Online and Offline Hybrid Learning System of Ideological and Political Course Based on Mobile Terminal

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Abstract. Aiming at the shortcomings of low coverage and weak interaction of traditional ideological and political courses online and offline blended learning systems, to improve the adaptability of the online and offline blended learning systems for ideological and political courses, a mobile terminal-based ideological and political course is designed. On-line and off-line blended learning system. Based on the mobile terminal, the hybrid learning server is designed using the three-tier structure of the B/S model to complete the overall system architecture design. Construct a learner model based on the characteristics of a blended learning model, design a learning process, and test the effect of software operation. The test results show that the online and offline hybrid learning system for ideological and political courses based on mobile terminals can effectively improve online and offline interactivity and expand coverage.

Keywords: Mobile terminal · Ideological and political courses · Online and offline · Blended learning

1 Introduction

With the continuous development and integration of modern multimedia technology and computer network technology, various mobile terminals, such as tablet computers and smart phones, have been rapidly popularized in people's daily production and life. Nowadays, smart phones are no longer just communication tools, but portable mobile terminals with independent operating systems and can install various applications and software. They can be used to complete corresponding tasks, and can also realize wireless network connection through mobile communication and other networks, so as to gradually develop into popular and popular electronic products. Affected by the rapid development of modern mobile devices, we should give full play to their advantages, innovate and optimize modern lifestyles and learning and working methods. With the wide application of WiFi technology and streaming media technology, the number of

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people who use mobile devices to watch video in real time is gradually increasing, and the role of mobile terminals in teaching is irreplaceable.

With the continuous advancement of mobile terminal technology, the application of mobile terminals in all walks of life is increasingly inseparable from it. For example, in the fields of information management and online learning, computers can be seen everywhere. With the development of mobile networks and intelligent terminal technology, mobile phones and other mobile terminals have been widely used in learning and office, so that their learning is no longer limited by time and space, and they can use mobile devices to acquire the required knowledge at any time. The connection of the mobile terminal needs to use the information it transmits during the entire process, which is also an important aspect of system design, which will directly affect the user's learning experience [1]. With the gradual development of online courses, students pay more and more attention to the interactivity of online learning. With the development of mobile terminals, the implementation conditions of online learning systems are more perfect, the cost is lower, the service quality is higher, and the stability and flexibility are higher. All of these have laid a good foundation for the development of online learning systems for college students, provide convenient learning channels for different types of students, promote communication between students, and facilitate the evaluation of learning effect so as to ensure the significant improvement of learning effect [2, 3].

Based on the mobile terminal technology, this paper extends the hybrid learning system in the ideological and political online learning system, and designs the software and hardware of the ideological and political online hybrid learning system. Multimedia information elements such as language, sound and image are displayed on the off-line classroom screen by mobile terminal, and learning is completed through the interactive operation between students and mobile terminal. The research on the online and offline learning system of Ideological and political course based on mobile terminal can not only stimulate students' learning interest and enthusiasm, but also shorten the whole cognitive process, so as to optimize and improve the teaching process, and significantly improve the teaching efficiency and teaching quality.

2 Hardware Design of Online and Offline Hybrid Learning System in Ideological and Political Courses

2.1 Overall Architecture Design

The popularization and innovation of online and offline mixed learning of political theory courses need to rely on the technological means of mobile terminals [4], optimize and improve the overall structure of the original online learning system, gradually form teaching features and enrich the service mode of mixed learning [5]. At present, most online learning systems adopt the B/S three-tier structure mode, and the overall system architecture is shown in Fig. 1.

Among them, the three-tier structure of B/S pattern includes data service layer, Web service layer and application service layer. It can provide an adequate data services layer for the system to run. The Web Services layer can use the Internet browser to provide system users with an online learning interface to optimize system services. And

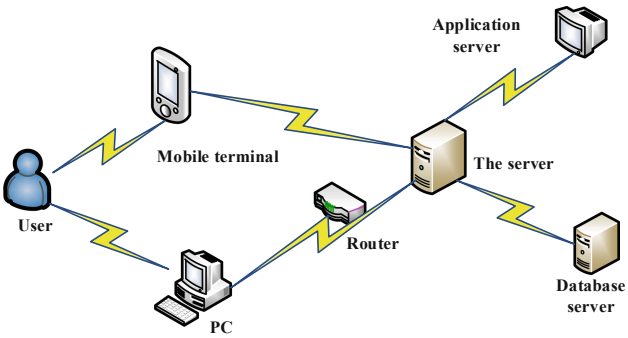

Fig. 1. Three-tier B/S architecture online learning platform

the application service layer can provide data service layer operation permissions for various types of users [6]. After the mobile device enters the online learning system page, it can learn courses, download materials, and modify user information. Web services layer can be used to analyze and standardize the user demand information, and transfer the data information to the middle layer. After receiving these data information, the application layer server will make corresponding feedback according to the user's request and provide the user with appropriate online services.

2.2 Hybrid Learning Server Design

The design of hybrid learning server is inseparable from the background data service. The whole mobile learning system runs from the background server [7]. The server-side mixed background learning in this paper is developed and implemented under the Android system, the development tool used is MyEclipse, and the programming language is Java. The hybrid learning server of the system adopts the classic SSH architecture. According to the analysis of system requirements, it is necessary to design the corresponding API interface on the background learning server for the mobile client to use, and the mobile client implements related functions by calling the corresponding API interface, its processing flow is shown in Fig. 2.

The client calls its corresponding API interface and sends a network request to the background through the HTTP protocol. The hybrid learning server first verifies whether the network request is valid, and then verifies whether the signature parameter in the network request is valid. If the two judgment methods are both valid, mixed The learning server will execute the corresponding request task, and then encapsulate the processed data into JSON data through the Struts2 framework and return it to the client. The client parses the JSON data returned in the background to obtain the corresponding information [8]. If the two judgments are not completely correct, the background will send the error reason code to the client. The common response status codes of the server are shown in Table 1.

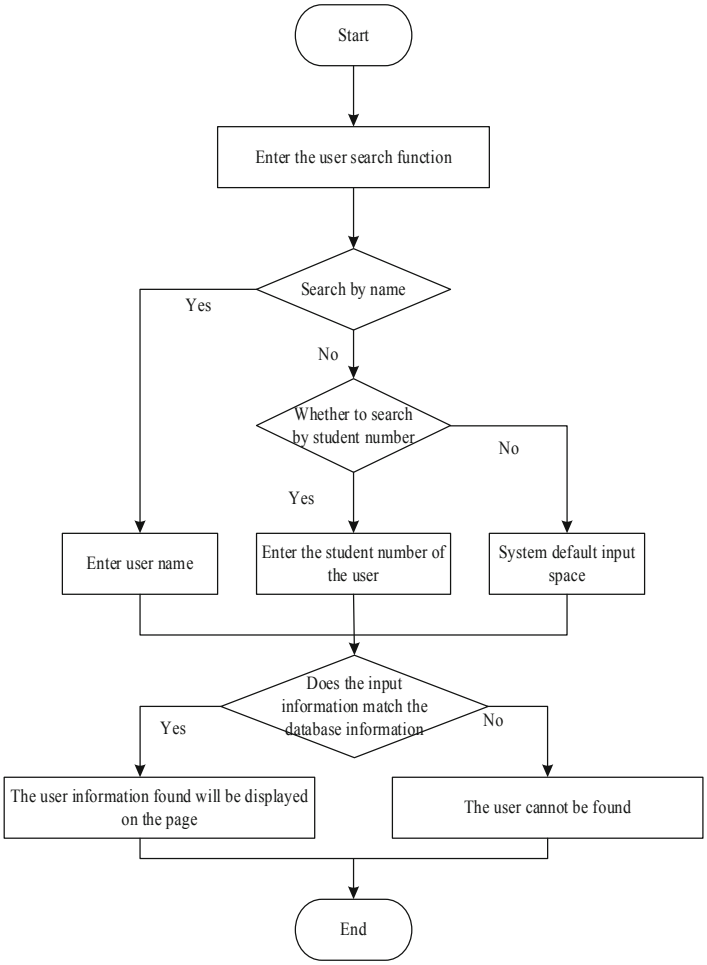

Fig. 2. Server side processing flow

The hybrid learning server returns the status code to the client, and the client needs to find the cause of the error and find the error according to the status code. Based on the first digit of the status code, you can determine whether the response is successful, whether the client or server is wrong [9]. If the first number is "2", it is judged that the response is successful; if the first number is "4", it is judged as a client-side error; if the first number is "5", it is judged as a server-side error. Based on the first number, developers can judge the basic problems. The background hybrid learning interface provided by the server mainly includes the IOS mobile learning client interface and the Android mobile client interface.

Table 1. Common corresponding status codes of servers

Status code	Explain	Details
200	Success	The server has successfully processed the request
202	Accepted	The server has accepted the request but has not yet processed it
400	Wrong request	The server could not parse the request
403	No Access	The server rejected the request
404	Not found	The server cannot find the requested page
408	Request timed out	Server request timed out
500	Server internal error	The server encountered an error and could not complete the request
503	Service is not available	The server is currently unavailable
504	Gateway timeout	The server acts as a gateway or proxy, but did not receive a request from the upstream server in time

3 Software Design of Online and Offline Hybrid Learning System in Ideological and Political Courses

3.1 Building a Learner Model

On the basis of the existing student model, the basic information data items and knowledge structure data items of the traditional middle school students model are retained, and the learner behavior data and cognitive level data items are introduced to construct a learner model which is conducive to adaptive learning path recommendation. The core data items are shown in Fig. 3.

To establish a personalized learner model, first of all, we should fully respect the differences between learners' cognitive levels; second, the data items of the student model need to dynamically express the learning tendencies and learning styles of different learners in learning activities [10]. Due to the particularity of the field of cyber security, professionals are required to have strong practical abilities, adaptability, and comprehensive knowledge analysis capabilities. This article proposes "understanding, application, the cognitive level standard of six basic aspects: analysis, synthesis, evaluation, and creation, and revised it into five basic aspects of "strategic analysis, management skills, technical research, engineering practice, and special breakthroughs", and the five basic aspects of learners The basic cognitive level score is used as an important basis for evaluating and recommending learning paths.

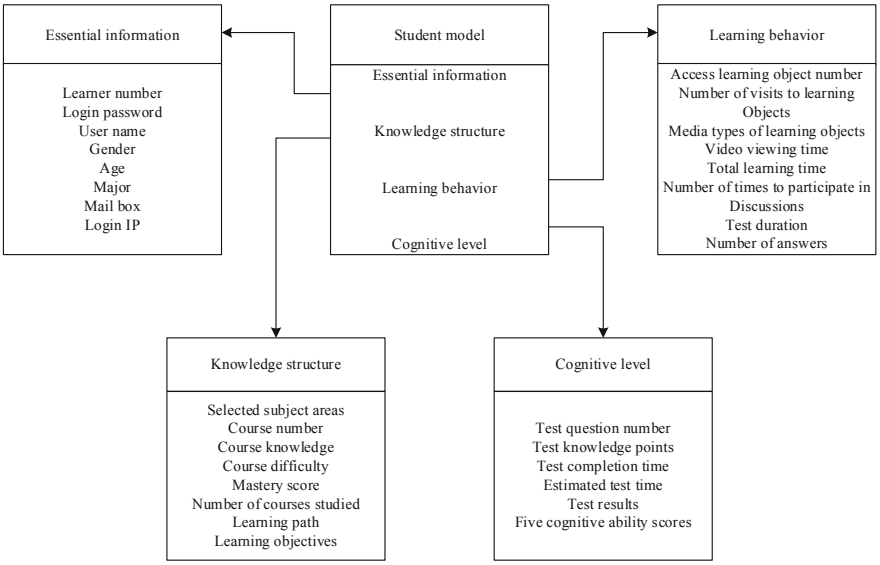

Fig. 3. Learner model data items

3.2 Design of the Online and Offline Hybrid Learning Process for Ideological and Political Courses

In the learning system designed for the online and offline hybrid learning process of ideological and political courses [11], users can be divided into two categories: learners and teachers. The operations performed by the two in the system are not the same [12]. Figure 4 shows the workflow of the online and offline blended learning system for ideological and political courses.

From Fig. 4, we can see that in the operation and use process of the two types of users in the system, the learner is the main body using the system and the main target of the adaptive learning system. When logging into the system for the first time, learners need to fill in some basic information to establish the initial exclusive model. Learners select learning courses in the system according to their own learning objectives, and then customize the learning path according to their current knowledge situation and knowledge map. After each class, the system detects the students' mastery of learning content in the form of adaptive evaluation [13]. Through the establishment of knowledge model and cognitive level, the system will dynamically recommend the most suitable course entity to complete the learning goal by calculating the skill completion index of each class. Users can choose the follow-up course according to the recommended entity. Compared with student users, the process of teacher/manager user using the system is relatively simple.

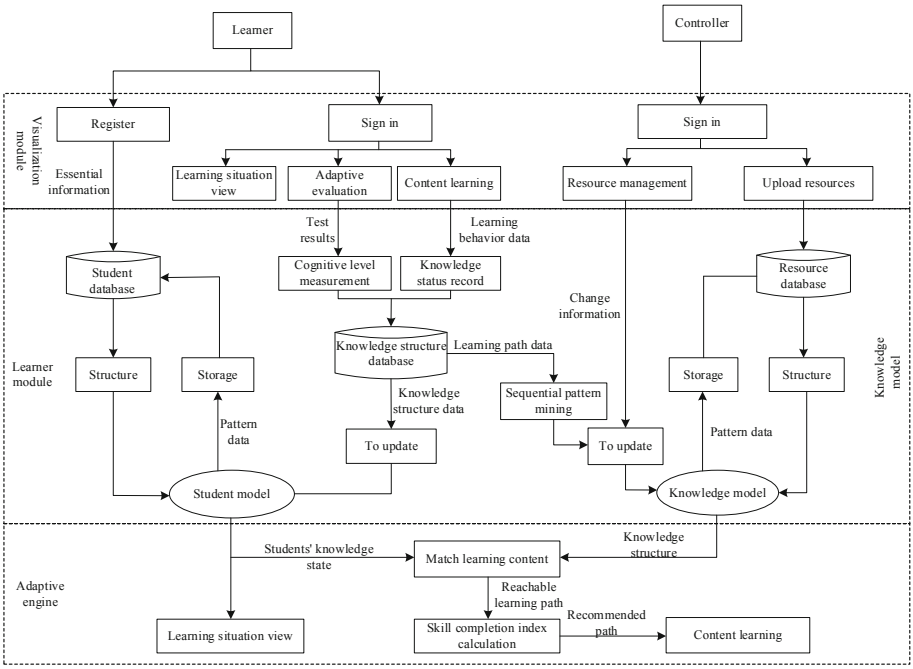

Fig. 4. System flow chart

4 Test and Analysis

System testing is an important process to ensure the reliability of the system. This process is an important part of the product's life cycle. This process provides important feedback information for the developers of the system to detect the use and operation of the system for development the user makes timely adjustments to the system to provide users with a good sense of experience.

4.1 System Test Environment

Test server: Dell OptiPlex 5040, Intel Core i3-6100, CPU is quad-core 3.70 GHz, operating system is 64-bit Windows7 Ultimate, RAM is 8 GB; Java language JDK version is 1.6.0, Tomcat server version is 6.0, The MySQL database version is 8.0.13. Web client: Google Chrome browser.

The test environment of IOS mobile phone client mainly uses the iPhone with different models and screen sizes loaded with IOS system as the test environment. The test process not only needs to test the running effect of the software on the mobile phone, but also tests the software for differences. Size of the mobile phone screen adaptation. The test environment of IOS mobile client is shown in Table 2.

Table 2. IOS mobile client test environment

Mobile phone model	Operating system	CPU	Memory	Screen size
iPhone SE	iOS 9.2	A9	2G	4 in.
iPhone 6 Plus	iOS 11.0	A8	1G	5.5 in.
iPhone 6s	iOS 12.0	A9	2G	4.7 in.

4.2 Test Process

Step 1: Open Tomcat server and enter IOS mobile phone client;
Step 2: The iOS mobile client enters the registration interface, fills in the relevant information and sends the mobile verification code, fill in the SMS verification code in the corresponding position, and click the registration button;
Step 3: After completion, enter the login interface, input the previous registration information, and click the login button to enter the main interface of mobile phone client;
Step 4: Click the "Discussion Area" control on the homepage of the IOS mobile client to enter the interactive discussion function. In the discussion area, click the post button, type questions about the article in the input box, and then click the post button. Please check the Discovery area to see if the article can be displayed successfully. Then click on the question post sent by other users, reply to the question in the post, and check whether the content of the reply is displayed in the post;
Step 5: Go back to the home page, click the circle control below to enter the assignment submission function. Student users need to choose whether to take photos to upload homework or upload homework from album;
Step 6: If you choose to take a photo to upload the job, enter the photo mode, point the camera at the place where you need to take a photo, click to take a photo, and then click the upload button after the preview is completed; if you choose to upload the job from the album, enter your mobile phone album, select the job picture that needs to be uploaded, whether the picture is complete after the preview is completed, and finally click the upload button;
Step 7: The teacher user enters the "view student homework" module to check the situation of students' homework, click the student user's homework view, and give the score;
Step 8: Click to enter the "Curriculum Learning" module, select the subject that needs to be studied. After entering, there are two options of "Content Learning" and "Question Practice", enter the content learning function, display the theoretical knowledge of the subject for users to learn. The user can complete the correct answer to the question on the interface. According to whether the user answers correctly or not, the interface will have different colors;
Step 9: Enter the "Personal Information Management" module, edit your own information, click the save button after completion, and the edited information will be displayed on the interface. Then click to enter the system setting interface, click to exit, and observe whether the user has completed this operation;

Step 10: Open the Google Chrome browser on the computer with Windows system, and enter "Google Chrome" in the URL bar http://localhost:8080/jwlearning/admin/ to enter the login page of web client;
Step 11: Enter relevant information, click the login icon, and enter the homepage of the web client after the operation is successful;
Step 12: first click the system administrator management function under the administrator management directory to check whether the page displays relevant information. Then click modify information to change the administrator's user name. Then click Modify administrator password, enter the original password and new password of the administrator, you can modify the administrator's password. Then click Delete User to move an administrator directly. Finally click Add Administrator, enter its account and password, click Confirm, and check whether the page is displayed successfully;
Step 13: First click the user management function under the user information management directory, and the user information of all registered IOS mobile learning clients will be displayed on this page. Click a user's detail icon on the page, and the page will display the user's details. Then click the task query function, you can preview the task submitted by the user, and you can delete the task. Finally, click "Delete" the user to remove it;
Step 14: Click the user search function under the user information management to search the user after entering the student number or name. When the input is finished, click the OK button to check whether the user information is displayed on the page.

4.3 Mobile Phone Client Test Results

The first is the matching test of mobile phone screen. Three iPhone phones with different models and sizes are installed on an app. Through the test, the software can well match different iPhone models, and different mobile phones can also display the app UI interface normally. This shows that the IOS mobile phone client has achieved the initial UI design goal. After completing the screen matching test, the function test is carried out according to different modules. The test results are shown in Table 3 and Table 4.

Table 3. Mobile client homepage function test results

Functional module	Test case	Expected results	Conclusion
Home	1. Click the "Discussion" button	Enter the discussion area selection interface	Adopt
	2. Click the "job upload" button	Enter the job upload selection interface	Adopt
	3. Click the "Learn" button	Enter the learning course selection interface	Adopt
	4. Click the "I" button	Enter the personal center function interface	Adopt
	5. Click the "Home" button	Return to home page	Adopt

Table 4. Mobile client personal center function test results table

Functional module	Test case	Expected results	In conclusion
Personal center	1. Click the “I” module on the main interface	Switch to the “I” module interface	Adopt
	2. Click the “View Homepage” button	Jump to the personal details interface	Adopt
	3. Click the “edit data” button	Jump to edit list	Adopt
	4. Enter the edit profile and modify the personal letter Click the “save” button	Prompt to modify the status information and jump to the interface	Adopt
	5. Click the “my concerns” button	Show my watch list	Adopt
	6. Click the “my fans” button	Show my fan list	Adopt
	7. Click the “my homework” button	Show jobs submitted by users	Adopt
	8. Click the “Settings” button	Enter the setting interface	Adopt
	9. Click the “clear cache” button	Clean up the memory garbage in the application	Adopt
	10. Click the help and feedback button	View help and feedback	Adopt
	11. Click the “about software” button	View the information of this software	Adopt
	12. Click the “log out” button	The user logs out and returns to the login interface	Adopt

4.4 Web Client Test Results

The test results of each functional module of web client are shown in Table 5.

Table 5. Test results of web client user information management function

Functional module	Test case	Desired result	Conclusion
User information management	1. Click the “user information management” button in the main menu	Query data, display the information of all registered users	Adopt

(*continued*)

Table 5. (*continued*)

Functional module	Test case	Desired result	Conclusion
	2. Click on a user's information	Jump to user details page	Adopt
	3. Click the "Homework" button	Jump to the page of all jobs submitted by the user	Adopt
	4. Click the "delete" button	Delete the administrator information	Adopt

The above test results can show that the performance of the online and offline hybrid learning system for ideological and political courses based on mobile terminals is relatively good in all aspects.

Running time is an index to directly judge the advantages and disadvantages of hybrid learning system. Under the same external environment, the proposed method, reference [4] method and reference [5] method are selected for the comparative experiment of running time.

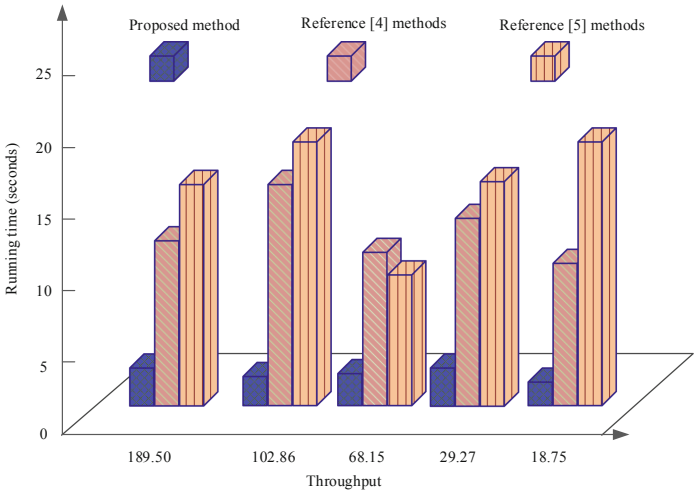

Fig. 5. Running time of different methods

The running time results of the three methods are shown in Fig. 5. This test is completed under different throughput. According to statistics, the running speed of the proposed method is much higher than that of the other two methods. The proposed method has the shortest time and the highest efficiency. Although the operation time of the method in reference [4] is stronger than that of the method in reference [5], the method in reference [4] still has large operation errors due to too long operation time and too slow speed. The method in reference [5] has the highest operation time in each

operation experiment. To sum up, the proposed method has the best operation effect, the highest efficiency and the shortest time. It is the system with the best operation performance among the three methods.

5 Conclusion

This paper proposes an online and offline hybrid learning system for ideological and political lessons based on mobile terminals. The real goal of online and offline hybrid learning system is to break through the "rigidity" of traditional online ideological education, combined with the flexibility of online ideological education, so that students can complete the learning of knowledge according to their own goals, interests and rhythm. In the teaching process, according to the characteristics of teaching objectives and objects, teachers scientifically and reasonably select and use modern teaching media, actively participate in the teaching process, apply various multimedia information to students, form the overall structure of the teaching process and achieve the best teaching effect. The test results show that this system can effectively improve the online and offline interaction and expand the coverage. As the whole system is independently developed by the author, due to the limited time and number of people, the whole system still needs to optimize the interface and improve the function in the later stage.

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