

Development of Class and Learning Materials Design Tool based on Instructional Design

Shigeru SASAKI^{a,*} & Hiroyoshi WATANABE^{a,b}

^a*School of Science and Engineering, Teikyo University, Japan*

^b*Learning Technology Laboratory, Teikyo University, Japan*

*sasaki@ics.teikyo-u.ac.jp

Abstract: We have proposed the class design and the learning materials development method by creating the “class outline” and “contents outline”. The class outline is the design of the whole activities in the class and the “contents outline” focuses especially on the contents. In this paper, we define the class and learning materials design method as a systematic process by making the class outline and the contents outline, and we develop the support tool (COEdit) for this method.

Keywords: e-learning, learning materials, design, development, support tool, class outline, contents outline

Introduction

In a self-learning style course, it is very important to develop the learning materials so that learners can surely understand. To design such learning materials, instructional design (ID) concepts and systematic models are variable and helpful. When we develop the learning materials, we need to design not only the class activities following the ID models but also the detailed structures and contents of the learning materials. However, sometimes it is very hard and time consuming to develop learning materials strictly following the ID models.

We have reported that we have designed and developed the learning materials for Java programming course with student assistants' participation [1], and we have proposed the class design and the learning materials development method by creating the “contents outline” which focuses especially on the contents in addition to creating the “class outline” which is the design of the whole activities in the class.

We found that, by creating the contents outline, teachers could share a very detailed image of the learning material contents with assistants and estimate the amount of work for the contents development [2]. It means that the contents outline is useful and effective even if we develop the learning materials without extra staffs' participation.

In this study, we have developed the support tool for the class and learning materials design following our method. Before developing the tool, we have indicated the role of the class outline and the contents outline in our method. We have designed and developed the class and learning materials for a laboratory course using this tool.

1. Class design and learning materials development following the ID models

So much attention has been paid to ID as an e-Learning course design and learning materials development method. The systematic design models have been adopted especially for e-learning courses. In systematic models, such as ADDIE model, the output from the prior step is used as an input to the following step. Dick and Carey's model is a famous systematic model which contains feedbacks from the formative evaluation step [3].

Nakai et al. have described the nine step model [4]. Their procedures are systematic and fitted for the class design at the universities. Among the ID models, the systematic procedures for learning materials development have not been described in detail because the less experienced staffs' participation in the learning materials development would not be assumed. We are going to define the learning materials design and development method as a systematic process in the next chapter.

2. Class design and learning materials development process including preparation of “class outline” and “contents outline”

2.1 Whole flow of learning material development

A large part of our class design process depends on the reference [4]. We have taken ID concept into consideration when we design our learning material development process. A whole flow of the learning material development is as follows.

(1) Analyze and design the entire course

The entire course is analyzed and designed in this stage, and then the objectives of the course are allocated to each class.

(2) Design each class

Each class is designed in detail. Activities in each class are also designed in this stage. The class outline is made by bringing these together.

(3) Design learning materials

The details of the learning material contents are designed based on the class outline. The contents outline is made in this stage.

(4) Develop learning materials

The learning material contents are made according to the contents outline.

(5) Implement learning materials

The learning material contents are converted into Web pages, and presented on the CMS.

(6) Evaluate learning materials

The learning materials are evaluated and revised after they had been made or they had been used in the course.

We have developed the class outline and the contents outline in stage (2) and (3). The details of a class outline and a contents outline are mentioned below.

2.2 Class outline

The class outline is design of each class, which is edited focusing on learning activities. The composition of the class outline is shown in Figure 1.

In a class outline, we design a composition and a flow of the whole class which also includes learners' activities. Therefore the contents of the class outline are not necessarily equivalent

to the contents that should be put in the learning materials, and it may contain some information which is not directly related to learning materials development.

- Objectives of the class
- Test items of the class
- List of the items that should be explained to achieve the objectives
- A flow of the module
 - Introduction
 - Contents of the learning material
 - Learner's activities
 - Test items of the class
 - Progressive studies

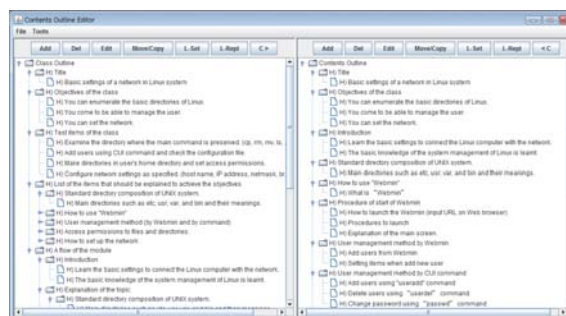


Figure 1. Composition of the class outline

Figure 2. Main screen of the class and learning materials design tool.

2.3 Contents outline

In contrast to the class outline which is written focusing on a composition and a flow of a whole class, the contents outline is written focusing on the structure of the pages of the learning materials. A flow of the developing learning materials based on the class outline is as follows.

1. Design the composition and the flow of learning materials in the whole class.
2. Determine the structure of the pages of learning materials according to the composition and a flow designed above.
3. Develop the explanations and the assessments, etc. on each page.

The item 1 and 2 mentioned above is designed in making a contents outline. We write the structure and elements which should be explained in the learning materials as in detail as possible, such as what sorts of thing are included and how to explain these elements.

The contents outline has been developed when we asked some high-achieving students to participate in the learning materials development as assistants. The contents and the composition of each page of the learning materials are clarified by introducing the contents outline. It will reduce the part that the student assistants need to design by their own thoughts. However, we think that the contents outline is effective even when student assistants do not participate in learning materials development.

3. Development of a support tool for class and teaching materials design

Following the process defined in Chapter 2, you can design a class and develop learning materials systematically by making the class outline and the contents outline. However, you have to work by making or referring the different outlines in each step. If you can work step by step obeying appropriate instructions or you can edit these outlines together, you will be able to work more effectively.

There is an evaluation process in the ID model. It is performed when learning materials have been completed or the teaching practice using the learning materials has been finished. Because we use two outlines when we design class and learning materials, it is troublesome

to correct them when we evaluate and revise the class activities and the learning materials. If the outlines are not properly maintained, it will be difficult to evaluate and revise them. To solve these problems, we have developed the support tool, which can be used when you design class and learning materials following the process defined in Chapter 2. We call this tool “Class / Contents Outline Editor (COEdit)”. The following functions are required for COEdit.

- The class outline and the contents outline are displayed at the same time.
- These outlines are displayed by the tree form so that the levels of headings are clearly shown.
- It has the wizard tool to support the class outline and material design following the procedure.
- The items can be edited by using add, delete, modify and copy functions.
- It can save and read the outline data written in Microsoft Word document format.
- The related items are linked so that they can be edited together.

COEdit was developed using Java Swing. The main screen of the tool is shown in Figure 2.

4. Practices of the class and learning materials design using the tool

We have designed the class activities and the learning materials of the “Laboratory on Information Science 3”. This course is set for third year students in the distance learning course in the information and computer science department. The class outline is written following the instructions provided by the wizard tool. Some items in “a flow of the module” step were copied from the former steps. Many items in the contents outline were copied from the class outline. The bookmark function in Microsoft Word is used for the link between items in COEdit. The bookmarks are set automatically when new items are added, and the bookmarks are kept when the items are copied. Hence we do not need to set the bookmarks again. Therefore we could work efficiently by using COEdit.

5. Discussion

We have defined the class and learning materials design method as a systematic process. It is recommended to follow the process when you write the class outline because this process is based on the ID theories. However, we think that it is not always necessary to write the contents outline. The contents outline will be necessary when we develop the learning materials with less experienced staffs’ participation. For instance, we need to ask them to participate in a large-scale development of learning materials. In such cases, the contents outline will be necessary. We have developed the contents outline when we asked student assistants to participate in the learning materials development for Java programming courses, in which we needed to prepare four 15-class courses [1].

Because there were only 7 classes which use web based learning materials in Laboratory on Information Science 3, one teacher in charge made the whole learning materials. In that case, the learning materials have been developed in Microsoft Word after the contents outline has been made using COEdit. If the learning materials development is small-scale so that the teacher can work alone, the teacher who has enough experience and skills might be able to develop them based on the class outline without making the contents outline. However, when we design the details of the learning materials by making the contents

outline, we sometimes review and revise them. It seems that the contents outline also has a role that designers can evaluate and review their work.

Jung et al. are aiming at the following by prototyping [5].

- (1) Imagine and discuss various sides of the learning materials design.
- (2) Clarify the idea and physical properties of the class.
- (3) Take early feedback from the learners.

It seems that our aims to make the contents outline are similar to (1) and (2). Needless to say, you cannot use the contents outline to conduct the evaluations to obtain feedbacks from learners.

We have implemented the class design wizard and the function to edit these outlines together by linking related items in COEdit. We think that the wizard function is useful when we write the items in “Objectives of the class”, “Test items of the class” and “List of the items that should be explained to achieve the objectives”. On the other hand, we need to improve the wizard interface for “A flow of the module”. Because “a flow of the module” step is divided into more detailed steps, these steps should be included in the wizard.

Moreover, it is hoped that COEdit will be able to support the analysis and the design phase for the entire course, and can manage all the data for the course design. These points will be our future works.

6. Conclusion

In this study, we have defined the class and learning materials design method as a systematic process by making the class outline and the contents outline. We have developed the class and learning materials design tool (COEdit) which has the class design wizard and the functions to edit these outlines together by linking related items. COEdit seems to be very useful when we design class and learning materials following the proposed process.

Acknowledgements

This research was supported by the Ministry of Education, Science, Sports and Culture, Grant-in-Aid for Scientific Research (C), 22500938, 2010 and also supported by Teikyo University, Grant-in-Aid for education and research, 2009.

References

- [1] Sasaki,S.,Arai,M.,Furukawa,F. and Watanabe,H. (2008) Web-based Learning Material Development with Less Experienced Staffs' Participation, Proc. of International Conference on Computers in Education 2008 (ICCE 2008), 445-449
- [2] Sasaki,S.,Arai,M.,Furukawa,F., Watanabe,H. and Takei, S. (2008) Web-based Learning Material Development with Student Assistants' Participation, Proceedings of research meeting for information in education in 2007, C1-4, 174-177
- [3] Dick,W., Carey,L. and Carey,J.O. (2001) Systematic Design of Instruction (5th ed.), Addison-Wesley Educational Publishers Inc.
- [4] Nakai,T., Yamasato,T., Nakajima,H. and Okada,T. (2003) e-Learning Handbook, Manahouse, Japan.
- [5] Jung, I., Kubota, K. and Suzuki, K. (2008) Instructional Design by the OPTIMAL Model – Effective Method for Blended Type e-Learning, Tokyo Denki University Press.