2. The network used for data transmission is campus laboratory network.

3.2 Testing Method

System testing methods generally include white box testing and black box testing.

(1) Black Box Test

Black box testing, also known as functional testing, data-driven testing, or specification-based testing, is a test from the user's point of view. Testers generally treat the program under test as a black box.

The main types of errors detected in the black box test are: incorrect or missing functions; interface and interface errors; performance errors; data structure or external data access errors; initialization or termination conditions errors, etc.

The commonly used black box test methods are: equivalence class division method; boundary value analysis method; cause and effect diagram method; scene method; orthogonal experiment design method; decision table driven analysis method; error inference method; function diagram analysis method.

(2) White Box Testing

The white box test is to check whether the internal actions of the product are carried out normally in accordance with the design specifications, and check whether each path in the program can work correctly according to the predetermined requirements. White box testing is generally used to analyze the internal structure of the program, which is transparent to the tester. The tester can see the source code of the program under test and analyze its internal structure. Therefore, white box testing is also called structural testing or logic-driven testing.

The principles of white box testing are as follows: ensure that all independent paths in a module are tested at least once; all logical values need to be tested for true and false conditions; check the internal data structure of the program to ensure the validity of the structure; and run within the upper and lower boundaries and operational range.

White box testing methods include: code inspection method, static structure analysis method, static quality measurement method, logic coverage method, basic path test method, domain test, symbol test, path coverage and program mutation.

3.3 Black Box Test Results

Choose three modules: login module, scenario simulation teaching module, and evaluation module for testing.

(1) Login Module Test

Purpose: To verify whether the module operates in accordance with normal business logic.

Test content: Whether the user can log in normally.

Test results: as shown in Table 1.

Table 1. Login module function test results

Use cases	Test Results
Do not enter ID, password, verification code	Please enter ID, password, verification code
Input wrong username, password, verification code	Remind the input ID password, the verification code is wrong
Close the client's network connection	Reminder please check the system network connection
Shut down the server	Connection timed out, server-side exception, please contact the administrator
Information input is accurate and network connection is normal	Successfully enter the main interface of the system

It can be seen from Table 1 that only when the information input is accurate and the network connection is normal, can you successfully enter the main interface of the system, which means that the login module can effectively prevent non-registered users from logging in and protect information data.

(2) Scenario Simulation Teaching Module Test

Purpose: To verify whether the module normally displays courses, plays courses, and evaluates courses. The test content and test results are shown in Table 2 below.

According to Table 2, the scene simulation teaching module can play video and audio online according to the learning records; Downloadable video and audio files; You can evaluate the course and set the word limit. And the test results are consistent with the expected judgment, which can effectively realize the situational simulation teaching.

(3) Evaluation Module Test

Purpose: To verify whether the module normally displays courses, plays courses, and evaluates courses. The test content and test results are shown in Table 3 below.

According to Table 3, the evaluation module can initialize the question bank and display the question type according to the selected course; Realize the timing function; Realize the scoring function; Click "Favorites" to add the question to the bookmark; The wrong answer can automatically match the wrong question. It has effectively realized the scene simulation teaching.

Table 2. Function test results of scenario simulation teaching module

Test content	Anticipatory judgment	Test Results
Scene teaching online play	Can play online	Video and audio can be played online, and according to learning records
Situational teaching course download	Can download the courseware	Downloadable video and audio files, the default storage address is the memory card
Situational teaching curriculum evaluation	Can the course be evaluated	Courses can be evaluated, and word limit should be set

Table 3. Functional test results of the evaluation module

Test content	Anticipatory judgment	Test Results
Basic question training	Whether to display the question type according to the major	Initialize the question bank and display the question type according to the selected course
Timer function	Can it be timed	Enter the test timing function to open, in seconds
Scoring function	Can score	Enter test scoring function, real-time scoring
Collection topic	Can the title be collected?	Click Favorite to successfully bookmark the question
Collection wrong question	Can the wrong question be collected?	The wrong answer matches the wrong question automatically

3.4 White Box Test Results

As a legal education scenario simulation teaching system for teachers and students, in addition to designing corresponding functions that meet the needs, the performance of the system should also be considered. Performance issues indicate the quality of the system and the user's desire to use it. For high concurrent access by multiple users, software should be used for stress testing. Under the influence of network and system design, the time delay index of data interaction is more important. Take the mobile terminal login function as an example to conduct a stress test.

Using Apache's open source testing tool JMeter, create thread groups to simulate multi-user dynamic assembly of request data, send sign in requests through HTTP protocol, set different number of threads to simulate concurrent users for testing, and the test results are shown in Table 4.

Table 4. Stress test results

Concurrent number of mobile terminals/piece	Response time / S
100	0.68
200	1.56
300	2.05
400	2.95
500	4.50

In the case of more than 500 concurrent requests, the response time of the system is still within the acceptable range, indicating that in terms of performance, the entire system also maintains a good level, basically reaching the expected effect at the beginning of the design.

3.5 Student Satisfaction Test

In order to further verify the practicability of the system in this paper, taking student satisfaction as the experimental index, the system in this paper, the system in document [1] and the system in document [2] are used for comparative test. The test results are as follows (Fig. 4).

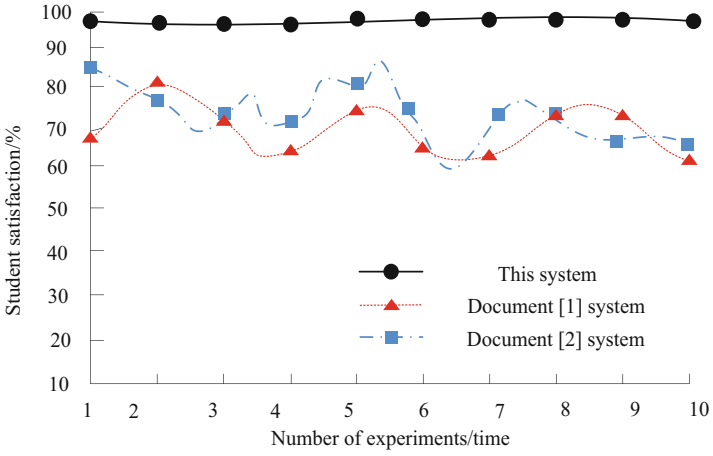

Fig. 4. Comparison results of student satisfaction test

As can be seen from the above figure, the student satisfaction of the system in this paper is up to 98%, and is higher than 90%. The student satisfaction of the literature [1] system is up to 88% and the lowest is 60%. The student satisfaction of the system of literature [2] is as high as 81% and as low as 62%. It can be seen that the student

satisfaction of this system is significantly higher than that of the comparison method, indicating that this system is practical.

4 Conclusion

The combination of the technology represented by the system and the traditional classroom is the exploration and innovation of the teaching mode, the supplement of online education and distance education, to make up for the deficiencies and deficiencies, and to provide teachers with a set of teaching software suitable for the current situation. The improvement of students' learning level can effectively improve the school's work efficiency and management level, and has a certain impact on the improvement of school teaching quality. Combining with modern mobile technology, this paper designs an intelligent teaching system of law education scene simulation based on mobile terminal. Through black-box and white-box tests, it is verified that the function and performance of the system in this paper meet the requirements. Through the student satisfaction experiment, it is verified that the student satisfaction of the system in this paper is up to 98%, and both are higher than 90%, which proves that the system has application value. So far, the development of the system has realized the basic functions required. However, due to the limited technical level and development time, the system still needs further improvement in many aspects and practical functions. Further update through user feedback, establish a reasonable model, continue to learn the latest theories and technology-related system development at home and abroad, strengthen learning management, and provide more perfect service software for teachers and students.

References

1. Zhu, L.L.: Application of online intelligent teaching system in colleges and universities based on artificial intelligence. J. Jiangxi Electr. Power Vocat. Tech. College **34**(2), 20–21 (2021)
2. Liu, Y.H.: Intelligent teaching system based on big data analysis technology. Mod. Electron. Tech. **44**(7), 178–182 (2021)
3. Ma, J., Niu, L., Li, X.: Design of key universities' laboratory intelligent teaching system based on multimedia and network technologies. Mod. Electron. Tech. **44**(20), 1–6 (2021)
4. Diaz, J.M., Costa-Castello, R., Dormido, S.: Closed-loop shaping linear control system design: an interactive teaching/learning approach. IEEE Control. Syst. Mag. **39**(5), 58–74 (2019)
5. Jiang, H.: Design and application of intelligent teaching system based on 5G communication. Guangxi Educ. **35**, 172–173 (2021)
6. Xiao, L.: Research on intelligent teaching system based on multi-modal deep learning technology. China Comput. Commun. **34**(16), 227–230 (2022)
7. Li, G., Wang, F.: Research on art innovation teaching platform based on data mining algorithm. Clust. Comput.. Comput. **22**(2), 13867–13872 (2018)
8. Granjo, J.F.O., Rasteiro, M.G.: LABVIRTUAL—a platform for the teaching of chemical engineering: the use of interactive videos. Comput. Appl. Eng. Educ.. Appl. Eng. Educ. **26**(5), 1668–1676 (2018)
9. Martinez, L.G., Marrufo, S., Licea, G., Reyes-Juarez, J., Aguilar, L.: Using a mobile platform for teaching and learning object oriented programming. IEEE Latin America Trans. **16**(6), 1825–1830 (2018)

10. Merayo, N., Ruiz, I., Debran, J., et al.: AIM-mobile learning platform to enhance the teaching-learning process using smartphones. Comput. Appl. Eng. Educ.. Appl. Eng. Educ. **26**(5), 1753–1768 (2018)
11. Yao, K., Li, L.: Mobile terminal network survivable database security anti-tampering simulation. Comput. Simul. **37**(1), 456–459+483 (2020)