Design of Mobile Education Platform for University Network Law Popularization Based on Streaming Media Technology

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Abstract. In order to make the function and performance of the university network law popularization mobile education platform meet the needs of users, the design of university network law popularization mobile education platform based on streaming media technology is proposed. Using the education platform client and streaming media server, this paper designs the structure of the university network law popularization mobile education platform. Combined with the design of sign in incentive module, legal knowledge integration module and legal knowledge extraction module, this paper designs the functional module of university network law popularization mobile education platform, and realizes the design of university network law popularization mobile education platform. The test results show that the platform in this paper can meet the user's requirements for the platform functions through the sign in incentive function test. In terms of the storage space and memory occupancy of the platform, it can also meet the user's requirements for the platform performance.

Keywords: Streaming Media Technology · Education Platform · Legal Education · Sign In Incentive · Knowledge Integration

1 Introduction

At present, there is a certain gap in the cultivation of rule of law awareness and rule of law thinking among most college students in China. On the one hand, the lack of cultivation of rule of law awareness in childhood education and family education results in the lack of college students' own grasp of legal common sense, and on the other hand, the lack of surrounding rule of law atmosphere and environment results in the deficiency of the guidance of the force of abiding by the law, Many college students are not only lack of rule of law education in their knowledge learning experience, but also lack of proper rule of law atmosphere edification [1] on campus. Therefore, the construction of the legal education platform in colleges and universities is particularly important. It can not only make up for the lack of legal knowledge of most students, but also reshape the legal personality of college students and improve their legal literacy.

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In domestic research, Shi Wanli et al. [2] designed a smart education platform based on big data analysis technology, including data resource database, big data analysis layer, smart education information cloud service layer, application service layer and presentation layer, to achieve one-stop online services in the education process. The big data analysis layer uses the Hbase database combined with the SQL computing execution engine to analyze the smart education data, and transmits the analyzed student, teacher and resource information to the smart education information cloud service layer. The intelligent education information cloud service layer enables platform users to enjoy services such as platform storage files, course management and course publishing by verifying users, service binding and service provision. The administrator of the online learning module in the intelligent education information cloud service layer reviews teachers' lesson preparation materials and students' learning resources, and realizes the functions of teachers' online or video teaching and students' curriculum selection and determination, so as to realize online information exchange among teachers, administrators and students. The platform test results show that the platform can provide personalized teaching and management according to students' personalized learning behavior, realize online communication between teachers, administrators and students, and the platform education resource storage service and portal service can be realized, with high application value. Gao Xue et al. [3]. First of all, the characteristics and advantages of distributed cognitive theory in the experience design of online education platform are analyzed through literature, and user research is conducted by questionnaire and interview methods to clarify the influencing factors of online learning from the perspective of distributed cognition. Secondly, the Coursera platform is analyzed as a case, and each element is distributed in its own context for analysis. Finally, the experience design strategy of online education platform from the perspective of distributed cognition is extracted. In the proposed design strategy, design methods such as visual knowledge map, collaborative tools to promote deep interaction, and social behavior to establish mutual benefit and sharing can meet the learning needs of online learning users, and solve the problems such as low learning autonomy and low communication and collaboration efficiency.

In foreign research, Song Y et al. [4] proposed an application method of mobile education in the intelligent campus assisted autonomous learning platform in order to solve the problems of low teaching effect and poor student performance in traditional intelligent campus construction methods. By analyzing the connotation and characteristics of mobile learning, this paper studies the influence of mobile education on assisted autonomous learning in smart campus. By means of questionnaire survey, the teachers who have carried out mobile education and those who have not carried out mobile education were investigated. And compare the test scores of mobile education classes and non mobile education classes. The survey results show that the application of mobile education in the intelligent autonomous learning platform can diversify teaching methods, improve teachers' teaching effects, improve students' learning achievements, and thus improve the teaching level of intelligent campus on the premise of improving students' enthusiasm for class.

At present, digital multimedia teaching has already entered the learning of various courses in colleges and universities, which is certainly essential for the development of

law popularization education for college students. However, there are still many shortcomings in how to build and improve the existing digital media law popularization platform. On the one hand, the multimedia infrastructure of some colleges and universities is not perfect. On the other hand, the participation and initiative of college students are also lacking. It is necessary to play the role of digital media law popularization education platform. First of all, colleges and universities should improve relevant infrastructure and supporting equipment, so that students can easily and quickly access the latest laws and regulations, relevant legal cases and legal advisory information. Also, teachers should learn to effectively use the existing digital media for law popularization teaching, so that law popularization education is no longer limited to boring textbooks, but the latest and fastest integration with social life, explain the latest legal social hot spots, and let the law popularization education keep pace with the development of the times.

Based on the above research background, this paper applies streaming media technology to the design of university network law popularization mobile education platform, so as to improve the ability of university students to popularize legal knowledge.

2 Structure Design of University Network Law Popularization Mobile Education Platform

The mobile education platform for online legal popularization in universities mainly consists of an education platform client and a streaming media server. The education platform client includes four modules: data transmission control module, partner management module, media data buffer, and media playback. The streaming media server utilizes a handshake protocol to build a network connection and transmit client streaming information to the streaming media server, achieving playback of audio and video files. This completes the structural design of the mobile education platform for university network legal education.

2.1 Design Education Platform Client

The education platform client is composed of four parts: data transmission control module, partner management module, media data buffer and media play. Its structure is shown in Fig. 1.

The partner management module is mainly responsible for the management and maintenance of the relationship between this node and other nodes. When a node joins a P2P network to carry out legal education, this module is responsible for sending requests to the server, obtaining the resource information of the parent node, establishing a resource information table, and then establishing a connection with the parent node. The partner management module stores the information of the parent node and child node, and carries out message communication with the parent node and child node every two seconds to detect whether the other party is still on the network and remains available, so that when a node suddenly leaves, the connection can be quickly restored in the P2P network.

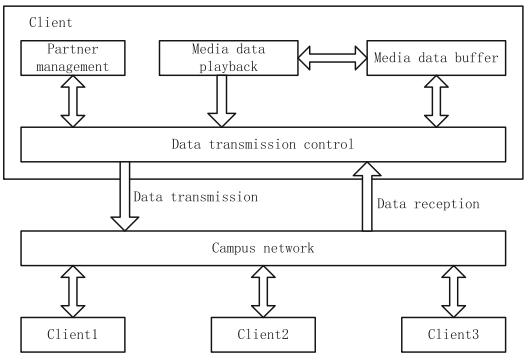

Fig. 1. Client Structure

The media data buffer is mainly responsible for receiving the streaming media data transmitted from the server or other clients, updating the streaming media data of this node and storing it.

The function of the media data playback module is to play the data in the buffer by calling the Media Player [5] that comes with Windows.

The data transmission control module is used to open a data buffer in the client host memory, store the received streaming media data to the buffer, and when the buffer is full, submit the data that first entered the buffer to the player at a certain rate for playing [6]. While caching data streams, it also distributes data streams to its child nodes.

2.2 Design Streaming Media Server

The process of streaming media server transmitting encapsulated media data to the player through streaming media protocol requires several steps: handshake protocol, network connection, network stream, and playback. The details are as follows:

Step 1: Handshake protocol

The handshake starts with the client passing C0 and C1 blocks. After the server obtains C0 and C1, it will pass S0 and S1. Once the client obtains S0 and S1, it will pass C2. After obtaining C0 and C1, S2 will be passed. Once the client and server acquire S2 and C2, the handshake ends. The schematic diagram of handshake protocol is shown in Fig. 2.

Step 2: Build network connection

The client passes the "connection" in the command message to the server. After the server obtains the connection command, it will send the protocol message of selecting the window size to the client, which is the same as the application in the connection command. The server transmits the message about the bandwidth protocol to the client. After the client processes the set bandwidth protocol message, it will send the confirmation window size protocol message to the server.

Step 3: Build network flow

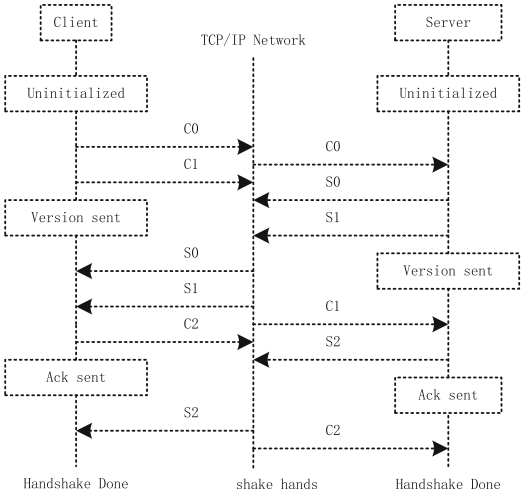

Fig. 2. Schematic Diagram of Handshake Protocol

The client transmits the "Create Stream" message in the command message to the server. After the server gets the "Create Stream" message, it sends the "Result" in it, and then transmits the client stream information.

Step 4: Play

The client transmits the "Play" in the command message to the server. After getting the play message, the server transmits the block size protocol message. The server passes the "streambegin" of the client to urge the client to obtain the stream ID. After the playback command is sent, the server will transmit the "response status" in it to facilitate better transmission of the client's "playback" command. Then, the server transmits the audio, video and other files to be played by the client.

3 Design the Function Module of the University Network Law Popularization Mobile Education Platform

After designing the structure of the mobile education platform for online legal education in universities, construct the functional modules of the platform. This module includes a check-in incentive module, a legal knowledge integration module, and a legal knowledge extraction module. The check-in incentive module is mainly aimed at students, and completing check-in can earn rewards. Design student check-in and re signing processes, distribute incentive coins to users upon completion of the event, and achieve check-in incentives. The Jacobi method is used to establish the characteristic equation of legal knowledge resources, and the template features are Linear map to the low dimensional feature space, so that the Bhattacharyya Distance between categories is maximized, and the legal knowledge integration module is completed. Extract legal knowledge based on the objectives of legal education tasks and the characteristics of course content in mobile education. This enables the design of functional modules for the mobile education platform for online legal popularization in universities.

3.1 Design the Sign in Incentive Module

The main users of sign in incentive are students. Students complete sign in before class to get rewards. If they can't sign in five minutes after class, they need to contact the tutor for re signing. The url address of sign in incentive is/signIn/episodes/{epidedId} [7], the request method is post, and the parameters required by the request method are shown in Table 1.

Table 1. Interface Parameters of Sign in Incentive Request

Field	Must	Type	Remarks
Userid	No	Int	User ID, no need to display the transmission, and then check and obtain the permission according to the requested context
Version	No	String	The version information requested by the user. The low version application does not support the function of continuous sign in incentive, does not return the corresponding results, does not need to be transmitted, and is obtained in the context
Epirsod	Yes	Int	Course id
Teamid	Yes	Int	Class ID, which is the class of the user in this course

The check-in process of students in the network law popularization mobile education platform is shown in Fig. 3.

There are two levels of check-in activity: student dimension and course dimension. In the curriculum dimension, each class of students in a series of courses belongs to the sign in range of the series of courses, and the sign in progress is different in different courses;In the student dimension, the sign in activity changes with the change of students. The sign in of students in different courses is unified progress. After signing in in one series of courses, the sign in activity in another series of courses is continuous.

In order that students will not be confused by the different progress of signing on different courses, the student dimension of signing in activity is selected here. However, this will bring some other complications. Since the current check-in times and previous check-in status are not in a series of courses, the student's check-in order cannot be obtained directly, so it is necessary to add the student's check-in order in the check-in table to indicate the student's position in this round of check-in, and the previous check-in statuses can also be obtained. In addition, a flag bit is required to mark whether the previous check in status is complete or partially complete, so that the client can display the final different award status.

There are two steps to obtain the status of students' current round of check-in. The first step is to obtain the latest check-in position, and the second step is to obtain the previous check-in status in the check-in record table according to the current check-in position. In addition, it is also necessary to record the user's non sign in status when the user has not signed in, so that it will not be lost when obtaining it later. The flow chart of the supplementary signing module is shown in Fig. 4.

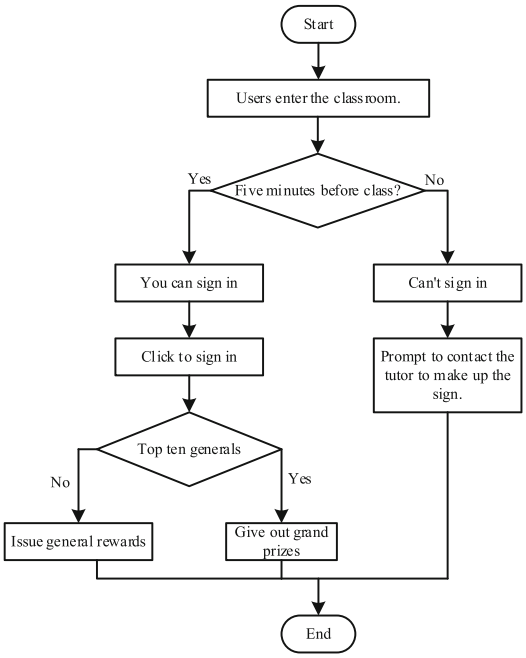

Fig. 3. Flow Chart of Student Sign in Incentive Module

The teacher needs to guide the teacher to select courses and students, generate corresponding supplementary signing records for students after judgment, and issue gold coins. If the student does not purchase, does not attend class, has too many times to sign in, and does not need to sign in for the course, the signing will fail and the corresponding information will be returned.

The time to generate an unsigned record is when the class is over, and the time to receive the bill for the class is when the unsigned user who should sign for the class creates an unsigned record. This will add some redundant records to the sign in table, because theoretically, the sign in table should only record the courses that users have signed in. Here, redundant storage of courses that users have not signed in is required, but it is necessary to achieve incentives for continuous sign in. In addition, it is also necessary to judge whether it is the last time to sign in for this round and whether it is necessary to send the grand prize. After signing in, users need to issue incentive gold coins. This is done through events, instead of blocking the return of the user's sign in results [8]. The reward service will consume after receiving the gold coin issue event, issue the corresponding gold coin to the user's account and add the related gold coin record.

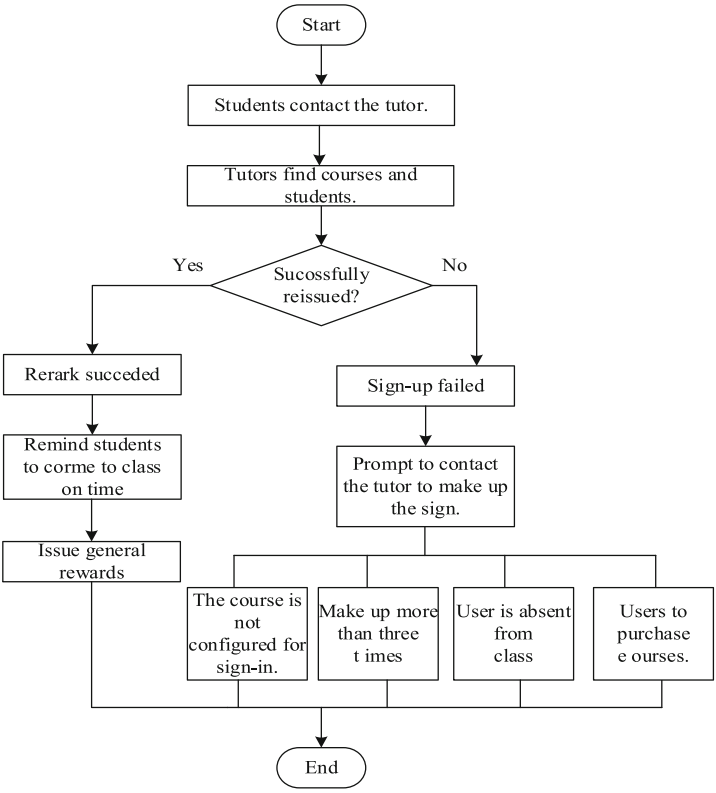

Fig. 4. Flow chart of supplementary signing of sign in incentive module

3.2 Design Legal Knowledge Integration Module

Assumed by n represents the number of sample characteristic variables in the original legal knowledge resource integration module, X representing the original sample n characteristic variables, satisfied with $X = x_1, x_2 \cdots x_n$. After orthogonal transformation u^* comprehensive variables (y_1, y_2, y_3), R representative sample X characteristic equation [9] of the integration module of legal knowledge resources is constructed using Jacobi's method and expressed by formula (1):

$$\lambda^n(i) = \frac{\{R \times X\}^n}{\{(y_1, y_2, y_3)\}} \cdot \frac{(x_1, x_2, \cdots, x_n)}{u^*} \tag{1}$$

Assuming λ_i represents the number of non negative eigenvalues of the sample correlation coefficient matrix, and rank them to satisfy the $\lambda_1 \geq \lambda_2 \geq \lambda_n \geq 0$. Extract the features of the first m legal knowledge resource integration modules through the ratio of λ_i to feature noise interference.

Assuming α before the representative m, if the variance of the characteristics of the legal knowledge resource integration module and its proportion in the total variance, then use formula (2) to calculate the characteristic variance contribution rate of the legal

knowledge resource integration module. The formula is:

$$\beta(p) = \frac{m+\alpha}{\mu(R)} \times \nu(e)\left(\sigma^* + \kappa\right) \tag{2}$$

where, $\mu(R)$ represents the weight of the characteristic sample of the legal knowledge resource integration module, information entropy representing different characteristics $\nu(e)$, σ^* represents the best threshold of the behavior variables of the legal knowledge resource integration module, κ represents the observed variable of student characteristics.

Assuming $X = x_1, x_2 \cdots x_n$ is defined as the characteristic random vector of the observable legal knowledge resource integration module, a_{ij} represents the factor load, representing the i variable vs j correlation coefficient of the factor, then use formula (3) to give the characteristic observable random vector of the legal knowledge resource integration module:

$$\partial(X) = \frac{X \times F}{\left(a_{ij}\right)_{n \mp m}} \times c_i + \varepsilon_i \times X_i \tag{3}$$

where, F represents an unobservable vector, c_i represents the load of the integration strategy factor of legal knowledge resources, ε_i representative influence c_i Unique factor of.

Integrate legal knowledge resources into information sources X^* The uncertainty degree of is defined as shannon entropy [10], calculate using the source space of source X^* and the probability of integration module events [11].

Assuming $I(\lambda_i)$ represents the information function of the integration module of legal knowledge resources, we use formula (4) to define the behavior probability of the integration of legal knowledge resources:

$$\xi(w) = \frac{I(\lambda_i) \times H(X^*)}{\zeta(k)} \times \vartheta(R) \tag{4}$$

where, the amount of information $\zeta(k)$ representing legal knowledge, $\vartheta(R)$ represents the cumulative information contribution rate of the legal knowledge resource integration module.

Integrate the module behavior probability with legal knowledge resources $\xi(w)$. For the basis, the feature vector corresponding to the non-zero eigenvalue of the legal knowledge resource integration module is defined as the classification feature vector, and the samples of the knowledge resource integration module are linearly mapped to the low dimensional feature space to maximize the Bhattacharyya Distance between its categories. The legal knowledge resource integration module is given. The specific steps are detailed as follows:

Assuming $\Phi(^\circ)$ represents a nonlinear mapping function, w represents a vector in the kernel space, integrating module probability with legal knowledge resources $\xi(w)$ based on, the feature vector corresponding to the non-zero eigenvalue of the legal knowledge resource integration module is defined as the classification feature vector, and the formula (5) is used to express:

$$J_B = \frac{(\mu_2 - \mu_1)}{\xi(w)} \cdot \frac{(W, Z_i) \times \omega_i}{\Phi(^\circ)} \tag{5}$$

where, μ_1 and μ_2 respectively represent a vector in the kernel space, W and Z_i mean and variance of the sample representing the category after projection to the one-dimensional space, ω_i represents a kernel function.

Assuming $o(k)$ represents that the sum of variances between the features of the kernel space is the smallest, and use formula (6) to linearly map the sample of the legal knowledge resource integration module to the low dimensional feature space, and promote the Bhattacharyya Distance between its categories to be the largest, namely:

$$\iota(u) = \frac{o(k) \times i_{(v)} \times J_B}{E(p)} \tag{6}$$

where, $E(p)$ represents the effective feature vector of the behavior classification of the legal knowledge resource integration module, $i_{(v)}$ represents the isoline value between two eigenvectors.

Based on the calculation result of formula (6), the integration module of legal education knowledge resources is established by using formula (7), namely:

$$\partial^*(y) = \frac{\iota(u) \times J_B}{\xi(w)} + H\left(X^*\right) \tag{7}$$

According to the above process, complete the design of legal knowledge integration module.

3.3 Design Legal Knowledge Extraction Module

In the field of legal education knowledge provided by mobile education platforms, the goal of legal education in mobile education is the product of learners' distance education learning needs, task activity needs, and legal course content.

Hypothesis $g(U)$ on behalf of the content design process of law popularization courses in the mobile education platform, $\mu(W)$ represents the teaching activities of learners, through the digital integration of legal education resources [12], formula (8) is used to give the characteristics of the content of legal education courses:

$$\psi(\kappa) = \frac{g(U) \times \mu(W)}{v(o)} \times \mu(j) \times \varpi(b) \tag{8}$$

where, $\varpi(b)$ represents the knowledge field of law popularization and teaching provided by the mobile education platform, $v(o)$ and $\mu(j)$ is the performance characteristics of the teaching content of popularizing the law, which represents the linear learning and leap learning of learners, will be based on the needs of the teaching environment of popularizing the law and the teaching objectives of popularizing the law $\xi(c)$ decomposes and reorganize. According to the organizational form of mobile education learners, use formula (9) to provide the extraction structure of legal resources suitable for learners' legal education and teaching mode:

$$\chi(y) = \frac{v(o) \times \mu(j)}{\xi(c)} \times \frac{k(\rho) \times z(i)}{\ell(a)/\partial(n)} \tag{9}$$

where, $k(\rho)$ represents learners' learning motivation, $z(i)$ represents the performance characteristics of learners in the process of popularizing the law. The internal psychological activity process of learners is related to the optimization and selection of legal course content by mobile education teachers, as well as the ratio of the performance characteristics of legal teaching content. Cognitive laws are related to the learning state of learners and the ratio of the performance characteristics of jumping learning legal teaching content.

Use formula (10) to build the extraction module of mobile education quality legal resources, namely:

$$m(g) = \frac{\iota(\vartheta)}{B(i)} \times \varsigma(\Omega) \times \alpha(d) \tag{10}$$

where, $\iota(\vartheta)$ represents the learning state of learners in the process of online law popularization and mobile education [13], $B(i)$ represents learner autonomy learning strategies provided in the extraction of common law resources, $\varsigma(\Omega)$ represents the learners' attention to the teaching content of the law course, $\alpha(d)$ represents the satisfaction of the content of the course for different types of learners.

To sum up, through the design of sign in incentive module, legal knowledge integration module and legal knowledge extraction module, complete the functional module design of university network law popularization mobile education platform.

4 Test Analysis

4.1 Test Environment

In order to improve the ability of college students to popularize legal knowledge and test the function and performance of the education platform, it is necessary to clarify the use environment of the mobile education platform before the test, so as to simulate the request in the real situation and achieve the same test effect as online. The test environment configuration of this article is as follows:

Hardware environment:
A PC with Windows operating system
MBP of a Mac OS operating system
A mobile phone on the Android platform
A mobile phone on the ios platform
Software environment:
Chrome browser
Mobile student app
Teacher app
Tutor following tool app
Other required software such as Paytm, Facebook, Whatsapp, etc.

4.2 Functional Test

In order to test the various functions of the university network legal popularization mobile education platform, this paper takes the sign in incentive module as the test object. The test steps are: after the development is completed, other members of the team will review the code. After the review and modification is completed, the self test will be conducted. The self test will be released in the test environment for front-end joint debugging, and then it will be proposed to the testers. After the testers pass the test, they will go online, finally, carry out online backtesting. For example, Table 2 is used for sign in incentive function test.

Table 2. Sign in incentive function test cases

Preconditions	Execution steps	Expected results	Actual results
The user has purchased the corresponding course	Enter the classroom within five minutes from the opening of the classroom to the beginning of the class, and click the sign in button;	You can sign in and complete the animation of common sign in, and send basic gold coins to users;	Consistent with expected results
	Sign in at the last class break that won the grand prize;	You can sign in, complete the sign in animation of the grand prize, and calculate the random proportion of gold coins to send to users;	
	If the previous courses are not fully signed, the last time of signing in is required;	You can sign in, complete the animation of ordinary sign in, and send basic gold coins;	
	Enter the classroom five minutes after the beginning of the class and click Sign In;	It is not allowed to sign in, and prompts that the tutor needs to be contacted for re signing;	
	The tutor will sign up for the students who have not signed in	Can be countersigned	

According to the results in Table 2, the platform in the article can sign in and prompt users to contact tutors, and tutors can also make up signatures, which meets user needs.

4.3 Performance Test

In the performance test, in order to highlight the advantages of the platform in this paper, the education platform based on big data analysis technology, the education platform based on distributed cognition and the education platform based on intelligent assistance are introduced for comparison. The storage space and memory occupancy of the test platform are as follows.

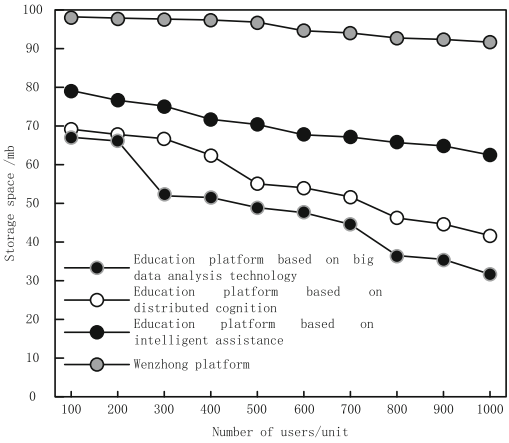

Fig. 5. Storage space test results of the platform

It can be seen from the results in Fig. 5 that when the intelligent assisted education platform is adopted, the storage space decreases significantly with the increase of the number of users. When the number of users in the platform increases from 100 to 1000, the storage space decreases from 67.6 mb to 32.1 mb. When using the education platform based on distributed cognition, the storage space is between 40 mb and 70 mb, and the range of storage space is basically the same as that of the education platform based on intelligent assistance, but it is larger than that of the education platform based on intelligent assistance. When the education platform based on big data analysis technology is adopted, the range of storage space changes is reduced, between 60 mb and 80 mb. When using the platform in this article, with the increase of the number of users, the storage space is still more than 90 mb.

According to the results in Fig. 6, with the increase in the number of user requests, the change trend of the memory occupancy of the education platform based on big data analysis technology, the education platform based on distributed cognition, and the education platform based on intelligent assistance is basically the same, all more than 20%. When using the platform in this article, with the increase of the number of user requests, the memory occupancy is always within 10%, which has high performance.

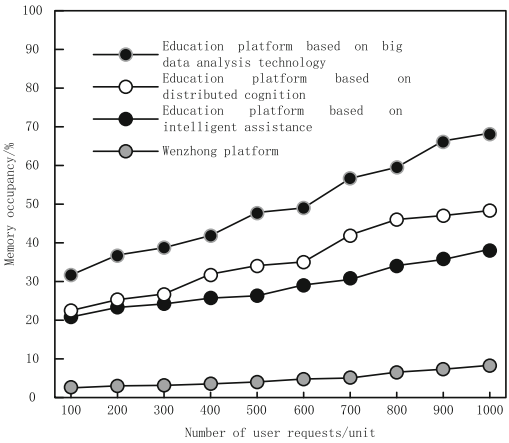

Fig. 6. Memory occupancy test results of the platform

5 Conclusion

This paper proposes the design and research of university network legal popularization mobile education platform based on streaming media technology. Design a mobile education platform client for university network legal popularization through four modules: data transmission control module, partner management module, media data buffer, and media playback. Design a streaming server based on streaming technology to achieve audio and video file playback. Utilizing the post request method and Jacobian method to establish platform functional modules, reducing the use of storage space, and thus achieving the design of a mobile education platform for university network law popularization. Through experiments, it has been proven that the storage space required by the platform in the article is small and the memory occupancy rate is always low, it is found that the function and performance of this platform can meet the needs of users. Although this research has achieved some results, there are still many shortcomings. Although streaming media technology has been applied to the design and development of actual projects, it has not optimized the configuration of various details of streaming media parameters, such as the response time of services. The next step is to optimize the parameter configuration of streaming media from this perspective.

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