Development of an Interactive Multimedia E-learning System for Training Dental Clinic Assistants

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Abstract

The dental assistants had already taken an important role in the dental clinic since several years ago because of the four-handed dentistry. In America, there are lots of training courses for dental assistants. However, the education and formal trainings are very insufficient in Taiwan. Furthermore, the dental assistants maybe engaged as many different kinds of occupations before the dental clinics employ them. So there could be some troubles for dentists to communicate with new assistants. In order to solve these problems, we have developed an interactive multimedia e-learning system for dental clinic assistants. They can learn the basic knowledge from the system such as the Chinese and English names of the instruments, the pronunciation of English name of the instruments, the appearance of the instruments, and the brief introduction of the instruments. After a short time training, the new dental clinic assistants will have the ability to communicate with the dentists very easily.

Keywords:

Dental assistants, e-learning, Multimedia, Dental material, Dental instruments

Introduction

At present, there are 6,377 dental clinics in Taiwan; the amounts of dentists are 9,353 【1】 . In an ideal condition, one dentist should have one to tow dental assistants 【2】 for cooperation during the treatment. As a matter of fact, a new-employed dental assistant should receive the training from formal academy, dental association, or academic institution. However, in our current medical system, there is neither the training institution for dental assistant and certificate, nor the related association and academic organization to conduct this task. At last, it is each clinic that has to take care of the training; consequently, the employment source of dental assistant originates from various kinds of vocations, and female is the majority. Because of the different backgrounds, the greatest problem for a new dental assistant is confusing with the variety of dental materials. It is hard to memorize not only the Chinese-English name of materials, but also the complicated usage and points of attention. This results in lots of dental assistant giving up at the very first day of their work. Plus dentists are engaged in diagnose. These reasons emphasize the importance of multimedia e-learning. Through the construction of multimedia e-learning system for dental assistant, new assistants can learn the basic dental professional knowledge as follows.

1. Understanding of dental materials and instruments for both Chinese and English name

2. Description of functions of dental materials and instruments, including material characteristics, and knowing instruments usage

3. English name of dental materials and instruments, including both pronunciation and listening

4. Sterilization and maintenance to dental materials and instruments, including sterilization steps and machine operation procedure

5. Acquirement and shape of dentition model, including mixture of die materials and the way to shape plaster cast

The extent of professional knowledge of dental assistant would directly affect the medical service quality and prosperity of operation, no matter it is for clinic or hospital. Hence, under present competitive environment, not only the enhancement of dentist's expertise and attendant attitudes, but also the proficiency of dental assistant takes a vital role in quality of dental medical treatment. By contrast, this reveals the importance of dental assistant education.

Materials and Methods

Multimedia e-learning system for dental assistant is constructed by three subsidiary systems, Dental material database management system, Dental material database generation system for end-user, and Multimedia e-learning interface for dental assistants 【3】 . Dental material database management system is based on Windows XP Professional as the development platform, and Microsoft Visual Basic 6.0 as the development implements of system management. Besides, it combines with Microsoft Access XP to complete the entire dental material database, and via this system to implement uploading actions, such as addition, deletion, and modification. Dental material database generation system for end-user also takes Windows XP Professional as the development platform, and Microsoft Visual Basic 6.0 as the system development implements. It mainly utilizes Microsoft Access XP database, which is constructed by dental material database management system, and the dentist can create a customized material database to meet individual requirement for materials; finally to export XML documents becomes characteristic clinic database. Multimedia e-learning interface for dental assistants for dental assistants is grounded on Windows XP Professional as the development platform, and Microsoft Visual Basic 6.0 as the

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development implements of the e-learning interface for dental assistants, and retrieves XML documents which was just created by Dental material database generation system for end-user as the database to process learning and examination functions. The capabilities for each subsidiary system illustrate as follows.

Dental material database management system

Dental material database management system primarily collects the whole products from internal dental material suppliers. At present, the main columns are product classification, product Chinese name, product English name, product picture and description, which is not allowed leaving blank. In product classification, there are Oral surgery, Implants, Removable denture, Fixed partial denture, Periodontics, Orthodontics, Pediatric dentistry, Endodontics, Dental bleaching, Dental hygienic materials, and others, 11 categories. (Figure 1) The purpose to develop management system is to adapt to future replacement of materials. On the one hand, the system can provide more various and more latest dental materials information for dentist's choices. On the other hand, it makes dental assistant able to learn the most updated professional knowledge.
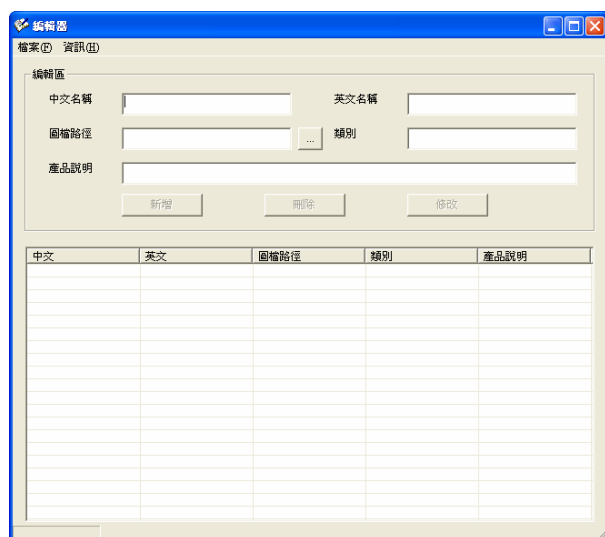

Figure 1- Dental Material Database Management System

Dental material database generation system for end-user

At present, there are various kinds of dental materials in Taiwan, and plus each clinic usually uses different materials. Hence, a menu program is necessary for each clinic to select its materials, or it may cause dental assistant to waste lots of time in learning unused product items. Dentist in each clinic can select and export XML documents as database. While exporting, the code and name of clinic must be entered to process coding and encryption mechanism. Furthermore, it has to combine with decipherment mechanism in Dental material database generation system for end-user to access database in case it has been pirated by other clinics and hospitals.
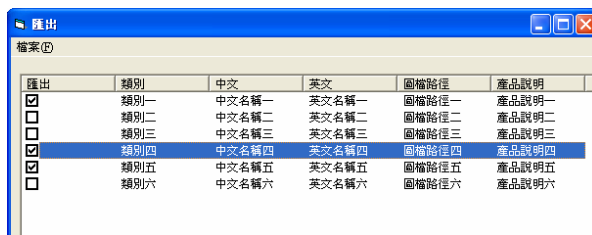

Figure 2- Dental material database generation system for end-user

Multimedia e-learning interface for dental assistants

After database has been constructed, the performance of entire learning system mainly depends on Multimedia e-learning interface for dental assistants, which can be separated into quick learning, self examination, and final examination, three modules. (Figure 3)

Quick Learning provides assistant with the classification of Chinese-English names and product photos, and the illustration of dental materials to learn. Moreover, combining with the TTS (Text to Speech) technology in Microsoft SAPI (Speech Application Interface)【4】, it makes assistant able to listen to English pronunciation of product without recording sound track previously. Besides, in hardware part, the conventional LCD screen will be replaced with electricity-resistant touch-panel screen, so the assistant can be self- study via selecting icons that is classified by materials on the screen. This user-friendly devise enhances the learning interests【5】. Second, Self Examination module enables assistants to briefly test her/his own learning results. The main page is the same as Quick Learning page; the differences are that text for Chinese-English name and product illustration will be hidden, and original speech sound button will be changed to answer display button to provide recognition test of product to assistants. After seeing product pictures, assistants can press answer display button to check whether they are familiar with Chinese-English name and product illustration of that item. On the screen there is a checking column for tough question memory to click. It enables assistants to conveniently record unfamiliar items, so that afterwards assistants can focus on reviewing unfamiliar product items to accelerate learning efficiency. In order to make Self Examination have better performance, examination method even supplies simulate test that the numbers of questions and duration of changing questions can be set, and this prevents the flaw that tester may memorize question sequence. Last, Final Examination module is a testing system for the clinic to examine its candidate while probation is due. It can set questions randomly from the database, including numbers of questions and testing duration for each question. The page mainly displays full-screen of product photo without any text, and is projected by projector for candidates to answer. After examination, system will publicize answers to facilitate paper correction. Via this simple testing mode, clinics can find the most qualified dental assistants.

Figure3- The main menu of Multimedia e-learning interface for dental assistants

Figure 4- Dental Assistant Quick Learning Interface

Conclusion

Dental Informatics Industry usually emphasizes on the development of medical record and digital image systems, but usually ignores education toward medical personnel, especially the scarcity of e-learning resources for dental assistant. The construction of multimedia e-learning system could solve dentist's problems to educate dental assistant the basic professional terminology and knowledge. Likewise, new dental assistant will have fundamental multimedia system to support his/her learning. Presently, system is proceeding into testing stage; database construction has equipped all product electric drawing and text files provided by internal agent. Till the construction and test of database and system are completed, the clinical test with contracted clinics can be progressed. Then through the system, both the present and new-employed dental assistants can begin the study, and furthermore the second phase system modification can be conducted according to new requirements.

Discussion

At present, dental materials being adopted in Taiwan are various and different from each dental clinic. The scheme of dental assistant training system is unlike the oral hygienic education applied to the public. The content of hygienic education is usually invariable. As for the dental material training to dental assistant, the software must be customized by individual clinic, and an internal dental material database must be built in advance to facilitate different selections. Thus, the biggest obstacle to the system construction lies in the difficulty to obtain authority of thousands of product information and pictures. In current stage, there are only data of static pictures; in the next stage, the video and audio data will be constructed, so it gives dentist more flexibility to display animated technologic steps in photography, and also makes the enhancement in software interaction. 【6】In the part of speech sounds technology, more configuration interfaces will be developed, so the male and female voices can be selected. Besides, health insurance VPN (Virtual Private Network) has already been completing. In the future, user can update on VPN, and even Dental material database generation system for end-user could be proceeded on Web side that takes Microsoft Visual Studio .NET 2003 as the means to create ASP.NET web page. Hence, the user can through Internet upload and download database by herself/himself.

Acknowledgments

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