Design and Implementation of Micro Learning Resources of Sharing Valuable Instruments for Medical Research—A Case of Thermo Scientific Excelsior AS Tissue Processor

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Abstract. In order to enhance the efficiency and level of the Instruments management in colleges, the case of Thermo Scientific Excelsior AS Tissue Processor is taken as example to analyze the design and implementation of Micro Learning Resources which is based on sharing valuable instruments in Medical Research.

1. Introduction

In 2009, with the starting using of the new Comprehensive Office Building of Science and Technology in Zhongshan College of Medicine, Sun Yat-Sen University, superior resources were centralized and resource allocation was optimized to establish a Scientific Research Instrument Management Center using sharing service as a core (hereinafter referred to as the Center). According to the “Three Separations” guiding principles [1-5] in Instrument Sharing Management Center of Zhongshan School of Medicine, with the application of advanced network information management system, and the hardware cooperation of the wireless radio frequency card reading system, the sharing equipment was open all day. At the end of 2017, the number of open medical science and technology instruments and equipment reservation on the Internet was more than 120 sets, with a total value of nearly 80 million yuan. There were 47 units of valuable equipment with the unit price over 40 million yuan. The principal object of sharing service is the Medical Research Laboratory of Sun Yat-sen University, and it also provides service for other scientific research laboratories inside and outside the university, and it is open for reservations throughout the day.

2. Difficulties in the Training of Sharing Medical Scientific Research and Valuable Equipment

After years of practice, in order to ensure the efficient use of valuable instruments throughout the day, there are certain difficulties in the development of the instrument training [6], mainly in the following aspects:

2.1 Contradictions Between Increased Training Needs of Users and the Limited Working Hours of Administrators.

By the end of 2017, there were much more than 5,600 registered users in the Scientific Research Instrument Management Center. The number of regular reservations required for training and follow-up every month averaged over 3,500. However, there are just 7 full-time laboratory equipment managers in the Scientific Research Instrument Management Center. Each manager needs to manage an average value of more than 10 million for each valuable equipment. Each manager follows up users for an average of 500 people per month. Administrators not only guarantee the smooth development of daily reservations and use of instruments, but also are responsible for the purchasing of instruments, maintenance, repairs, and other transactional tasks in the Center. The workload is large and complex. It often cannot reach the user's need for temporary non-reservation training.
2.2 The Contradiction Between Limited Lecture Training and User Time Conflict

Different types of experimental technical training lecture are conducted for the use of new equipment based on the technical characteristics of different instruments in the Center or according to the needs of users. However, many postgraduate students or interested users have failed to participate in lecture training because of various reasons, or they cannot understand the key points of the use of a certain device after listening to the training lectures, thereby requiring the administrator to repeat it several times.

2.3 The Contradiction Between the Richness of the Training Resources of the Instrument and the Low Storage Sharing Space

A large number of training resources are accumulated in the Center, such as PPT, expert lecture videos, etc. The required electronic storage space for these data is very large, but the small server space for the sharing reservation platform is very limited. It can only comply with the data processing of the daily reservation system and the authorizing system. The contents of the various instrument training resources are difficult to combine for sharing in the form of a network. Therefore, the intuitive and simple micro learning sources for the key and difficult points and precautionary issues of each valuable instrument operation are made in the Center. In addition, these micro learning resources are saved in the blackboard (BB) teaching platform of Sun Yat-sen University and linked to the sharing and reservation platform, thereby realizing providing online training service throughout the day. To take “Thermo Scientific Excelsior AS Tissue Processor” as an example, combined with the operating characteristics of the device, increasing micro videos are made in order to give full play to the online training function and improve the sharing and use benefit of the instrument.

3. The Making of Micro Learning Resources

3.1 The Definition of Micro Learning Resources

Micro learning resource refers to presently structured digital resources for fragmented learning content, processes, and continuation materials by using information technology and in accordance with cognitive laws. Micro learning resource is characterized by a distinct theme, a small amount of content, and a real situation [7-9]. In the design and implementation of the valuable instrument in sharing medical science and research, the function of micro learning resource is to link the difficult points of the use and training of valuable instrument and the places where users have problems to reflect and relatively large training needs, especially the teaching and training content such as the key points and precautions of the operation steps. The core knowledge points in the micro learning resource are refined. Associated with multiple multimedia tools such as PPT, Flash, audio and video editors, the resources are edited to create streaming media video files in MP4 or FLV format within 5 minutes. Using campus network, smart devices (smartphone, tablet PC, etc.), combined with the BB network teaching platform of Sun Yat-sen University, an autonomous learning network platform is developed for users to reserve and use the instrument at any time or anywhere. Therefore, users can learn core concepts and key knowledge of instrument operation, which meets the training requirements throughout the day.

3.2 Design of Micro Learning Resource

To analyze the training content of the selected equipment, the first is to understand its position or role in the entire medical research. The second is to refine the content, clarify the context structure between the various knowledge points, and write down the logical relationship between the key and difficult content clearly. For example, the Center purchased a Thermo Scientific Excelsior AS Tissue Processor in 2017. The equipment is the major equipment for the pathological section making of scientific research laboratories. Dehydration has a direct impact on the quality of specimen sections. Therefore, in the training of equipment use, users should clear the key knowledge of the equipment, including 7 parts of the operation principle of the equipment, the
structure of the composition, operation settings, reagent rotation, routine maintenance, common problems and solutions, commonly used consumables. Correspondingly, the design and implementation of micro learning resources of Thermo Scientific Excelsior AS Tissue Processor are comprised of seven parts.

3.3 Micro Learning Source Scripting

Before recording, it is needed to write a script for micro lessons as an outline for micro video shooting and post-production. The content to be shot by each sub-camera, the corresponding voice commentary, and the position of the inserted title or subtitle are specified in the script. The time of each micro learning resource is controlled within 3 minutes. For example, in principle of Thermo Scientific Excelsior AS Tissue Processor, the shot number, scene type, content, commentary, and subtitles are listed clearly on the table. In addition, the reagent rotation principle can be shown as the principles of flow.

3.4 The Making of Micro Learning Resource Materials

According to the multiple shooting materials shot the script, the panoramic, close-up, close shot are often cross-converted during shooting. Various videos can be taken based on the original design. In addition, relevant materials should be prepared for subsequent editing, such as text material, picture material, audio material, etc. For example, the structure and composition video of Thermo Scientific Excelsior AS Tissue Processor must have a panoramic view of the equipment as a whole, as well as a close shot of the host computer screen and a close-up of the inside such as the sealed electronic switch.

3.5 The Editing of Micro Learning Resource Materials

The videos are cut and linked through Video Editing, iJianJi, Ulead Video Studio, Camtasia Studio and other video software [10-14]. After adding subtitles, recording voice commendatory, and matched by background music, the complete, consistent instrument operation video clips are edited. The frame ratio is set to 16:9, and the static and dynamic composition is reasonably matched to make the picture concise, complete, balanced and unified. The theme is highlighted to maximize the expressiveness of the video screen. In the end, we made the Thermo Scientific Excelsior AS Tissue Processor operation training into seven micro learning sources, including the principle of equipment operation, structure and composition, operation settings, reagent rotation, routine maintenance, common problems and solutions, common consumptive materials, etc. Maximum learning sources account for 43.1M at the time of 4 min; the minimum for 5.21M, 30 s.

3.6 Micro Learning Source Sharing

We uploaded the produced micro learning resources to the online training course for medical scientific instruments of the BB network learning platform at Sun Yat-sen University, and established links with the instructions for the use of equipment for the Thermo Scientific Excelsior AS Tissue Processor on the reservation sharing platform. In this way, users who are reserved to use any mobile terminal (laptop, mobile phone, etc.) to perform 24 hours of on-line rapid operation and training of the equipment anytime, anywhere, especially for the key points and difficulties of the equipment, Users can have faster and more direct understanding for the reagent rotation of the Thermo Scientific Excelsior AS Tissue Processor.

4. The Effectiveness of Using Micro-Learning Resource Online Training

Scientific Research Instrument Management Center of Zhongshan School of Medicine is a highly-shared public technology platform that serves the whole medicine in the school and is open to both inside and outside schools. It has already introduced radio frequency identification (RFID) technology and simultaneous video monitoring systems into instrument sharing management. Automation and intelligence of instrument user authorization, open reservation of instrument, instrument sharing and management, instrument real-time management, fund settlement, and
benefit evaluation, fully realized at present. Most of the valuable instruments and equipment have been realized use throughout the day. The developed micro learning resources are uploaded on the BB network teaching platform of Sun Yat-sen University, and links are made with the reservation sharing platform of scientific research instrument. The communication platform of QQ and WeChat is utilized to promotion, and the “mobile + interactive” micro learning resource teaching and training for instrument use is realized. Therefore, online, fast food style, simple, practical, intelligent, diverse, and entertainment user learning can be achieved. Taking the Thermo Scientific Excelsior AS Tissue Processor as an example, the reservation was officially opened in May, 2017. However, by the end of 2017, there were a total of 81 persons for reservations and 160 uses, and 970 hours of resource use. Efficient training at any time and in any place through micro learning sources has greatly reduced the workload of face-to-face and one-on-one training for equipment managers, effectively improving the sharing usage rate of the equipment.

5. Conclusions

Focusing on valuable instruments for medical research, micro learning resource is developed with the characteristics of outstanding topics, targeted and specific content. For example, the making of key steps or key knowledge of sharing valuable instruments is more in line with the learning requirements of contemporary college students and general medical graduate students. It will be the establishment trend in the future.

Scientific Research Instrument Management Center of Zhongshan School of Medicine, Sun Yat-sen University has become one of the model radiation bases for equipment sharing management in universities in China. In 2017, the reservation of Scientific Research Instrument Management Center was 37,000 persons for the entire year, and service time of the equipment reached 79,300 hours. A total of more than 1300 research groups inside and outside the school used the equipment on the platform to conduct scientific research. Valuable instruments of the platform are used to complete experiments and publish high-quality SCI papers every year. Through the simplification of the results and diversified production of micro learning resources, the “mobile + interactive” instrument operation of micro learning source training can be used to effectively promote the open sharing of instruments at university.

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References:


