Developing a Video Teaching and Learning System for Online Course

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Abstract

Online courses have become increasingly popular among students due to convenience and high efficiency. Most teachers would like to send their well-prepared teaching video to students and receive student's feedbacks via the internet. Although there are a lot of commercial education software in the market, few can really satisfy special needs of teachers. Moreover, it is a big challenge for students and teachers with limited computer skills to use some complicate software. To address the issue, this paper presents a novel web-based video teaching and learning system (WBVTS) for special needs of teachers and students. The target users are English major teachers and students. WBVTS makes their teaching and learning more convenient and efficient. The paper presents the development of WBVTS and its test approaches: questionnaire, interviews and contrast and comparison. The result shows that most teachers and students have positive attitudes towards using WBVTS and student's performance is improved significantly. Further studies are need to identify and fix the limitations of WBVTS and update it.

Keywords

Network education; online course; web-based education platform; Video course.

1. Introduction

1.1. Development of Technology and Network Education

Over past decade, the network education has been divided into main three stages, according to the different means and tools of transmitted information. The first stage is "Correspondence Stage" beginning in 1870s. An education course was transmitted by post and teachers and students communicated by telephone or letters. The second stage is "Radio and TV teaching Stage" from 1950s to 1970s, and courses were released on cassettes and broadcasted on radio and TV. And the third stage is "Online Distance Education" born in 1990s. Combining telecommunication technology and information technology, the course was released on the internet and students register online to take the course [1, 2].

With the rapid development of information technologies, educational modes show a surprising change. Some teachers give lectures, course forms or assignments by e-mail, instead of face-to-face teaching. Over past decade, online courses have gotten popular among students, especially college students. It was reported that 80% colleges had their online courses for students to take and each adult educatee prefers to take one or more online courses in America. [3, 4] Moreover, there are 20% global netizens would rather take online courses than face-to-face courses (Hsu 2015) [5]. Due to the fast increases of needs for web-based education, educators and educational departments have been trying to build databases of online course resources, and develop some online teaching and learning systems (TLS) [6]. Later, the management of online teaching activities is also incorporated into the systems. In short, the functions of these systems meet the basic needs of online education and are often called the online education platform [7].

1.2. Development of Online Education Platform

The online education platform has gone through four stages since 1990s. The first stage is "Content Management Systems, (CMS)" [8,9]. In this stage, some colleges, famous companies, and training institutions started to develop some special online education platforms to store their educational resource for saving costs. Learners can choose learning resources from database by themselves through visiting certain websites. But the function of such platform was limited. It just offered the management of resources and could not give a criterion file format to store resource. Moreover, there were few opportunities to share educational resources due to different file formats. "Learning Management Systems (LMS)"[10] is the second stage. This platform originated from the automated management system of educational training and they have several function modules, such as users register module, resource management module, user information management module, learning process record module, and statistical module. But such systems could not generate learning contents for user. In order to make up the shortcoming of the second stage platform, the third stage platform, "Learning Content Management Systems (LCMS)" [11] was developed. The main functions are to manage the learning content. Teachers and educational experts who have few IT skills can easily use this platform to design, generate, release, and manage their courseware. LCMS gives more possibilities to instructors for easily sharing their courseware and learning resources, as well as instructional interactions. The fourth stage is "Web-based Instruction Platforms (WBIP)" [12, 13]. This platform has function of teaching resources sharing and leaners interaction, except for instructional interactions. It combines teaching procedure, teaching organization and management, online teaching database management and user management. The fourth platform integrates the main subsystems of network teaching, and constructs a relatively complete supporting environment for online teaching.

Now WBIP is popular in China. Colleges release their own WBIP and some Education & Training institutions also use some software for their teaching, such as "TAL Education Group" and "New Oriental Education & Technology Group". These institutions mostly use WBIPs for afterschool students with a commercial purpose. Therefore, some companies develop commercial WBIPs for schools or institutions. However, most commercial WBIPs are too complicate to use because of too many subsystems and multiple functions. Moreover, some functions are dispensable and some special needs of certain courses are not found in such commercial WBIPs. Based on above mentioned reasons, the author develops a program of web-based video teaching system (WBVTS). WBVTS is concise and can be easily used for a series of teaching activities, especially for English teacher and learners. It meets some special needs of users, like uploading video without format restrictions and one-to-one communication by video. For this system, the author held a holistic test among English major students and teachers and some results will be presented below. The following paragraph will show the organization of the paper.

The remainder of this paper is organized as follow: Section 2 shed on the light of the development of WBVTS, including main five modules which are "user register or logging module", "user information module", "learning management module", "resource module" and "interaction module". Section 3 presents a case of study that used some evaluation approaches to assess WBVTS and Section 4 concludes the paper with future research directions and suggestions.

2. WBVTS Developing

The main goal of this project is to develop an application of web-based video teaching system. It allows students and teachers to conveniently manage their learning or teaching resources and interact and communicate easily. The program of WBVTS was written in Java, a programing

language, and composed of two main interfaces, i.e. teacher interface and student interface. The functions of each interface will be illustrated as follows:

2.1. Features

Teachers and students are two kinds of main users of WBVTS and they use it for a series of teaching activities. The features of their acts show as follows:

Teachers:

(1) Allow the teacher to log into the system using his/her username and course code.

(2) Allow the teacher to upload video courseware to the database of resources.

(3) Allow the teacher to manage his/her teaching resource and class teaching

(4) Allow the teacher to give the students assignment and check them learning results.

(5) Allow the teacher to post announcement or text messages for the class.

(6) Allow the teacher to interact with students by a video.

Students

(1) register or log on WBVTS.

(2) manage their information, such as filling in the formation and changing their password.

(3) manage their learning, such as registering new course, checking their learning records, watching the video, continuing the course, and downloading learning resources.

(4) check the message board and leaving message for classmates or teachers.

(5) check announcements from teacher.

(6) interact with a teacher or a classmate by video or voice.

2.2. Main Technologies

WBVTS is a web project based on B/S (Browser/Server) construction. It was written in the programming language, JAVA for the backend and several web technologies such as HTML5, CSS, and JavaScript for the frontend. It can be used on desktop computer and laptop, and some portable computer. Mysql, a software of database management, is used for the manage learning resources, such as saving, deleting, modifying, inserting, and searching data in the resource database and other databases. Free Tomcat+ Apach Server is used for deploying our web project. And three frameworks are used in the web project, such as hibernate, spring, and struts2 frameworks.

In order to convert video formats, the software, FFmpeg (Fast Forwards Mpeg) was used and a piece of code written in Java was showed as follow:

```java
public class ConvertVideo {
  private String inputpath="";
private String outpath="";
    private String ffmpeg="";

public static void main(String args[ ]) throws IOException {

    getPath();

    if (!checkfile(inputPath)) {
      System.out.println(inputPath +"is not a file")
      return;
    }
    if (process()) {
      System.out.println("Ok");
```

```
        }
    }
}
```

getPath( ) is a function to get the path which video is saved in, get the path which converted video would be saved in, and get the path which FFmpeg is saved in.

process( ) is a function to convert a video format into an appropriate one for online showing.

There are three steps in this function. First step, the function decides if video formats meet the request of FFmpeg. Second step, if they don't, then use Mencode, a video format converter, to convert formats into "avi". Third step, use FFmpeg to convert all formats into appropriate ones to online showing.

We also used several Servelet APIs in our system, and this offered us an opportunity to reuse a few existing services and software on the web without having to code them from scratch (Panziera, 2012) [14].

2.3. Components
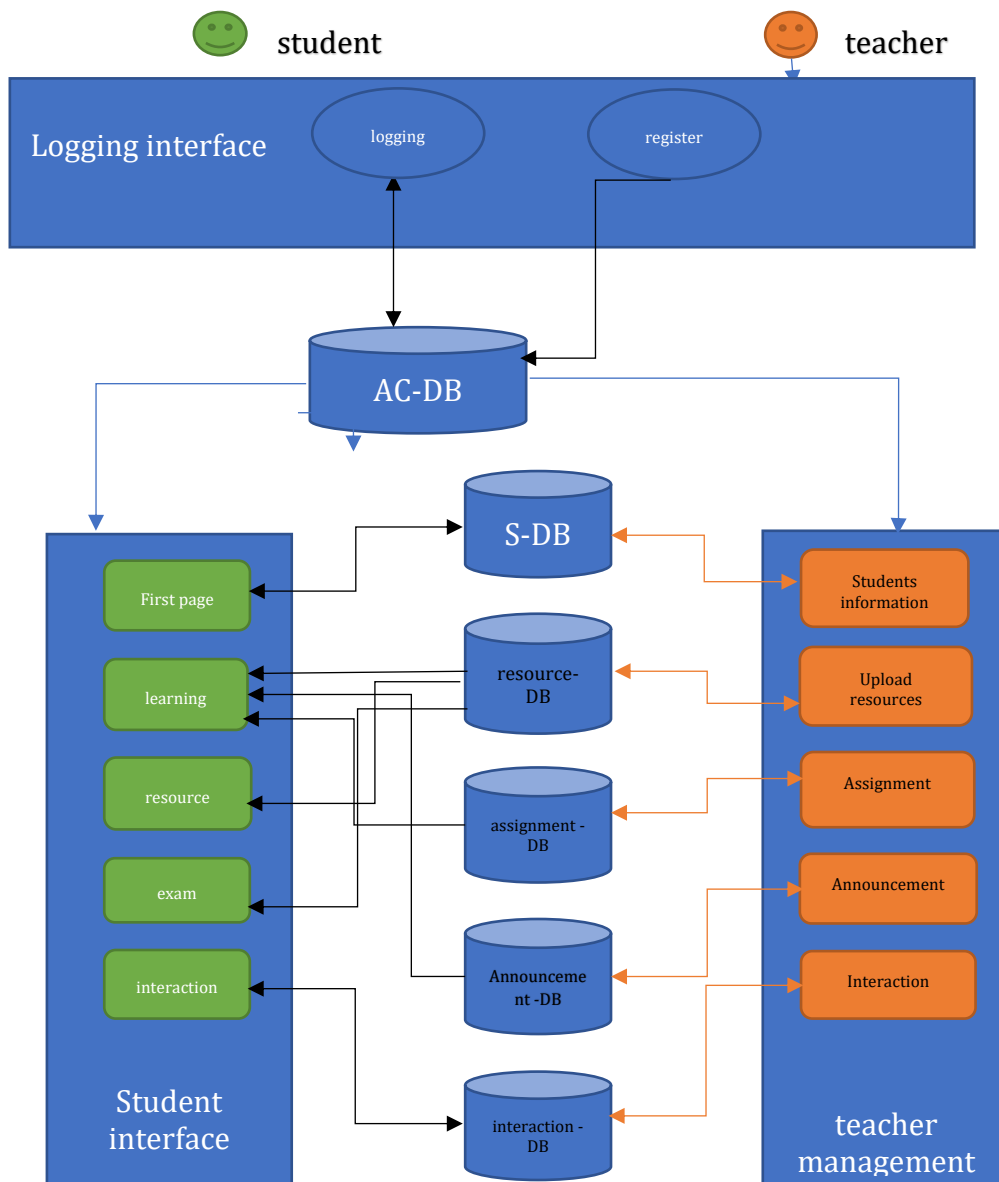
AC-DB : account database; SA-DB: student account database.

Fig 1. WBVTS architecture

WBVTS has two main views. One is teacher's view by which teachers can run through a series of teaching operations. And the other is student's view by which students can go through a chain of learning processes. The logging interface are the same for both the teachers and the students. All databases (DBs) are saved in the server, like user account DB (AC-DB) that includes student DB (S-DB) and teacher DB (T-DB), and resource DB which teacher uploaded resources were saved in and students download resources from. After checking the identity of user whose information in user account DB, each user will go into the appropriate interface. For the teacher, he or she can manage student information, resource, assignments, announcements. For all resources will be stored in the resource DB. For example, learning materials will be stored in the resource DB. All the uploaded materials will be stored in the resource DB. Text papers and assignment will be also stored in assignment DB. Posting announcements from teachers will be saved in announcement DB and interaction contents will be also stored in interaction DB. The main functions of WBVTS is shown on following Fig.1.

There are some functional buttons showed on the two main interfaces, teacher interface and student interface. Users click the buttons on the interfaces to get information that they want. And all the sessions will be conducted between the browser and the server. For example, for the student interface, the system will show six buttons that contain relevant functional modules, namely "first page", "learning", "resource", "interaction", "exam" and "quit". Features of each modules make students to interact with the system. For example, "first page" shows students' learning activities. "Learning" will let students take their courses, watching course videos, and selecting the course. The functions of this module show in Fig. 2.
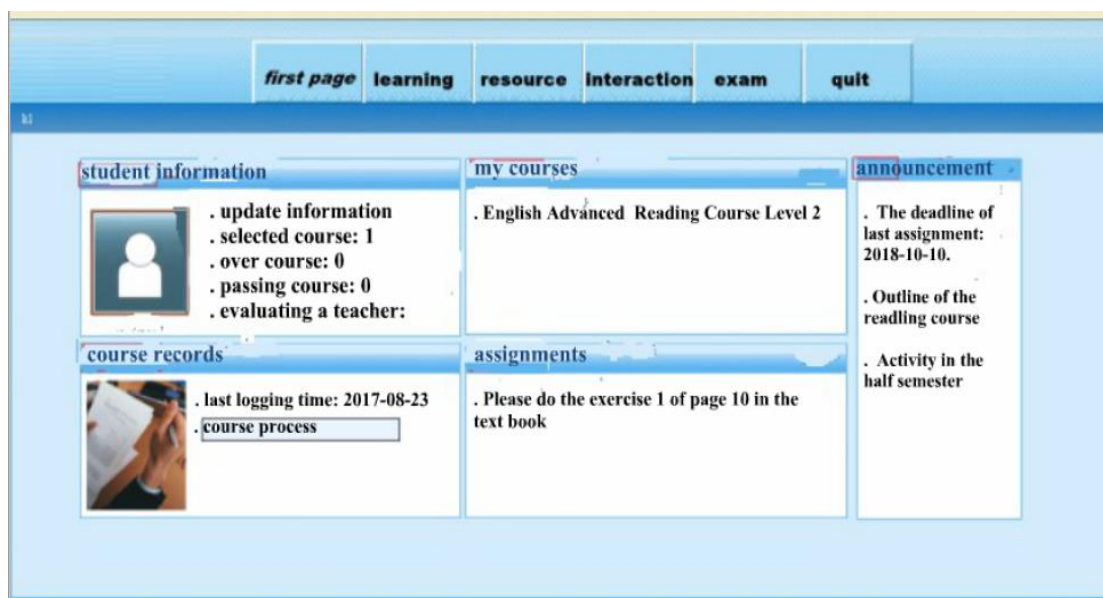

Fig 2. Student interface after logging into the system

3. WBVTS Evaluation

To evaluate WBVTS, a case study was carried with two main methods: interview and comparation. The subjects of the interview were 25 English major students and teachers. Students' scores were contrasted and compared before and after using WBVTS for student optional courses.

3.1. Test Scenario

We developed a test scenario to measure the functions and user acceptances. Firstly, randomly selected teachers were asked to use WBVTS for user experiences one by one. The test scenario is shown the following table

Table 1. Test functions of teacher interface in WBVTS

Function number	steps
1	Enter a valid username or register one; press log in
2	Add/delete/update/check student information
3	Set a course code
4	Upload teaching resources/test paper
5	View/add/delete/modify/search resources or test paper
6	Post an announcement
7	Interact with a student
8	log out

Five of English major teachers used the system to test the functions listed in Table 1. They began from the first task, entering a valid username or register to the one, logging out. They ran their operations one by one, according to the order shown in Table 1. And each task was coded with 1 or 0 (pass or fail).

Some English major students were asked to user the system to test the functions of student interface. The test scenario was shown in Table 2. Students also began from logging interface and carried the tasks one by one with the order of Table 2. Each operation was also coded with 1 or 0 (pass or fail).

Table 2. Test functions of student interface in WBVTS

Function number	steps
1	Enter a valid username or register one; press log in
2	check/update student information
3	View/search learning resources
4	Choose a course to learn
5	Download learning resources
6	Take an exam
7	Check assignments
8	Check announcement
9	Interact with a teacher/classmate
11	Log out

3.2. Test Procedure

WBVTS was first tested among the English major teachers and students from a famous university located in Northwest of China. Students are freshmen and the age is 18-19. The ratio of boys (n=16) and girls (n=64) is 1: 4, and the number of students is 80. Five teachers have five courses for 80 students.

One of five teachers, firstly, logged in the system with the staff ID, and set the course code. Then His/her students registered in the system with student ID and filled in their information. The teacher input student ID to search student information. When the teacher deleted one students account, the student cannot log in again and the interface will give a pop window to hint he/she

is an invalid account. The student had to register again or asked the teacher to add the account into the SA-DB. After managing the account of student, the teacher uploaded the course with course code and could be saved in the resource DB located in the server. Then, he watched and deleted his uploading and uploaded it again. After he was sure the resource was correct, he asked students to choose the course ID and watch/download the course video. When students were watching the video, the teacher uploaded the course quiz, and deleted/modified/added some questions in quiz. Student were asked to take the quiz after they watched the video. The teacher set assignments and post announcements, and students checked assignments and announcements. The teacher chose a student ID to leave a message for him/her or called this student for talking about the learning, so did one of students. The teacher and the student also interacted with each other by video. Teacher and students post on the discussion column for giving or asking help. This interaction with multiple people is only by texting, not by voice or video.

Above procedure was carried by other four teachers and their classes.

3.3.   Test Questionnaire and Interview

After the procedure was over, the researcher set the questionnaire which is a reliable and industrial-standard questionnaire that consists of 10 questions with 5 Likert response options ranging from "strongly agree" to "strongly disagree". The questionnaires were handed out among 80 students and received 100%. The researcher analyzed the data with statistical software, SPSS 22.

At the same time, the interview was also carried out among five teachers and 10 students randomly chosen among 80 students, respectively. Three teachers had positive attitudes towards the system. Teacher 1 said the system could be easily operated and the interface is clear and simple. It is much better and convenient than some commercial teaching software that he ever used.

Teacher 3 said he likes the system because he can make the test paper easily, especially when there is a mistake in the test paper, other teacher will find it and give him an instant suggestion.

Teacher 4 said the main advantage of the system for him is the compatibility for video format. He did not consider which video format he can upload because the system could convert the pervious format into the standard and saved it into resource DB.

Teacher 2 and Teacher 5 gave their negative opinions on the system. They thought the system would have no new creativity. The classroom interaction could not be carried in the system and teachers could not watch emotions of students when they were watching the course video. They did not think it is a good way for teaching.

At last, teachers gave some advice, such as there should be a very clear guild line and some plug-in for recording videos directly in the interface, besides uploading them.

When 10 students were interviewed, 7 of them gave following positive comments on the style of interface and some functions.

Student 1 said, "I like the student interface. It is clean and simple, no much more text or button on it, especially its color, light blue, my favorite color."

Student 2 said, "Each quiz follows watching the video, and taking the quiz facilitates me to keep what I learn in my mind. Moreover, when I fail in the quiz, I can easily go back and watch video again. I really love the system."

Students 3 said, "The system is fantastic. You know, it usually takes me one or half semester to finish an offline course, but here I can finish one course with half or less time. Furthermore, I can easily review my course and check my mistakes in all quizzes."

Some students also talked about other advantages of the system, such as free complaint about courses, no scare of being asked question suddenly, no laugher and no noise around them, and

no teacher walking up and down. In a short, the system gives them more free time and space to learn. They feel comfortable.

However, 3 students gave their negative comments on the system. They thought they can easily lose their minds on the course because there are always windows popping up online. They cannot interact with classmates or their teacher instantly during watching the video. They complained about discussing column. They said it is not easy for reading posting one by one because of too long and too many postings in this column. Moreover, some contents of posting did not refer to the learning. The key point is they could not find teacher's posting at the first sight because it is flooded among such nonsense postings. In sum, they did not think they can learn better using the system than sitting in the classroom.

3.4.   Test Result

The analysis of the data from questionnaire revealed a generally positive attitude toward using the system. 75% (n=60) students showed their enthusiasm for the system and the preference for using the system frequently to learn. For interface style, 73% students thought it is good and not complicate. Regarding functions of the system, 68% students viewed the functions are satisfied with their learning. 66% students agreed that the system is convenient for learning and they also operated it easily without help. Moreover, all boys (n=16) are among these 75% students. While 25% students who are girls did not like the system and showed their negative attitudes. The finding from analysis is that most students like using the system for learning. The one interesting finding is boys are more possible to use the system for learning than girls. It is consistent with the finding of Adrianson (2001) [15].

The ratio of positive and negative comments from interviewed teachers (n=5) is 3:2 and the ratio from interviewed students (n=20) is 7:3. The interesting thing is whether teacher or students who gave negative comments are female. It is line with what Blum (1999)[16] found, men more likely accept the new technology than women.

Above ratios also indicate that majority of teachers and students showed their positive comments on the functions of the system. However, there is still some work we should do in the next step.

3.5.   Contrast and Comparation of Learning Effect with and without WBVTS

Even if most students are fond of using the system for learning, the research still wonder if the system really facilitates students for learning. There are four classes in English major. At the beginning of the term, there are little differences of class average score among of 4 classes for reading course. Class 1 and class 2 use the system for learning the course and other two classes 3&4 have reading course without WBVTS. At the end of term, the class average score of this course showed obvious difference. Table 3 shows this change.

Table 3. Four class average score at the beginning/end for reading course

class	Beginning score	yes/no using WBVTS for learning	end score
1	70.2	yes	75.3
2	70.1	yes	74.5
3	70.3	no	70.8
4	70.2	no	70.5

The comparison of class average score from Table 3 indicates that for the reading course, students who learn with the system will improve their achievement faster than those who learn without the system. It is possible for WBVTS to facilitate student learning.

4. Conclusion

The paper presents the design and the development of WBVTS, an online teaching system for language learning student, especially for English major student. Both teacher and student can use the system and it gives them more freedom to teach or learn at any time and any place.

The system was developed with Java, a program language, several web technologies, and three main frames to assess desired content fast and conveniently. For evaluating the system, the study was conducted with questionnaire, interview and comparison approaches. The results showed that most users accepted the function of the system for learning and it most likely facilitates student learning.

One feature of the system is that it can be used in any operate system of computer and main browsers that are popular online. Users don't worry about their uploading/downloading resources are restricted due to the various formats because the system provides video converter to meet user needs. However, the system has also some limitations and some functions also have some bugs. As for limitation, one issue is users cannot use the system on their mobiles, especially IPhone. The other one relates to the sustainability of the three main frames, which might affect the operation of the system in the future.

There are still a lot work in the future about the system. Some functions should be added or improved. For example, there is no video recording plug-in on the interface. Teachers have to record their course videos before they upload into resource DB. Another problem is interactivity online. The system cannot provide multiple people interaction by video or voice. The interaction only happens between two persons by video. Multiple people interaction by video/voice should be considered in the future. In addition, the system only was used by English major teachers and students for testing and further work should consider if the system is widely accepted by other major students and teachers. Above issues should be solved one by one in the future. Finally, once the system has been completed, it would be released as an open-source online teaching system from which the school/community will be able to derive benefit.

Acknowledgements

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