Design and Application of Automatic-explanation PPT Courseware for Key Points about Optical Time Domain Reflectometer Parameter Setting

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Abstract. Today, PPT courseware has become an effective means of teaching. However, PPT is often used only as an auxiliary tool for classroom teaching, so it is a subject worthy of study how to improve the PPT courseware for excellent courses. Turning such courseware into “automatic-explanation PPT courseware (AEPPTC)” through secondary processing will enable students to use it after class for more in-depth learning. To maximize the effectiveness of excellent courses, the paper describes how to design and apply the AEPPTC for the course Key Points about Optical Time Domain Reflectometer Parameter Setting (“Key Points” or “the course” for short hereinafter), so that it can be kept by the students to facilitate their preview, review, and self-study of the course in a vivid, interactive, and effective manner.

Keywords: PPT courseware, automatic explanation, design, optical time domain reflectometer, on-the-job training.

Introduction

“Simply speaking, the so-called multimedia courseware is a computer-based modern teaching means that, according to the teacher's teaching design, integrates the text, language, image, and other media information with the use of digital processing technology and audio-visual technology to achieve the storage, transmission, processing, transformation, and retrieval of teaching materials.”[1] As an effective form of multimedia teaching, PPT multimedia courseware has been widely used in training classes. After years of use in teaching, teachers of the training centers of various enterprises have accumulated a large amount of courseware for excellent courses, which is a
very valuable asset for employees. However, such courseware usually serves as an auxiliary means of classroom teaching, and students cannot understand the content of the course without watching and listening to the teacher. For company employees in particular, who have very limited opportunities to receive off-the-job training due to the limitation of working hours, it is necessary and important to design a type of AEPPTC that not only shows the teaching document but also has a voiceover. Such a kind of courseware, on the one hand, helps students with their preview, review, and self-study of the course, and on the other hand, facilitates the dissemination and inheritance of excellent courses. The paper elaborates on the AEPPTC for Key Points from the aspects of design principle, production process, and application effect.

**Design principle**

“Making multimedia courseware is not a simple process, but an extremely complicated process which involves a lot of educational theories such as pedagogy, psychology, instructional design, learning theory, and esthetics.”[2]

Hence, the AEPPTC design for Key Points must be based on the principle of being typical, educational, interactive, topic-prominent, and expandable.

**AEPPTC must be typical.** Typicality is the premise of automatic-explanation PPT courseware and determines whether the ordinary PPT courseware needs secondary processing. The principle of being typical, on the one hand, requires the PPT courseware to be representative, i.e., it should represent the typical knowledge and skills of a certain discipline; on the other hand, it requires that the course corresponding to the PPT courseware should be an excellent one that is worthy of promotion. The content of Key Points PPT courseware is about the operation settings of a kind of optical time domain reflectometer, which is a test instrument commonly used in the communication field, and the course teaches communication employees very essential operation skills. As the course won the first prize in the First Teaching Skills Competition of the State Grid Corporation, it was decided to upgrade the courseware into AEPPTC through secondary processing so as to achieve the best use of the course.

**AEPPTC must be educational.** The principle of being educational is the basis of automatic-explanation PPT courseware, and all courses must follow this principle. “The courseware must be based on the teaching material.”[3] It must follow the laws of teaching; all the links must be complete and reasonable; the teaching objectives must be clear; the content must be accurate and scientific; the key points and difficult points must be highlighted; the exercises and homework assignments must be arranged rationally. In addition, the PPT courseware’s pace and speed of automatic explanation should be appropriate to leave enough time for students to understand the course content.

The PPT courseware is designed and produced in strict accordance with the principle of being educational. The curriculum is introduced and arranged in line with the requirements of educational psychology. The course content begins with a typical case of optical cable fault. By revealing the real data related with the fault, the courseware enables the students to intuitively realize the serious impact of an optical cable fault on the power system, thus arousing
their interest in learning. Furthermore, a brief introduction of the distribution of key and difficult points of the course helps the students clearly understand the structure and focus of the curriculum; an introduction of the knowledge goals and skill goals of the course enables the students to be clearer about the knowledge and skills to be taught. In addition, each link of the courseware conforms to the teaching law. By reasonably setting questions and discussions, the courseware helps the learners to find out and solve problems independently. An accurate summary at the end of each section helps the students to review the knowledge, enhance memory, and form a knowledge system. By doing exercises and homework, the students learn how to use the knowledge and master the skills.

**AEPPTC must be interactive.** The principle of being interactive is the key to automatic-explanation PPT courseware. Since the AEPPTC is mainly used by students for self-learning, with appropriate guidance from the teacher, if most of the content is merely one-way explanation, it will make the course less interesting and reduce students’ learning efficiency. For this reason, the courseware must be designed to be interactive so as to enhance students’ sense of participation, improve their learning experience, and stimulate their interest in learning. To achieve these effects, the courseware may be designed to contain some interactive questions and answers, small games, etc. The principle of being interactive is taken into full consideration in the production of the Key Points PPT courseware. The students are guided to think through questioning, practice, interactive games, etc.

**AEPPTC must be topic-prominent.** The principle of being topic-prominent is the key of automatic-explanation PPT courseware. The AEPPTC must be topic-prominent and clearly layered. Key content can be stressed by using bold-type or colored key words, and main information can be displayed to the students in a hierarchical manner by the use of animation buttons to help students better understand the content of the course. The principle of being topic-prominent is followed throughout the production process of the Key Points PPT courseware. The main content of the course is highlighted by adjusting and changing the font size and color so that the learners can get the key content from a vast amount of information. Difficult points are taught in the form of animations so as to deepen learners’ understanding and memory.

**AEPPTC must be expandable.** The principle of being expandable is an effective supplement to automatic-explanation PPT courseware. Effective expansion can improve the breadth and depth of the students' knowledge, broaden the work ideas, and enhance the awareness of innovation. In addition to teaching basic knowledge and skills, the AEPPTC may also contain some knowledge-expanding documents to introduce more in-depth course content, the most cutting-edge technology, and the latest innovation achievements in the field, with which the students can expand the scope of learning according to their own needs and actual conditions. The principle of being expandable is taken into full account in the design of the Key Points PPT courseware. The course book of Key Points and expansion documents are inserted at the end of the courseware in the form of hyperlinks. The expansion documents include...
the product manuals of commonly-used types of optical time domain reflectometers (OTDRs), materials about testing skills of OTDRs, and relate papers. These documents provide students with richer and more in-depth learning contents.

**Production process**

Automatic-explanation PPT is made through secondary processing of traditional PPT; in other words, it is an update and innovation of the latter. “To optimize multimedia classroom teaching and strengthen the application effect of multimedia courseware, we must deepen our understanding of the correct application of multimedia courseware and update our teaching concept under the guidance of modern educational theories and instructional design theories.”

Therefore, the production process of PPT courseware must conform to these theories. Since the Key Points AEPPTC is produced by upgrading the original PPT courseware, it accords with the above-mentioned requirements and principles. The original courseware is one class hour in time length and consists of five parts: case introduction; teaching objectives; course content (including “basic working principle” and “parameter setting”); classroom exercise; content summary & action tasks. The courseware visualizes the abstract theoretical knowledge by means of pictures, animations, comparison, etc. It is on this basis that the courseware is produced.

**The form of the original courseware is appropriately modified to increase readability and interactivity.** With more contrast curves but less text content, the original courseware was mainly designed for the teacher to use in classroom teaching. The AEPPTC, however, is intended for students’ self-learning, so it has more text content so as to be more readable. In addition, the interactive quiz points in the original PPT are replaced by point-and-click interactive quiz in the AEPPTC, where the student can complete the interactive quiz by clicking on the mouse to choose the answer option corresponding to the question, and the courseware will automatically give different responses to different options along with automatic explanations to guide the student to choose the right option. Furthermore, considering that the original courseware has quite a lot of contrast curves, an interactive game “Let’s Observe Details” is introduced into the new courseware, through which the student can carefully observe two contrast curves and point out their differences by the use of the mouse. Interactive games like this have stimulated students’ interest in learning, encouraged them to think actively, deepened their understanding, consolidated their memory of knowledge, and effectively improved their learning effect.

**Insertion of teaching documents.** Teaching documents are a summary and development of the teaching contents, helping the students to understand knowledge, broaden their horizons, and broaden their thinking. Teaching documents including the course-related textbook, knowledge-expanding materials, research papers, the latest technical data and innovations, etc., are inserted in the form of hyperlinks into the courseware’s summary interfaces. Students can click on any of these hyperlinks to choose the teaching document they want to read according to their own needs. These documents not only help students better understand and master the course content, but also provide them...
with the materials for more in-depth learning, give them new ideas, help them find the breakthrough point of innovation, and equip them with the latest cutting-edge technology.

**Addition of WeChat learning group two-dimensional code.** With the continuous development of the times, WeChat groups have become good platforms for learning and exchanges. A WeChat learning group two-dimensional code is added to the last page of the PPT, so that the students watching the courseware can join the WeChat learning group by scanning the code with their mobile phones. Members of the group can have free discussions, share learning experience, resolve difficult problems together, and make common progress through mutual communication.

**Voice-over recording.** As a specific description and explanation of the PPT courseware content, voice-over is equivalent to the classroom teaching of teachers, and its quality directly affects students’ understanding and mastery of the course content. For this reason, particular attention is paid to the clarity and speed of the voice-over in the production process of the PPT courseware.

Full preparations have been made before the voice-over is recorded. First of all, the content of the voice-over is made into the form of a document, which is conducive to the fluency of recording. Next, the document is segmented and numbered according to the page number of the PPT, which is conducive to the accuracy of recording. Finally, explanatory voice-over in standard Chinese is recorded for the PPT courseware. The narration is medium in speed and clear in logic, accurately corresponding to the course content. The interactive part, in particular, gives different voice-over responses to different operations of the student. Provided on the first page of the PPT courseware are three play modes — auto play with voice-over, manual play with voice-over, and play without voice-over — to meet the different needs of students.

**Setting of automatic show.** Since the fluency and speed of PPT courseware play directly affects the learning effect of students, particular attention is paid to the control PPT courseware play time and speed. PPT automatic show is set through the rehearsal timing function, followed by adjustments, modifications, and improvements until the courseware becomes almost perfect.

**Application effect**
The Key Points AEPPTC has been fully used at the Training Center of State Grid Jilin Electric Power Supply Company. According to a questionnaire survey on 48 students who have received training at the Center, 75% of the respondents are “very satisfied” with the courseware, 18.75% “satisfied,” and 6.25% “basically satisfied,” showing that the courseware’s application effect is quite good. In addition, the author will continue to adjust, modify, and improve it according to the comments and suggestions of the respondents so as to optimize the training effect.

**Summary**
As an upgraded version of the traditional PPT courseware, the AEPPTC facilitates students’ preview, review, and self-study. Produced through secondary creative processing of the original PPT courseware, the Key Points
AEPPTC has extended the time span of teaching achievements and contributed to the dissemination and inheritance of excellent courses.

References