THE DEVELOPMENT AND PRELIMINARY APPLICATION OF PLANT QUARANTINE REMOTE TEACHING SYSTEM IN CHINA

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Abstract： With the development of modern information technology, the traditional teaching mode becomes more deficient for the requirement of modern education. Plant Quarantine has been accepted as the common course for the universities of agriculture in China after the entry of WTO. But the teaching resources of this course are not enough especially for most universities with lack base. The characteristic of e-learning is regarded as one way to solve the problem of short teaching resource. PQRTS (Plant Quarantine Remote Teaching System) was designed and developed with JSP (Java Sever Pages), MySQL and Tomcat in this study. The system included many kinds of plant quarantine teaching resources, such as international glossary, regulations and standards, multimedia information of quarantine process and pests, ppt files of teaching, and training exercise. The system prototype implemented the functions of remote learning, querying, management, examination and remote discussion. It could be a tool for teaching, teaching assistance and learning on-line.

Keywords： plant quarantine, remote teaching, system development and evaluation, e-learning

1. INTRODUCTION

China need more professional workers at plant quarantine field given that 2008 Olympic Games will be hold in August 2008, Beijing and increasing

quality safety concerns. At present, most of universities apply TE to plant quarantine education, i.e., classroom teaching (CT). With the development and popularization of computer and multimedia technology, many teachers also use such as video and power point for teaching, but comparing with e-learning, CT have many shortage.

● The information of book education (BE) is limited. It is not well if we only read book. In order to satisfy the need of training more persons with ability, learner should get great number of information so that they can success in huge competition with others.

● Some experiment video and power points which are applied to teaching reformation make courses active. However, the arrangement is only considered by the teacher, not learners. Thus, we can not adjust measures to different learners' conditions.

● For some graduated learners who attend in a advance studies lesson, their study time is hard to meet. Then they can't go to class completely as normal learners.

As the result, the insufficient of professional workers will never be overcome within a short period of time under the context of the traditional teaching mode. With the development and popularization of computer and internet technology, remote teaching, a new education mode, appeared and is developing quickly. And on-line learning (i.e., e-learning) is attracting more and more attention. E-learning refers to the use of electronic devices for learning, including the delivery of content via electronic media such as Internet/Intranet/Extranet, audio or video tape, satellite broadcast, interactive TV, CD-ROM, and so on (Kaplan-Leiserson, 2000).E-learning applications may appear with different forms of designation such as web-based learning, virtual classrooms, and digital collaboration (Kaplan-Leiserson, 2000; Khalifa et al., 1999). This type of e-learning places a greater emphasis on the enabling or facilitating role technology plays in data search and transmission, interactivity, and personalization (Piccoli et al., 2001).

E-learning offers new possibilities in learning. It share education resource, individual study condition, and hasten study socialization. Many research showed that e-learning is better than traditional education (TE), and it may replace TE at some terms （Hertz-Lazarowitz et al., 2002; Buchanan, 2002）. Thus, a learner can get immediate feedback on problem, learning paths can be individualized, etc. At present, a lot of e-learning tools with varying functionality and purposes exist (Aroyo et al., 2002; Murray et al., 2003). E-learning is an alternative concept to the traditional tutoring system. The course tutor in a software tutoring system controls learners relatively weaker than (s)he does in the traditional one, where the (human) tutor is in charge of the contents and sequence of instructions. Therefore, in order to obtain better tutoring outcomes, a software tutoring system should

emphasize engaging learners in the learning process and be adaptive to each individual learner（Anatoly et al., 2008）.

It is showed from some data that 72% of American universities adopted e-learning in 1999. And the proportion increased sharply to 99% in 2001（Li Rongsheng, 2005；Yuan Qiu, 2002）. Some universities, middle schools and elementary schools also adopted some e-learning courses in China. There are many plant quarantine information system, but most of them are decision assistance system, alarm analysis system, authentication assistance system etc（Sun Guanying et al., 2003；Zhou Weichuan et al., 2004；Li Zhihong et al., 2003；Li Zhihong et al., 2005）. However there have few of report about plant quarantine learning and assistance system.

This paper discusses our experience in developing and evaluating an e-learning system for plant quarantine. Section 2 describes the questionnaire to acquire user' need and part of domain knowledge. Section 3 shows the system architecture and discusses the system implementation. Then the last section discusses and draws some conclusions.

2.   USER NEED ANALYSIS

When applying a learning tool or system for learners, it is necessary to investigate both teachers' and learners' attitudes toward that tool or system. Essentially, understanding their perceptions toward learning environments is a crucial issue for enhancing teaching performance and learning effects. The results of Liaw's study confirm that instructors are willing to use e-learning environments to aid their teaching activities. Learners also respond favorably to e-learning environments for complementing to their learning activities (Liaw et al., 2007).

The potential users of plant quarantine e-learning system are undergraduates and graduate students and staffs who work at plant quarantine. To better meet their needs, a questionnaire was designed to investigate their problems and needs（Fig.1）. The questionnaires were sent to some Chinese universities, the plant quarantine departments and plant protection stations of Beijing, Tianjin and Guangdong. The result gave us much good suggestion and idea.

● The system must has a own user database. Thus, not only it can run by itself, but also can be added to other systems.

● For different users in different level, the interface should be very friendly and simple.

● The modules of testing by themselves and chatting on-line are necessary.

● The modules of Learning note, statistic and analysis, email awoke and study plan are also suggested.
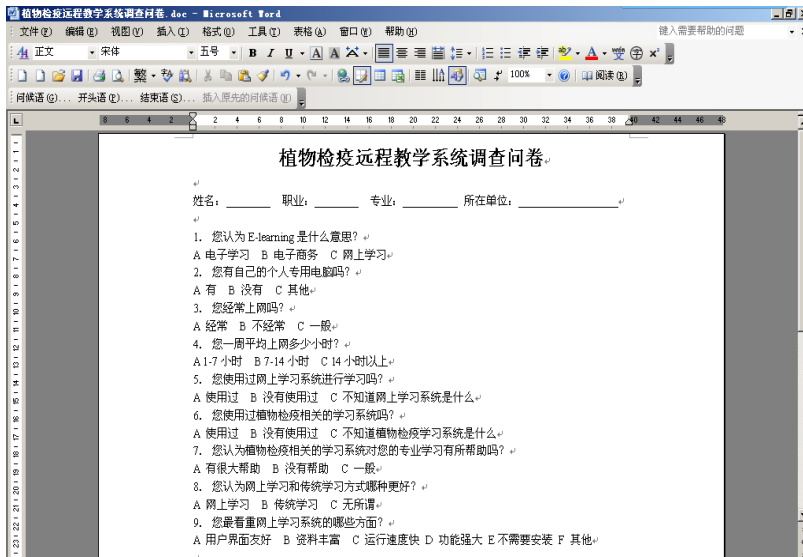
Fig.1: part of questionnaire

3. SYSTEM DESIGN AND DEVELOPMENT

To explore the assistant effect of e-learning system on plant quarantine teaching, we designed and developed Plant Quarantine Remote Teaching System (PQRTS). The system included lots of plant quarantine teaching material, such as quarantine pest, international glossary, regulations and standards, multimedia information of quarantine process and pests, ppt files of teaching, training exercise and so on. The system prototype implements some function, such as remote learning, querying, management, examination and remote discussion. It could be a tool for teaching, teaching assistance and learning on-line.
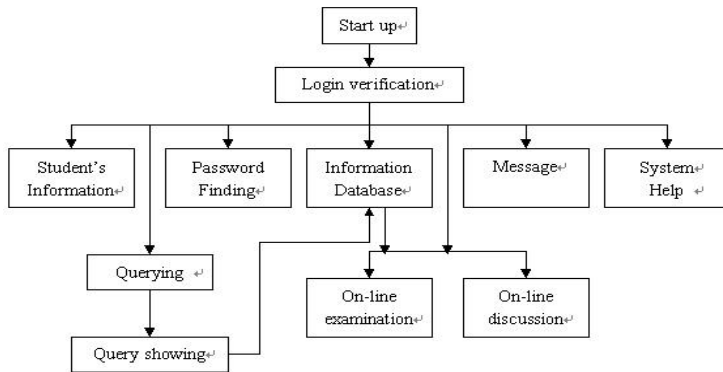

Fig.2: the functional diagram of the system

3.1 Database

The database takes a very important part and is responsible for storing all the information in the whole system. In view of transplant and money, the database was designed with MySQL. The databases include 8 teaching materials databases and 3 system function databases. Fig.3 shows the logic relationship among the databases.
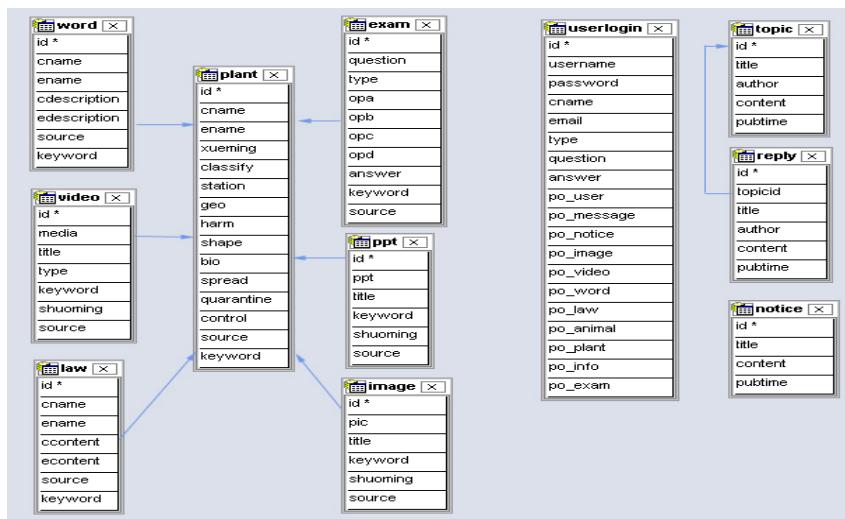

Fig.3: the logic relationship among the databases

3.2 User interface

User interface is the direct media between users and computers. To best meet the different users' need, designers should insist on friendly principle. In another word, they should consider all users' knowledge level and ensure the interface complete, compact and easy. We made the system interface with considering the characteristic of plant quarantine teaching as much as possible. For instance, the index page includes 6 areas, such as system navigation, system function, system introduction, fast querying, user login, user register and system notice (Fig.4).

Users can use the function of examination on-line to test themselves easily at any time. After they choose the number of test subject, the system will select randomly from exercises database and form test paper. When users click the submit button, the result of the examination will be showed in front of them（Fig.5）.

Fig.4: the index page of the system

Fig.5: the user interface on on-line examination

3.3   Development language and environment

In view of easy development, easy transplant, little money, the system took B/S structure. Users only need use Brower such as Internet Explorer, firefox and so on to visit the system website via internet or LAN, not install any other software to their PC. There are many solutions for developing the web-based systems. We adopted the solution by Sun, i.e. JSP (Java Sever Pages) + MySQL + Tomcat due that it is prone to master by non-professional system developer. Among the development plan,

● JSP is serving as the main develop language to bridge user interface and

web server and database server.

● MySQL4.0, a GPL (free) SQL relational database management system and data warehouse development tool, is serving as the back-end of the workstation to facilitate data storage and retrieval.

● Tomcat 5.0 is serving as a web server to provide information service.

● Microsoft Windows Server 2003 is serving as an operational system.

● Serv-U 6.0 is serving as an FTP system.

● In addition, JavaBean technology is adopted to access the database (Fig.6). It make the system more safe.

```
........
public class DBconn  ..
{.i
String DBDriver="org.gjt.mm.mysql.Driver";  ..
String ConnStr="jdbc:mysql://localhost/pqrts?useUnicode=true&characterEncoding=GBK";  ..
String MyUser="sa";  ..
String MyPassword="";  ..
Connection conn = null;  ..
ResultSet rs = null;  ..
int i=0;.i
public DBconn()  ..
{.i
try  .i
{.i
        Class.forName(DBDriver);  .i
}  ..
......
public ResultSet executeQuery(String sql)  ..
{.i
rs = null;  ..
try {.i
        conn = DriverManager.getConnection(ConnStr,MyUser,MyPassword);  ..
        Statement stmt = conn.createStatement();  ..
        rs = stmt.executeQuery(sql);  ..
}  ..
......
```

Fig.6: part of JavaBean code for access to database

4.   DISCUSSION

The system were applied to the plant quarantine course of China Agricultural University (CAU) in 2006. During the last 2 years, the system ran well and got good appraise by users. It played a good role in plant quarantine teaching assistance. We think that the system could be introduced to other agricultural universities and plant quarantine departments as a method for teaching reform. By using such e-learning system, students could get more acquaintance and promote their interesting in plant quarantine. It may also provide some material for Chinese remote teaching.

● The system has over 100 pieces of international glossary, 20 pieces of

regulations and standards, 200 pieces of quarantine pest, 20 ppt files of teaching, 500 images, 20 Flash files, 20 videos and so on.

- After surveying and ensuring of the user group, we designed the system in term of different users' need. It's interface was friendly and can be operated easily.
- The system took B/S structure. Users only need use Brower to visit the system website via internet or LAN.
- The system not only can run by itself, but also can be added to other systems.
- JSP is serving as the main develop language, so the system can run in many platforms.
- Besides some shortage mentioned above, there are still some items should be addressed, such as:
- Most of the materials come from Chinese data. We should add some materials from foreign language data.
- The examination on-line module should add the multinomial question into exercise database.
- The system only practice in CAU because of time limit. In order to better finish the study, we should put it into practice in other universities and departments.
- Due to time limit and money limit, we only developed an system antetype. The modules of Learning note, statistic and analysis, email awoke and study plan should be developed in future.

Remote teaching is a new teaching mode, not the copy of TE, broadcast education or TV education. We argue that the aim of remote teaching is that we can implement share and individuated teaching. Then a environment of teaching and learning will be built by modern information technology（Lim, 2001）. The remote teaching system based computer technology is modern tool for modern education. It provide a platform which be used to explore new method and new mode of modern education.

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