A Brief Discussion
About the Accessibility and Usability
of Web-Based Instruction in Software
Design Teaching

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Abstract. Web-based instruction is the product of the new era and it has the characteristics of time and place. So people can arrange their own learning time and place freely when they are learning through the network. Software design is composed of the processes of requirement analysis, outline design, detailed design, implementation and testing. Software design does not require too much basic knowledge for learners. The software design processes can be realized easier via computer, so it is suitable for network teaching. Now, the web-based instruction of software design already exists, but it still has some shortcomings and needs to be improved. In this paper, we first introduce the traditional teaching and web-based instruction as well as the existing software design web-based instruction. Then analyze the accessibility and usability of web-based instruction in software design teaching.

Keywords: Software design · Web-based instruction
Traditional teaching

1 Introduction

The development of Internet technology has promoted the development of various businesses. We have made new changes in all aspects of our life and work, including education. E-schools with different teaching mode have appeared in the public field of vision, and web-based instruction has become a very common phenomenon. Broadly speaking, web-based instruction refers to the teaching methods that use multimedia devices or network technologies. In a narrow sense, it refers to the distance learning method that connects teachers and students through the Internet and computer [1]. The teaching of web-based instruction in software design in this article refers to the web-based instruction in a broad sense.

1.1 Classification of Web-Based Instruction

There are many ways to classify web-based instruction. According to synchronization of the web-based instruction, it is usually divided into two types, one is the live mode, the other mode is taped. In a nutshell, live streaming is a simultaneous teaching of teachers and students. A live room usually has a dialog box to get students' real-time feedback on the content of the course. So the teacher can master the teaching progress. The live mode has no spatial requirement, but has strict temporal requirement. The teacher records the teaching video in advance in recording mode. Then students watch and study. There are no real-time dialogs in this format, but the teaching video can be viewed repeatedly. Hence, the space and time are not required strictly in recording mode.

According to the spatial limitation of web-based instruction, it can be divided into: short distance web-based instruction and long-distance web-based instruction. Short-distant web-based instruction is limited by space and time, so it is basically the form of live broadcast. It is usually the case that the teacher and the students are in the same room in short-distant web-based instruction. If only teacher client, then teacher makes presentations. If not only the teacher client but also student client, then teacher can do some operations as explains knowledge, distributes file and locks student-side operations etc via teacher client. Long-distance web-based instruction does not require teachers and students to be in the same place. In other words, long-distance web-based instruction is not limited by space, so it can use live form or recording form. But teachers can use fewer operations that they generally have operations of explanation of knowledge and prohibition of students' speech. The short distance web-based instruction is always as the auxiliary means of traditional teaching, but the long-distance web-based instruction can completely replace the traditional teaching [2].

According to the network range, web-based instruction can be divided into LAN teaching and Internet teaching. LAN teaching is required for space and time, so it is suitable for the teaching of short range network. And the Internet teaching is suitable for both short distance web-based instruction and long-distance teaching.

1.2 Traditional Teaching

Traditional teaching is face-to-face teaching, and its teaching environment is generally composed of blackboards, students' tables and chairs, and lecturing.

Because of face-to-face teaching, teachers can capture students' real and effective responses to the contents explained in a timely manner. Subsequently teachers quickly adjust the contents, teaching ways and so on. Moreover, if a student happens to be absent from class, teachers can generally find out and stop it in time. If students have any questions, they can consult teachers separately after the class.

On the traditional teaching class teacher teaches students in one-to-many way. Because of limited teaching time and heavy teaching tasks, in general, it is mainly the teacher explains and students listen in the class. During the

class, teachers may ask questions and students think and answer. Students lack initiative and enthusiasm for the reason that they rarely ask questions voluntarily [3]. In the traditional teaching, the teacher's explanation is generally irreversible. That is to say, students need to follow their teacher's explanation for better understanding. If someone is hard to understand or distracted, or cannot see clearly because of seat location, light or other reasons, it is likely to miss the teacher's explanation. If the student wants to complement the knowledge, he or she can only ask teachers and classmates in private or wait for the teacher to repeat this part of the knowledge. But because of this, students will learn more seriously.

1.3   Web-Based Instruction

Web-based instruction is generally composed of multimedia devices, networks and other teaching environments.

In the broad sense, there is also face-to-face teaching mode in the web-based instruction, which is usually only the auxiliary means of traditional teaching. Face-to-face web-based instruction has the advantages of traditional teaching: teachers can obtain students' real and effective responses, and teachers can remind students of bad situations. And it has corrected the shortcomings of traditional teaching, such as the use of computer fonts instead of handwriting to avoid the misclassification of students. However, some shortcomings in the traditional teaching are also reflected in the face-to-face web-based instruction, such as the mode in which the teacher talks and students listening [4,5].

In the narrow sense, web-based instruction is long-distance web-based instruction, and it can be a substitution for some courses. Long-distance web-based instruction does not exist poor seat position, blackboard reflective and so on as long as the network to keep it open. For students, the teaching effect of long-distance web-based instruction is not different from that of traditional teaching. Long-distance web-based instruction does not limit time and space, so the degree of students' freedom is greatly improved. And because it is not face-to-face in long-distance web-based instruction, the shyness of students is greatly diminished, so that they dare to ask their own questions directly [6]. Whether live (can be recorded in a live screen) or recorded, long-distance web-based instruction generally allows multiple watch. It's helpful for students to understand the difficulty. But long-distance web-based instruction adds some difficulties to teachers. Generally speaking, long-distance web-based instruction can only watch teachers, and can not see the state of students, so the teacher can not know the students' response to the teacher's explanation in time. Even in the form of live broadcasting, teachers can only get feedback from students by asking questions. This way not only the teacher grasps the situation inaccurately, but also delays the time. And if students have problems, it is not as convenient as traditional teaching, especially after class.

2   Analysis of the Existing Web-Based Instruction of Software Design

The theoretical part of the software design is not very different from the traditional teaching in the web-based instruction. Their differences lie in the practical part of software design. The practice parts of the existing software design are generally divided into two kinds. One is short-distance. We can call it classroom web-based instruction. One is remote, and we call it remote web-based instruction. Classroom web-based instruction is generally the teacher's on-site operation for students to watching. If there are student clients in the classroom, the teacher can do something with the student client [7–9]. Figure 1 shows most of the teacher client's functions given by the existing software of classroom web-based instruction. The software has three functions: teaching, online examination and management. Teaching includes teaching demonstration, writing on the screen, watching student screens, sending files to students, collecting homework, roll call, special instruction, student demonstrations, locking student client, warning students, groups discussions, etc. Online examinations include making examination papers, invigilation, collecting test papers, terminating the exam, sending answers, evaluation test, and statistics of results. Management includes group management, seating arrangement, machine management, network management, permissions setting, application restriction, and operation
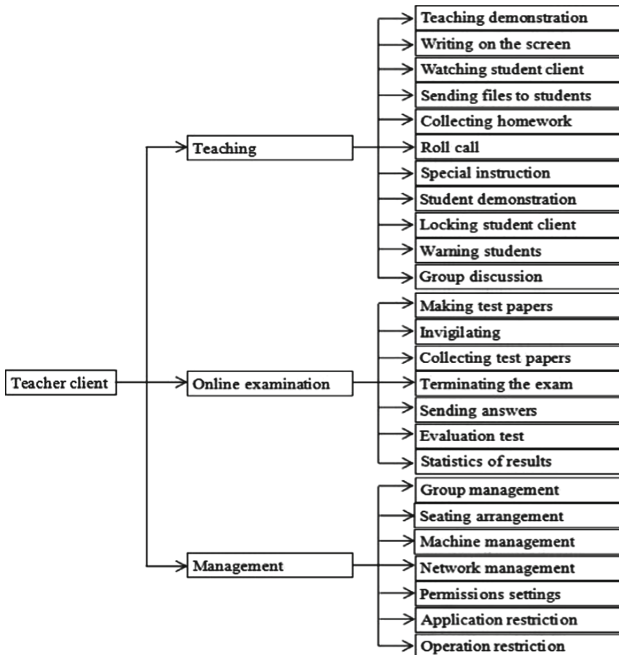

Fig. 1. Teacher client's functions of software of classroom web-based instruction

restriction. Figure 2 shows that most of the functions of the student client are given by the existing software of classroom web-based instruction, including operation, presentation, sending information, online examination and request.
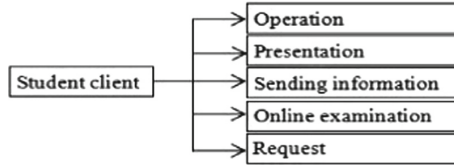

Fig. 2. Student client's functions of software of classroom web-based instruction

Classroom web-based instruction solves troubles of traditional teaching due to seats and other issues. And classroom web-based instruction inherits advantages of traditional teaching methods, such as convenience of tutoring and so on. Teachers can make sure that students do not have irrelevant actions during class by looking at student clients' screens and restricting their programs. But they do not guarantee that students are listening attentively and weakening students' real-time monitoring.

Remote web-based instruction is mostly recorded, and the operations of live broadcast are less than the short-range. Figure 3 shows that most of teacher client's functions in the existing software of remote web-based instruction, and they include teacher demonstration, writing on the screen, recording course, sending files to students, collecting homework, group management. Figure 4 shows the student client's functions of remote web-based instruction, which include operation, presentation, and sending information.
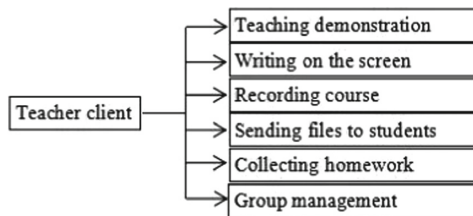

Fig. 3. Teacher client's functions of software of remote web-based instruction
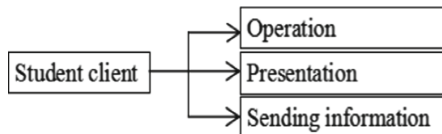

Fig. 4. Student client's functions of software of remote web-based instruction

The functions of teacher client in remote web-based instruction are much less than in classroom web-based instruction, and teachers almost completely lose the supervision of students. But remote web-based instruction does not require space. Teachers and students can teach and study wherever they want. And the recording function allows students to repeat their studies where they don't understand.

3 The Accessibility and Usability of Web-Based Instruction in Software Design

3.1 Extensive Applicability

Now, the existence of web-based instruction is common. Web-based instruction has a wide range of application, including preschool education [10], primary education [11], secondary education [12], higher education [13], adult education [14], vocational education [15] and so on. In this paper, "web-based instruction" is input on CNKI. After the search results are classified according to subjects, it is easy to find that the proportion of computer software and applications is large, reaching 17.30%. The specific situation is shown in Table 1.

Table 1. An analysis of the subject for web-based instruction

Subject	Proportion
The theory of education and the management of education	27.36%
Computer software and its application	17.30%
Secondary education	13.60%
Foreign language and literature	9.48%
Higher education	6.36%
Primary education	5.53%
Internet technology	3.54%
Vocational education	3.35%
Medical education	2.31%
Other	11.17%

The population of software design learning is mainly concentrated in higher education, adult education and vocational education. These students have basically completed the study of compulsory education. Software design is not required for students' basic knowledge. Each student has different grasp of the basics of computers, but he or she can learn as long as he or she masters computer-based operations. Other professional knowledge can be complemental by learning. Of course, people who have no access to computers can also learn, but they are only suitable for learning through traditional teaching methods and

short range web-based instruction, which is not suitable for remote web-based instruction. Therefore, for these three groups of people, it is feasible to learn software design through network learning.

3.2   Supplement of the Deficiency of Traditional Teaching

Network teaching can alleviate the problem of time and space of campus learning. In the information age, there are more and more people learning software design. If there is no network teaching, for schools, the increase of students means that schools need to provide more computers and classrooms for teaching. For full-time workers, they can only study in their spare time at work. There will be a lot of inconvenience: time is limited, and it is not sure, space also has a certain limit [16]. While network teaching is not so high in time space, it can ease the time and space of traditional teaching and the problem of resources.

Web-based instruction drastically liberalized the number of students. In software design learning, it is subject to teaching space, equipment and energy of teachers. Although traditional teaching is a teacher teaching a lot of students, the number of students is very limited that fifty people are already very much. Network teaching allows teachers to teach hundreds or even thousands of people at the same time.

Web-based instruction can drive the students' enthusiasm for learning. In traditional teaching, students can only acquire knowledge through teacher's narration and textbook. When the actual situation and the teaching material are different, it will cause great difficulties for the students' practice. When students are stuck, they will get rid of their enthusiasm for learning [17]. Even if a teacher uses a multimedia device as auxiliary teaching to demonstrate code, students can only use their notes to memorize, not follow the operations. The memory of a person is limited so that when the student is stuck, he or she will fade away the enthusiasm of learning. If the students follow the teacher to demonstrate the code, the students' chances of mistakes will drop and their enthusiasm for learning will rise.

Web-based instruction can reduce the teacher's duplication of work. In practice, many problems of students are repetitive, but students are equivalent to isolated islands. Their problems do not connect with each other. Therefore, in traditional teaching, teachers need to solve students' problems one by one, and do a lot of repetitive work. In network teaching, a student raises questions, and the teacher demonstrates solutions. Other students can get solutions. They save time and reduce the workload of teachers.

3.3   The Feasibility of Teaching Environment

Software design is the process of analyzing software requirements, designing software, writing code, and testing. The learning of software design can be divided into two parts, one part of which is the theoretical part. It mainly studies the things of concepts and designs all aspects of the software. The part of the learning achieved by web-based instruction is no problem. The other part is the

practical part, which is the programming process and the testing process. This part is mainly the teacher's explanation and the students' practice. Using a computer for instance demonstration can achieve better explanation effect. The student's practice part must be operated by the computer. In short, both parts of the software design can be done on the computer without having to use other tools. And the web-based instruction also needs to be carried out in the computer environment, so the teaching environment of the software design meets the conditions.

Software design does not require teachers' hands-on teaching. Web-based instruction is very common, but not all traditional teaching can be replaced by web-based instruction. Some of the content of learning requires a teacher's face-to-face guidance, such as the learning of basketball, web-based instruction is at the most as an auxiliary means. Software design tools, computers, have not strict operational requirements for users. If someone finishes the entire software design with one finger, no one will think that the person's design is wrong because the person uses only one finger. Therefore, the teacher does not need to correct the student's mistake face to face. So the advantage of software design is that both theory and practice can be done on a computer than other learning courses that need to be implemented.

4   Conclusion

Software design is the process of requirement analysis, summary design, detailed design, implementation and testing. In this process, many requirements for software design are not high, such as interaction requirements between teachers and students, time and space requirements, operation requirements and learners' basic knowledge requirements. And software design teaching process involved a single tool - the computer. Therefore, web-based instruction in software design teaching is feasible and easy to use.

Software of web-based instruction in software design teaching has already existed, and has a relatively complete function. In the course of short range web-based instruction, a teacher client has three functions, such as teaching, online examination and management, and a student client has the functions of listening, examination and so on. In the distance web-based instruction, although a teacher client has two functions of teaching and management, its sub functions are much less than the sub functions of a teacher client's in the short range web-based instruction. In any case, the teachers' interaction with the students and the teacher's monitoring of the students still need to be improved, especially in the distance web-based instruction.

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