Online Education System for Innovation and Innovation Courses Based on Big Data from the Perspective of Rural Revitalization

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Abstract. The key to promoting rural development lies in the introduction of outstanding talents. Higher vocational colleges are mostly local schools and are closely related to local rural development. To this end, a research on the design of an online education system for innovation and innovation courses based on big data under the perspective of rural revitalization is carried out. The system design includes four parts: related technical analysis, frame design, functional module design and system testing. After testing, it is concluded that the system functions and performance meet the requirements, which provides important help for the "village revitalization" to cultivate high-quality rural talents.

Keywords: Rural revitalization · Big data · Double innovation course · Online education system

1 Introduction

China is a big agricultural country, and the issues of agriculture, rural areas, and farmers have always been the top priority of the national strategy. In early October 2018, the Central Committee of the Communist Party of China and the State Council issued the "Strategic Plan for Rural Revitalization (2018–2022)" (hereinafter referred to as the "Plan"). The "Plan" made a phased plan for rural revitalization strategies from the national strategic level. And carried out a systematic deployment, including the following specific deployments for strengthening the talent support for rural revitalization: first, to vigorously cultivate new professional farmers; second, to strengthen the construction of rural professional talents; third, to give play to the supporting role of scientific and technological talents; fourth, to encourage all sectors of society to devote themselves to rural construction; fifth, to innovate the introduction and use mechanism of rural talent cultivation [1]. As an important highland for talent training, colleges and universities have accumulated experience, resources, and connotations in fulfilling the functions of talent training and serving the society.

In order to better promote talent training in colleges and universities, this paper takes the opportunity of innovation and entrepreneurship, namely "mass entrepreneurship

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and innovation", and proposes an online education system for mass entrepreneurship courses based on big data from the perspective of rural revitalization. By analyzing the requirements of rural revitalization development on human resources and the advantages of higher vocational colleges in serving the society, this paper designs an online education system of mass entrepreneurship and innovation courses based on big data, in order to provide a steady stream of new forces for its "rural revitalization".

2 Related Technologies

2.1 Streaming Media Technology

Streaming media refers to the transmission of compressed video or audio content over the network and play it immediately, rather than saving it on the hard disk. Through the use of streaming media technology, users can play without waiting for the entire file to be downloaded. Because streaming media sends data in the form of a continuous data stream, it can be played in real time when the data arrives, so that it can be downloaded and played while the user can pause, fast forward or rewind. Streaming media technology allows the server to monitor what users are watching and how long they are watching, while at the same time making effective use of network bandwidth. When the user's computer plays a media file, it will continue to download and buffer other content from the streaming media server. Play and download happen at the same time. Except for a short initial buffering, the process is almost invisible to the viewer. When the network download speed is lower than the playback speed, the player will use a small section of data in the buffer, which can avoid the interruption of playback and ensure the playback quality [2].

The mainstream streaming media protocols are RTMP and HLS. RTMP is an open protocol developed by Adobe Systems for audio, video and data transmission between Flash players and servers [3]. RTMP has good real-time performance, but it is limited to Flash players.HLS is an HTTP-based streaming media transmission protocol implemented by Apple. Since the data is transmitted through the HTTP protocol, there is no need to consider firewall or proxy issues. However, the disadvantage of HLS is that its delay is generally higher than that of ordinary live streaming protocols.

Adaptive HTTP code rate is abbreviated as HAS (HTTP Adaptive Streaming), which is a transmission protocol based on HTTP protocol that can perform code rate adaptation. RTSP/RTP streaming media technology and HTTP progressive download technology have their own advantages, but also have their own shortcomings. The HAS technology is proposed to merge the advantages of the two. The HAS technology actually divides the media data into blocks and provides slices of multiple bit rates on the server side. The progressive download technology of HTTP is used for transmission. In the broadcast control, the slice files of the corresponding bit rate are selected according to the network conditions.

DASH (Dynamic Adaptive Streaming over HTTP), also known as MPEG-DASH, is the first international standard streaming solution based on HTTP protocol with adaptive bit rate, organized by MPEG (Moving Picture Experts Group) in 2010 Started development and became a draft international standard in January 2011. The MPEG-DASH

international standard ISO/IEC23009-1:20120 was released in April 2012. The second edition of MPEG-DASH in July 2013 has been approved for inclusion in the First Amendment, including supporting event messages and multimedia descriptions.

MPEG-DASH is a kind of HAS technology. It proposes a hierarchical file structure organization to store video slice files on the server. In order to describe these structures, MPEG-DASH specifically defines the media presentation description file MPD (media presentation description), This file is based on XML format. The purpose of the MPEG-DASH standard is to unify the current HAS technology, and it summarizes the current HAS technology.

2.2 HTMLS Technology

HTML5 is an HTML standard formulated by the World Wide Web Consortium (W3C), and the latest HTML5.1 standard will be officially released soon. HTML5 adds new technical standards, so that the browser can achieve more diversified and more powerful website applications. At the same time, HTML5 adds many new tag elements to the mobile terminal, making it possible to achieve cross-platform through the browser. HTML5 is not only used to display the content of page elements, it also provides browsers with new native implementation standards such as multimedia and animation. Many new features have been added to HTML5, such as canvas elements for painting, video and audio elements for multimedia, and Websocket technology for communication between browsers and servers. The following is a brief introduction to the HTML5 video playback technology, Canvas canvas technology and Websocket technology used in this article.

HTMLS video playback technology has the following advantages: support ABR (Adaptive Bitrate), ABR can effectively reduce buffering time, can use media source expansion to make videos and live broadcasts play smoothly in many browsers; support VP9 codec, VP9 Codec can effectively save bandwidth, loading time and file size; Encrypted Media Extensions, through the combination of this extension and normal encryption measures, the video can be easily configured to protect multiple content on different platforms. The support simplifies the inconvenience caused by the encryption protection and the high integration of content in the video transmission, and can reduce the lag in the video playback. According to the above content, the use of HTML5 to play videos or live video broadcasts does not require flash plug-in support, and there is no security problem, which can improve video continuity and cross-platform to a certain extent.

A very useful feature of HTML5 is the Canvas element for painting, which can realize the electronic whiteboard function of the online education system. Canvas has many drawing functions and image processing methods, such as brushes, rectangles, circles, and characters, which provide new processing methods for web page drawing and image processing. Traditional Web drawing development is implemented through flash, VML, and other technologies. VML technology uses an XML document to describe the drawing. The declarative drawing method of the XML-based drawing language cannot meet the performance requirements of complex drawing operations, such as Pixel-level drawing capabilities required in Web games. The HTML5 canvas element makes up for this shortcoming. The canvas has a JavaScript-based drawing API. Developers can use the JavaScript scripting language to perform a series of command-based graphics

drawing operations in the canvas. The HTML5 canvas element can directly use JavaScript scripts to draw on the Web page without any third-party plug-ins.

Before the advent of HTML5, instant messaging based on the B/S architecture was realized through long rotation training. The shortcomings of this method are obvious. Most of the requests sent are useless, waste a lot of traffic and bandwidth, and consume server resources, which puts a lot of pressure on the server. With the introduction of the HTML5 standard, websocket provides a new web communication technology. websocket can provide low-latency, high-performance two-way data communication between client and server. It subverts the request processing response mode of previous web development, and provides a real sense of the client request, server push data mode, especially suitable for real-time data interactive application development. Therefore, the web client of the interactive chat platform of this system is implemented by using HTML5 websocket technology.

3 System Structure

In the current development process of network distributed application systems, two different but parallel system structures are continuously developing. One technical route is the traditional application system, namely Client/Server (C/S) structure, and the other It is a Browser/Server (B/S) structure based on the Internet.

The C/S structure, that is, the client/server structure (see Fig. 1), is a well-known software system architecture. By reasonably assigning tasks to the Client and Server, the communication overhead of the system is reduced, and both ends can be fully utilized. Advantages of the hardware environment. Early software systems mostly used this as the preferred design standard [4].

The B/S structure, that is, the browser/server structure, is a change or improvement of the C/S structure with the rise of Internet technology (see Fig. 1). Under this structure, the user interface is completely realized through the WWW browser, and part of the transaction logic is realized on the front end, but the main transaction logic is realized on the server side, forming the so-called 3-tier structure and B/S structure, which mainly uses the mature WWW browser technology, combined with the browser's multiple Script languages (VBScript, JavaScript) and ActiveX technology, uses a universal browser to achieve powerful functions that originally required complex special software to achieve, and save development costs. It is a brand new Software system construction technology. With Windows98/Windows2000 implanting browser technology into the operating system, this structure has become the preferred architecture of today's application software.

In the C/S mode. Client (client) is responsible for providing expression logic, displaying user interface information, accessing database servers, etc., and Server (server) is used to provide background data management services. In the B/S mode, there are client and server, and the client is mainly used for browsing information.

The biggest advantage of the B/S mode is that it can handle real-time events more flexibly without being restricted by time and region. For the online education system, the fundamental purpose of its design is to realize remote paperless real-time education. The system requirements are not restricted by region, and there are more flexible real-time requirements, so this system adopts B/S structure to design [5].

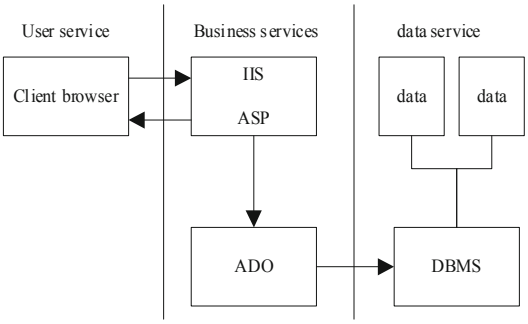

Fig. 1. B/S structure

In comparison between the two, the B/S structure completely adopts the Web environment, and the technology is popular and advanced. The client only needs a standard Web browser, and other applications are stored on the Web server and downloaded when needed. This is the real meaning In the B/S structure, the server is responsible for providing information and requested data to the user, the client uses the IE browser to display the information from the server, and the server controls the content and layout of the information. The development of this online education system adopts a Web-based B/S structure and makes full use of the advantages of this structure to realize the construction of an online teaching platform.

4 System Function Design

4.1 User Management Module

(1) Teacher module
After the teacher logs in, he can make an announcement (only the class where the teacher is the teacher can see the announcement, and he has the permission to edit and delete personal announcements), upload files (the system will record the teacher number, so that students can find this teacher to download, Has the ability to upload and delete personal resources to upload and delete the classes taught and the courses taught by yourself, with search limits), review student work (select your own search, score statistical analysis, delete-one system will set the logo "Teacher delete", But the teacher himself will not be able to view it in the future), answer student questions (choose the class you teach and the course you teach to answer, have question query search, delete permissions, delete is a system will set the logo "Teacher delete", The teacher himself will not be able to view it in the future).

(2) Administrator module
The administrator has the authority to change users, to add, delete, and modify users, and to manage assignments and problems (there is a query search function, mainly delete functions, but the assignment or problem identification must be "Teacher delete " Or "student delete"), have the authority to organize resource courseware (have query search function and delete function, and have the authority to modify the description of the resources uploaded by themselves) and upload authority

(the resource system uploaded by the administrator will Set as a public resource, convenient for users to choose to download), announcement publishing and management permissions (mainly the permissions for publishing announcements and editing announcements).

(3) Stuoddent mule

After logging in, students can check the announcements, submit assignments (check the assignments posted by the teacher, and complete them in a timely manner), ask questions (select teachers and courses to ask questions, targeted questions, and get more credible answers), upload resources (You must designate a teacher to upload, and the designated teacher will have all the permissions to upload resources, mainly for teachers to view), download resources (you can choose public resources and select teacher resources for download) [6].

4.2 Online Interactive Module

This module is further divided into modules such as teacher online Q&A, students staying in high school, and student homework submission. Teachers' online Q&A is a way for teachers to communicate with students through the Internet, discuss learning, and communicate with students in a remote place to solve student problems in a timely manner; student staying in high school is to ensure that students can stay high and let teachers online You can see it first, and return the same opinions to the students as soon as possible. This module is a form of leaving a high profile; student submission of homework, in order to understand the student's learning situation, can be viewed by doing homework, the submission of homework is done through the FTP server [7]. After the student enters with the student ID and password, there is a space on the server to save the student's homework. Students can upload their own work to the teacher for correction. The online interaction module is shown in Fig. 2:

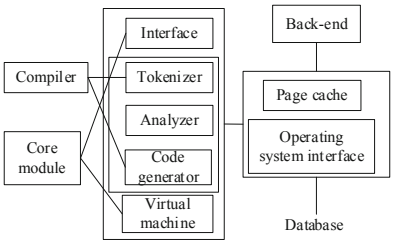

Fig. 2. Structure of online interaction module

4.3 Course Content Management Module

Online learning courses are different from traditional offline teaching models. The traditional offline teaching model can give students textbooks and face-to-face teaching in the classroom at the beginning of the course, while the online course teachers and

students may not be the same in time and space. It is possible that the 100 students of elective courses are in To view this course at different times or with different learning progress, teachers need to enter the relevant content and materials of the courses they have opened into the system so that these students can view them according to their learning progress.

The course content management module contains 3 sub-functions: chapter setting, chapter content setting, and chapter homework setting.

Chapter Setting: Teachers who start the class can set up the corresponding chapter structure according to their own course outline. The system provides "New Chapter", "New Section", "Chapter Modification", "Section Modification", and "Delete". For example, the teacher who starts a class now needs to add "Chapter One Java Programming Guide" under In the section "1.1 History of Java", click the "Chapter One Java Programming Guide" menu bar, click "New Section" in the upper right corner of the chapter menu bar, enter "1.1" in the section number, and enter the section name "Java History", click "Enter and Submit", and the system will generate the corresponding section [8].

After the initiating teacher has set the overall course outline, if you want to adjust a certain chapter, such as changing the order of Chapter 3 and Chapter 4, find "Chapter 3" in the chapter list and click "Edit", In the pop-up page, enter "4" in the chapter number and save; find "Chapter 4" in the chapter list, click "Edit", enter "3" in the chapter number in the pop-up page and save. The system will automatically change the order of chapters, and the course catalogs that students see will also be changed.

After the initiating teacher sets the overall course outline, if a chapter is found to be redundant, the chapter should be deleted as a whole. Find the chapter in the chapter list, click "Delete", the system will pop up "Do you want to delete Chapter 5?" Click "OK to delete", the system will delete all the content of Chapter 5, including the nodes under Chapter 5 The content of the courseware and the exercises will be deleted and cannot be restored. This chapter will also be deleted from the course catalogues that students study and see. Since the delete operation cannot be recovered, it should be done carefully.

Chapter content setting: After setting the corresponding chapter of the course, the teacher can enter and edit the content of the corresponding chapter. According to the traditional teaching mode, the system provides several courseware content formats. Teachers can import courseware in the following formats, PPT, Word, pdf, video, and pictures. You can also use URL links to import course materials from other websites, or you can use them The online text editor provided by the system can edit the course content text.

One chapter can import multiple courseware. Teachers who start the class can click "Add Content", then enter the content name +.lava historical introduction video, select the content type "Video", click "Upload" to select the corresponding video in their computer system The file is uploaded successfully. Teachers can also add other types of files again in the same chapter, such as entering the content name "Java related history" and selecting the content type "Text", the system will pop up an online text editor corresponding to the start of the class. Enter the corresponding text content and click "OK to add new content" after completion, the save is successful. At the same time, when students study this chapter, they can see the two courseware content set by the

teacher, and click the corresponding courseware name. You can enter the courseware of this chapter [9].

Chapter Assignment Setting: After the initiating teacher has set the content corresponding to the course chapter, he can arrange the assignment of the corresponding chapter. According to the form of traditional teaching mode, teachers will usually assign homework to test students' learning effect after class is over. The system also provides the function of assigning homework online, and the initiating teacher can assign the exercises corresponding to the chapters according to the needs of the course.

The homework question types supported by the system are mainly standardized test questions, including single-choice questions, multiple-choice questions, and true or false questions. Teachers can click "Add Question" to enter the corresponding question name, question content, question options, correct answers, and scores. Generate corresponding exercises. Since the system is an online intelligent correction of homework, which is different from offline teachers' manual correction of homework, the exercises do not support the intelligent judgment of essay questions for the time being.

In order to facilitate teachers to set up homework exercises, the system provides the function of batch importing homework exercises. Teachers can edit the corresponding word file and save it offline according to the exercise mode provided by the system. After editing, click "Import word exercises in batches", select the word file in the system, and click "Upload". The system will automatically parse the word and insert it into the background database in batches. For batch-imported homework exercises, if the teacher needs to modify or delete some content, you can find that title and click "Edit" or "Delete" to enter the editing mode of a single exercise.

4.4 Online Teaching Module

(1) Video live teaching

Video live teaching is the main teaching method. The live teaching mainly includes three functional modules: live video, voice interactive platform and electronic whiteboard. Among them, teachers use live video to explain the content of the course, and can perform some auxiliary operations similar to "blackboard" through the electronic whiteboard; the voice interactive platform can enable teachers and students to conduct real-time and efficient interactive communication.

There are two main ways for teachers to share video resources during live video broadcasting. One is to call the device's camera to collect video resources, and the other is to share the teacher's computer screen. The system also provides a video recording function, which is convenient for teachers to upload course teaching videos for on-demand use.

The voice interactive platform is divided into a free discussion area and a question and answer area, and the form of communication can be text or voice. The free discussion area is mainly for students to discuss freely. In order to maintain the order of the classroom, it is necessary to limit the frequency of students sending messages here. During the live video broadcast, teachers and students can interact in the Q&A area. Teachers can ask questions in the Q&A area and invite students to answer; students can also make requests during the live broadcast, and ask questions after obtaining the teacher's permission [10]. In the Q&A area, teachers and students can

communicate in the form of voice messages to facilitate the description of problems and improve communication efficiency [11]. The permission of the question-and-answer area is controlled by the teacher. Students can only send messages in the question-and-answer area with the teacher's permission [12].

The electronic whiteboard is an auxiliary tool for teachers to teach. It provides teachers with some tools such as diagrams, drawings, brushes, and provides some advanced animation display functions for some subjects [13]. During the live broadcast, teachers can perform operations such as writing on the blackboard in the electronic whiteboard to achieve the effect of the blackboard in the offline classroom, which helps to improve teaching efficiency and enables students to better understand the teaching content [14].

(2) Video on demand teaching

On-demand classroom is when teachers upload teaching videos to the system for students to watch on their own. Compared with live teaching, the form of on-demand teaching is more flexible. Students can watch it repeatedly and can interrupt learning at any time [15]. After students join a course, they can watch the teaching videos in the course. At the same time, the system adds a non-real-time interactive discussion area to the on-demand classroom [16]. Students and teachers can leave messages under the video to discuss problems encountered during the video watching.

4.5 Exam System Module

The module is divided into exercise questions, simulated test papers, final examination papers, test paper answers and other modules [17]. Practice questions, this module is used for students to practice when learning, students can practice according to the chapters or types of questions, and can also be done during review; simulation test paper is used by students in the final review, when students finish the course, they can automatically generate test papers and carry out simple tests according to the situation [18]; The final examination paper is only opened by the teacher at the end of the term. According to the situation of each course, the question bank is updated, and the students have the right to open the paper for examination within the specified time, and return to the answers of the paper.

5 System Implementation and Testing

The last chapter discussed in detail the design and realization of the main functional modules of the online education system. On the basis of system implementation, this chapter tests the various functional modules of the online education system and the overall performance and operating status of the system (Table 1).

5.1 Test Environment

Table 1. System test environment

Category	Project	Name	Configuration
Hardware environment	Service-Terminal	Processor	Intel Pentium IV 1.6GHz or higher
		RAM	256 MB
		Hard disk space	80 GB
		Graphics card	SVGA display adapter
	Client	Processor	Intel Pentium 166MX or higher
		RAM	32 MB
		Graphics card	1 GB
		Graphics card	SVGA display adapter
Software Environment	Service-Terminal	Operating system	Windows NT Server 4.0 or Windows 2000/Windows 98
		Network protocol	TCP/IP
		Web server	Internet Information Server 5.0
		database	Microsoft
		Browser	Internet Explore
	Client	Operating system	Windows 98/ME/2000/XP
		Network protocol	TCP/IP
		Database	Microsoft SQL Server 2000
		Browser	Internet Explore 5.0

5.2 System Function Test

The functional modules of the online education system are mainly divided into online teaching module, user management module and course management module. Among them, the online teaching module mainly tests the video live broadcast function, the video on demand function, the voice interactive platform and the electronic whiteboard; the user management module mainly tests the user registration and login functions, the personal information maintenance function and the teacher qualification function; the course management module mainly tests the addition of teachers Courses, add course plans, upload course resources and other functions. Different roles are used to test the corresponding functions during the test (Tables 2, 3 and 4).

Table 2. Test cases of online teaching modules

Enter	Desired result	Result
The teacher creates a live video room	Created successfully, start live broadcast	In line with expectations
Teacher chooses camera live broadcast	Live video source becomes camera	In line with expectations
Teacher chooses to share screen live	The live video screen is the teacher's computer screen	In line with expectations
Student requests to speak	Teacher receives student's request to speak	In line with expectations
Teacher allowed to speak	Students can send messages	In line with expectations
The teacher refused to speak	Students cannot send messages	In line with expectations
Students are sending messages in free discussion	Other students receive news	In line with expectations
Teachers use electronic whiteboard	Draw selected graphics on the page	In line with expectations
Student on-demand video	Students on-demand video can be watched	In line with expectations
Students leave comments in the comment area	Page content display comment content	In line with expectations

(1) Test cases for online teaching modules
(2) User management module test case
(3) Test cases of course management module

Through the above test cases, it is concluded that each functional module of the online education system has passed the test.

5.3 System Performance Test and Analysis

The performance test of the online education system mainly includes two aspects: 1 the performance of the browser client HTMLS video player; 2 the performance of the system under high concurrency.

(1) HTMLS video player performance test
The browser video player in this article is implemented based on HTML5, and is used to play MPEG-DASH protocol streaming media. First of all, from the perspective of intuitive user experience, due to the use of native HTML, no Flash plug-ins, etc., the loading speed of the video player is relatively fast, and there is no waiting for the player to load; in terms of cross-platform, PC browsers and mobile You can watch the video normally in any browser. Then, regarding the

Table 3. Test cases of user management module

Enter	Desired result	result
User registration	User registration is successful	In line with expectations
Student user login	Successful login, showing student user interface	In line with expectations
Teacher user login	Successful login, showing the teacher user interface	In line with expectations
Administrator user login	Successful login, showing the administrator user interface	In line with expectations
Modify Personal Information	Personal information updated successfully	In line with expectations
User applies for teacher qualification	Add an application to the administrator task list	In line with expectations
The administrator agrees to the teacher qualification application	User role changed to teacher	In line with expectations
Enter the wrong username and password	Login failed, return failure message	In line with expectations

Table 4. Test cases of course management module

Enter	Desired result	result
Teacher creates courses	Course created successfully	In line with expectations
Teacher adds lesson plan	Lesson plan added successfully	In line with expectations
Teacher uploads course resources	Successfully uploaded course resources	In line with expectations
Teachers modify course information	Course information updated successfully	In line with expectations
Teacher revises lesson plan	Course plan information updated successfully	In line with expectations
Teacher release course	System course page displays the course	In line with expectations
Teacher delete class	The system pops up twice to confirm the deletion	In line with expectations
Students join the course	Successfully joined the course, with the course permissions	In line with expectations
Student withdraws from the course	Successfully exit the course, cancel the permission of the course	In line with expectations

resource consumption of personal devices, since this article does not implement streaming media services based on other protocols, it cannot be compared with the case of using the Flash plug-in to play streaming media. This article chooses another method for comparison and places it on the server. Two 10-min video files, an MP4 file with a size of 63.6MB and a SWF file with a size of 46.2 MB, and then use HTML5 video tags and Flash to play in the web page respectively to test the system memory occupied by the browser, as shown in Fig. 3. Among them, 0 means the memory occupied when opening the browser with only one blank page tab.

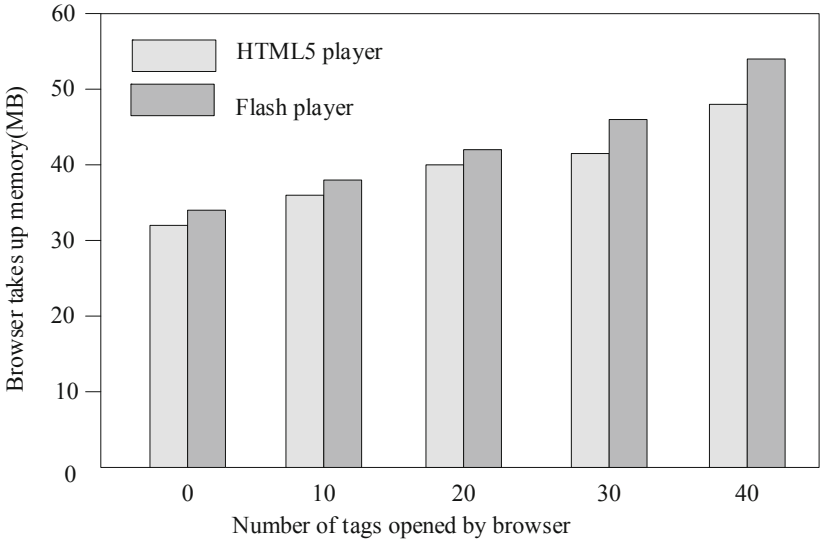

Fig. 3. Client memory usage

It can be seen from the data that the browser occupies less memory when playing videos with HTML5 video, so it can be predicted that in the actual streaming media system, using HTML5 video players will consume less system resources and have better performance.

(2) System performance under high concurrency

The performance of the system in the case of high concurrency mainly refers to the number of simultaneous online users that the system can withstand, the number of simultaneous live video courses and the number of simultaneous live video watching. This article mainly measures the performance of the system under concurrent conditions from the two aspects of server load and request response time under concurrent conditions. The load of the system under concurrent conditions is tested here. Since the server cluster system can improve the performance of the system through expansion, only a single server is tested here. After testing, when the number of concurrent requests is set to 50, the CPU usage instantly rises to about 25% for concurrent requests, increases the number of concurrent requests to

100, and the peak CPU usage reaches about 60%. When the number of concurrent requests increases to 200, the CPU usage The rate reached 100%. Therefore, it is estimated that a single server can support a maximum of about 200 concurrency. In actual use, expand the server to increase the system capacity and improve the concurrency of the system.

6 Conclusion

In order to realize the revitalization of the countryside, it is very important to cultivate local talents with intelligence, technology and management, especially the new type of professional farmers who love agriculture, know technology and are good at management. To this end, in order to cultivate the talents needed for rural revitalization, an online education system for innovation and innovation courses based on big data is designed. The system has been tested that each functional module works normally and the performance is also good, but the system still has some shortcomings. First of all, most of the front-end functions of the system are implemented based on the HT'MLS standard, and a newer version of the browser is required. Although most browsers currently support HTMLS better and better, there is still a certain market share. Browsers cannot support HTMLS well, such as IE5 and IE9, so in an actual system, in order to ensure the compatibility of the browser, it is necessary to provide a compatible solution for each function of the system.

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References

1. Zhang, T., Ding, Q., Hu, Q., et al.: Towards rural revitalization strategy for housing in gully regions of the loess plateau: environmental considerations. Energies **13**(12), 3109 (2020)
2. Wang, L., Huang, R.: English teaching platform based on online education technology and licensure and master's program technology. Int. J. Emerg. Technol. Learn. (iJET) **14**(16), 154 (2019)
3. Lin, P.H., Wooders, A., Wang, T.Y., et al.: Artificial intelligence, the missing piece of online education? IEEE Eng. Manag. Rev. **46**(3), 25–28 (2018)
4. Ming-Xia, W.: Construction of "responsibility-oriented" education system of corporate social responsibility in colleges. J. Interdiscip. Math. **21**(2), 369–376 (2018)
5. Su, G.: Analysis of optimisation method for online education data mining based on big data assessment technology. Int. J. Contin. Eng. Educ. Life-long Learn. **29**(4), 321–335 (2019)
6. Misra, S., Maskeliūnas, R., Damasevicius, R., et al.: Artificial intelligence, smart classrooms and online education in the 21st century: implications for human development. J. Cases Inf. Technol. **21**(3), 66–79 (2019)
7. Leonor, U.C.R., Cuauhtemoc, L.M.: Neural networks for predicting student performance in online education. IEEE Lat. Am. Trans. **16**(7), 2053–2060 (2018)

8. Zheng, S.Y., Jiang, S.P., Yue, X.G., et al.: Application research of an innovative online education model in big data environment. Int. J. Emerg. Technol. Learn. (iJET) **14**(8), 125 (2019)
9. Wang, W., Zhang, P., Zeng, C.Z.: Construction of learning behaviour tracking analysis model for MOOC online education platform. Int. J. Contin. Eng. Educ. Life-Long Learn. **30**(1), 1 (2020)
10. Khalil, A., Shaltout, M., Costa, S.: Identifying opportunity for online education to address HIV/HCV knowledge gaps in health professionals and students in Egypt. Ann. Glob. Health **84**(4), 580 (2018)
11. Fu, W., Liu, S., Srivastava, G.: Optimization of big data scheduling in social networks. Entropy **21**(9), 902 (2019)
12. Liu, S., Li, Z., Zhang, Y., Cheng, X.: Introduction of key problems in long-distance learning and training. Mobile Netw. Appl. **24**(1), 1–4 (2018). https://doi.org/10.1007/s11036-018-1136-6
13. Epp, D.A., Kubota, T., Yoshida, M., et al.: Promoting patient care through communication training in a pre-clerkship pharmacy education course in Japan. Am. J. Pharm. Educ. **83**(21), 121–129 (2019)
14. Jong, P.G.M.D., Hendriks, R.A., Luk, F., et al.: Development and application of a massive open online course to deliver innovative transplant education. Transp. Immunol. **26**(3), 45–53 (2020)
15. Hwang, C.S.: Using continuous student feedback to course-correct during COVID-19 for a nonmajors chemistry course. J. Chem. Educ. **97**(9), 78–83 (2020)
16. Denis, A., Fadyl, E., Pierre, E.: Characteristics and postoperative course of tinnitus in otosclerosis. Otol. Neurotol. **24**(1), 48–51 (2019). Official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology
17. Soil carbon sequestration in bermudagrass golf course fairways in Lubbock, Texas. Agron. J. **112**(1), 55–62 (2020)
18. Canavese, D., Motta, I., Marinho, M., et al.: Health and sexual rights: design, development, and assessment of the massive open online course on lesbian, gay, bisexual, transgender, and intersex health promotion in Brazil. Telemed. e-Health **26**(10), 147–152 (2020)