Design of an on-line lesson preparation system

Dan Li, Xin Xu, Yanshuang Li & Jianbo Wang

North China University of Science and Technology
Tangshan, Hebei, People's Republic of China

ABSTRACT: Learning conditions analysis, matching of teaching resources to the teaching, and providing an on-line system based on the teaching timeline are the practical requirements for an on-line lesson preparation system. The design of an on-line lesson preparation system is put forward in this article. The system would connect with the students' learning system, with the teaching process based on a teaching timeline. Individual lesson preparation and collective lesson preparation are supported. From this study, a design for an on-line lesson-preparation system was deviced, including personnel roles and authorities, and a function model. This is expected to provide a theoretical reference for the development of network lesson-preparation systems.

INTRODUCTION

As the preparatory phase, lesson preparation plays the role of formulating teaching in the pre-teaching stage [1]. Along with the promotion of primary and secondary school education informatisation, electronic schoolbags and the intelligent classroom are becoming more common. This is leading to a dynamic and flexible intelligent teaching environment [2]. As an important part of the intelligent teaching environment, a lesson-preparation system plays a significant supporting role for teaching. Preparing lessons based on an on-line lesson-preparation system is gradually increasing in primary and secondary schools [3].

ANALYSIS OF ON-LINE LESSON-PREPARATION SYSTEMS

Current On-line Lesson-Preparation Systems

- Inflexible teaching plans:

  Early electronic lesson-preparation systems simply organised teaching material according to the teaching plan, without the functions required for electronic lesson preparation [4]. Later research produced designs for the electronic lesson-preparation systems using HTML, which provided editing and composing functions [5].

  Current electronic lesson-preparation systems provide functions for content editing, composing and linking to resources. They provide for the editing and storage of content, without an easy-to-use visual interface for teachers when designing the lessons. When teachers design teaching plans using these lesson-preparation systems, they usually describe directly the content according to the original teaching plan. The result is simply to convert the teaching plan on paper into an electronic version. This inflexible system, although convenient for the transmission and diffusion of the teaching plan, does not support the teachers' lesson preparation process, nor does it exploit the possibilities for on-line lesson preparation.

- Lesson preparation divorced from the teaching process:

  Given widespread implementation of the *Class 2 Class* platform, teachers desire their individual teaching plans to be developed using a network platform [6]. However, on-line lesson preparation is still at an initial stage of *storage - extract - print*, which means the electronic teaching plan is simply converted into a paper teaching plan and Microsoft PowerPoint courseware. There is no essential difference between this and the paper teaching plan in traditional lesson preparation. It does not exploit the characteristics and advantages of on-line lesson preparation.

Requirements for Primary and Secondary School on-line Lesson-Preparation Systems

- Students' learning condition:

  The teaching design needs to be carried out with a full understanding and analysis of students' learning level and other learning conditions [7]. Prior to lesson preparation, a teacher needs to have a full understanding of the students' mastery of knowledge, homework completed, learning style and learning difficulties. The students' learning condition is the basis for determining teaching activities and teaching resources.

- Quality teaching resources:

  Some researchers maintain that resource management is the most important requirement for educational informatisation [6]. This is even more so during lesson preparation and teaching. During lesson preparation, materials needed by teachers can be obtained directly using a search engine. However, the material will be of mixed quality, applicability and usability.

  Good quality resources accumulated by teachers are dispersed in many places, which makes it difficult to research, use or share them. Therefore, teaching resources that can be readily stored and accessed are needed by the on-line lesson-preparation system, e.g. a resource bank by grade and subject. The resources should be convenient for teachers to search and find. In order to maintain the openness and dynamics of the resource bank, it should be allowed for teachers or administrators to add new resources and delete outdated ones [8].

- Timeline-based activity frames:

  Lesson preparation is a process whereby teachers design a teaching activity sequence, with matched teaching resources, for the purpose of reaching a teaching goal. Teaching is a process by which teachers implement the teaching based on the lesson plan developed during lesson preparation. Teachers organise and implement teaching activities in a time order, to form the teaching activity sequence or teaching procedures. With on-line lesson preparation, teachers expect the same lesson preparation experience. The timeline is the main driver, with various teaching and learning activity frames providing support for lesson preparation.

GUIDELINES FOR AN ON-LINE LESSON-PREPARATION SYSTEM

To address the weaknesses of current lesson-preparation systems, adapt to the trend of informatisation of the teaching environment, and based on demands of primary and secondary schools, this study led to an integrated design for an on-line lesson-preparation system with these characteristics:

- Connect with students' learning:

  The starting point of lesson preparation is an analysis of the students' learning [9], in particular the connection between on-line lesson-preparation system and learning. Thus, teachers understand the degree to which previous knowledge has been mastered and the adaptation to the original teaching method. With these as reference, the lesson preparation and teaching will be in accord to demands.

- Co-ordinate with the classroom teaching:

  There should be a seamless merger between the lesson-preparation system and classroom teaching. The teaching plan formed during lesson preparation is applied to classroom teaching. With the digitalisation of the learning environment, the direct application of electronic teaching plans to classroom teaching through the teaching platform becomes possible [10]. When designing the on-line lesson-preparation system, the interface to teaching plans should be convenient and fast, to support integration of lesson preparation before the class, with teaching in the classroom.

- Timeline-based teaching activities:

  Designing teaching procedures is the core of lesson preparation, which is also key to influencing the teaching process and teaching benefits. Teaching procedures design is the design of teaching activities, which determines the order and priority of teaching activities, that is to say, it determines the timeline for teaching activities.

  Therefore, the design of the teaching process based on the timeline is an important principle for guiding on-line lesson preparation. This stresses that the on-line lesson-preparation system should release teachers from the tedium of lesson preparation, so they can concentrate on the teaching procedures, which is the key to lesson preparation. The on-line lesson-preparation system should provide teachers with a lesson preparation framework for the teaching activities and timeline at the same time.

Design of the teaching process based on the timeline proceeds; thus, teachers *put* the teaching activities on the timeline to form many teaching activity nodes on the timeline; by changing the position of teaching activity nodes, a teaching activity sequence with time order is formed, thereby, realising the design of the teaching procedures.

- Individual and collective lesson preparation:

  Individual lesson preparation involves a single teacher; collective lesson preparation involves a number of teachers [11]. Both occur in primary and secondary schools and both are important for guaranteeing successful, effective teaching. The on-line lesson-preparation system should support both individual and collective lesson preparation and easy switching between these lesson-preparation modes. The on-line lesson-preparation system should be simple to use in either mode.

DESIGN OF THE ON-LINE LESSON-PREPARATION SYSTEM

Based on the above guidelines, a design was conducted of an on-line lesson-preparation system, including personnel roles, authorities and function model.

Personnel Roles and Authorities

A system generally has three grades of user, viz. system administrator (or super user), subject administrator and common user [12]. The subject administrator has a management role between system administrator and subject teacher, and is responsible for the teaching plan and resource management for a subject. The system administrator authority includes user management (e.g. adding, deleting, reviewing), management of teaching plans and teaching resources (e.g. importing, deleting, reviewing) and maintenance of the system. As a key user, the subject teacher establishes, edits, and deletes resources related to the teaching plan and other works.

Application Procedures and Functional Model

The design of the on-line lesson-preparation system should fully support the teacher's daily lesson preparation activities; integrate lesson preparation with teaching; be centred on teaching activity design; and be practical and easy to use [13].

Through analysis of teaching plans, it is found that during lesson preparation, teachers need to analyse learning conditions, design teaching activities reflecting teaching content and teaching purpose, and allocate teaching resources. Therefore, the application procedures of the on-line lesson-preparation system should support these activities, and in the language commonly used by teachers [14].

Lesson preparation and teaching integration requires the teaching plan to have pertinence and applicability. The starting point of the on-line lesson-preparation system is the learning conditions analysis and the ending point is the application of the teaching plan to teaching. Teaching procedures are teaching activity sequences in priority time order. Teaching activity design is the key section of the lesson preparation activity. So, the teaching activity design and teaching activity sequencing are important application procedures.

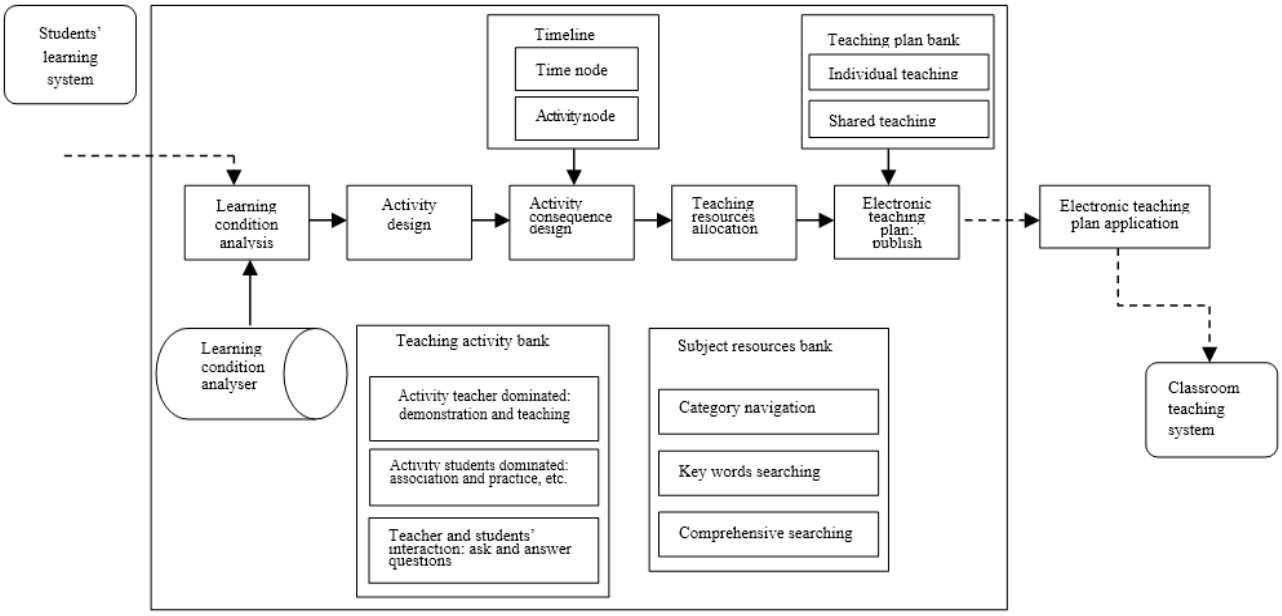

Figure 1: Application procedures and functional model for the on-line lesson-preparation system.

Based on the above analysis, the on-line lesson-preparation application procedure covers: *learning conditions analysis - activity design - activity sequence design - teaching resources allocation - electronic teaching plan release*. This is shown in Figure 1. This can meet the demands of teachers in primary and secondary schools for individual and collective lesson preparation. From the perspective of system functions, collective lesson preparation is a collaborative activity by teachers based on individual lesson preparation. To support collective lesson preparation, functions were added for building a collective lesson preparation group, reviewing basic teaching plans, re-establishing finished teaching plans and others using the individual lesson preparation function as a basis.

Based on the principle of promoting teachers' efficiency and providing a rich framework for lesson preparation, five functional modules were designed for the on-line lesson-preparation system:

- Learning conditions analyser:

  Learning conditions analysis is the starting point for teachers' lesson preparation. An exact and timely understanding of students' learning conditions is the necessary precondition for teachers to prepare lessons. The learning conditions analyser connects with the students' learning system, making it convenient for teachers in understanding the status of students' development and predicting future development possibilities. It allows teachers to check and analyse data related to students' learning, so as to determine mastery of knowledge points, homework completion and the extent of preparations. Hence, this assists teachers in formulating teaching, which meets students' learning demands and improves the teaching outcomes.

- Teaching activity bank:

  In order to support fast and convenient design of teaching activities, the lesson-preparation system provides a teaching activity bank. The teaching activity bank has three categories, viz. teacher, student, and interaction between teachers and students. The bank includes demonstrations, teaching material and practice material, as well as questions and answers. Teachers can add teaching activities through a simple click-and-drag operation. Meanwhile, the lesson-preparation system has a teaching activity template, which can be used by teachers to produce personalised teaching designs as required.

- Timeline:

  Classroom teaching is an orderly implementation of teaching activities according to a time order. The timeline tool is a frame provided by the lesson-preparation system for the teachers to design teaching-activity sequences. The timeline takes the time node and activity node as the basic units. The lesson-preparation system provides a time node segmentation template for teachers, and also allows for teachers' independent design and segmentation. Through dragging, teachers can quickly adjust and modify the teaching-activity sequence. They can set the start and duration of each teaching activity. By linking the time and activity nodes, the teaching-activity sequence can be completed.

- Subject resource bank:

  The subject resource bank is used for storing the teaching resources for a subject. This is used by teachers during lesson preparation. Resources in the subject resource bank are stored according to grade, category, knowledge and other properties. Teachers can search for these resources by classification, keyword search and combined searches. Teachers can also preview resources in various media formats and add these resources directly into the teaching plan for later classroom use.

- Teaching plan bank:

  For the convenience of teachers storing, accumulating and sharing teaching resources, the lesson-preparation system creates individual space and sharing space for the teachers, viz. the individual teaching plan bank and shared teaching plan bank. In the individual teaching plan bank, teachers' individual teaching plans are stored, and the teaching plans retrieved from the shared teaching plan bank. Shared teaching plans are stored in the shared teaching plan bank. The shared teaching plan bank is a support for the collection and re-establishment of teaching plans. Through the sharing, collecting and re-establishing of teaching plans, communication among teachers is promoted.

CONCLUSIONS

Digitalised teaching environments are evolving continuously, supporting an increased proportion of the teaching process. A seamless connection between lesson preparation and teaching is a demand of teachers and a direction for educational informatisation. Instead of simply converting paper teaching plans into an electronic form, on-line lesson preparation involves the organisation and design of a teaching-activity sequence. The on-line lesson-preparation system is an important and constituent part of an integrated and intelligent learning environment.

The on-line lesson-preparation system, designed as part of this study, is a support for teachers' teaching design based on learning conditions data from the student learning system, allowing teaching activities to be organised in priority time order. The teaching plan can be used directly in the classroom teaching. The seamless connection between lesson preparation before class and classroom teaching, with extremely strong operability, has significance for the promotion of digital teaching.

REFERENCES

1. Sheng, Q. and Ma, L., On lesson planning process of system design teaching. *Educ. Research*, 5, 67-71 (2001).
2. Wu, F. and Huang, L., Design of network preparation lessons system based on thinking of integration. *Modern Educational Technol.*, 25, 9, 103-109 (2015).
3. Wang, Y. and Jiang, J., Construction of the intelligent classroom system based on demand. *Modern Educational Technol.*, 6, 99-105 (2014).
4. Cai, Q. and Wu, X., The design of electronic lesson preparation system based on campus network. *China Audio-visual Educ.*, 12, 58-60 (2000).
5. Li, L., The design and implementation of lesson preparation system based on Web. *Educ. Infor.*, 5, 34-36 (2006).
6. Wang, S., Research on the construction of teachers' personal space based on network teaching and research platform. *China Audio-visual Educ.*, 11, 140-142 (2012).
7. Cui, P. and Sun, Y., Causes and countermeasures of low efficiency of students' learning. *Chinese and Foreign Entrepreneurs*, 26, 184-185 (2013).
8. Zhang, S. and Zhang, H., Vocational school *ship lofting*: exploration and practice of the construction of teaching resource database. *J. of Wuhan Institute of Shipbuilding Technol.*, 6, 85-87 (2014).
9. Yin, D., Highlight the core of the main line, pursuit the effective teaching - talking about the practice and thinking of effective teaching in junior middle school. *Middle School Mathematics*, 2, 11-13 (2014).
10. Song, G., Zhou, S., Zhang, W. and Mou, H., Reform the traditional teaching mode by using the multimedia technology of computer assisted instruction. *Heilongjiang Higher Educational Research*, 1, 74-75 (1999).
11. Li, J. and Zhao, W., Collective lesson planning: connotation, problems and reform strategies. *J. of Northwest Normal University (Social Science Edn)*, 6, 73-79 (2011).
12. Qi, X. and Ma, X., Design and development of network teaching resource database system of *educational technology*. *Chinese Distance Educ.*, 4. 37-40 (2005).
13. Li, D., Xu, X., Li, Y-s. and Wang, Y., Designing a developmental evaluation system for a network teaching platform. *World Trans. on Engng. and Technol. Educ.*, 13, **4**, 456-461 (2015).
14. Li, X., Lesson preparation: three steps and four questions of *Study the Teaching Materials*. *Vocation*, 29, 86-87 (2009).