

Title	学習者の要求に応じた電子教材の設計と実現
Author(s)	岸, 三樹夫
Citation	
Issue Date	2002-03
Type	Thesis or Dissertation
Text version	author
URL	<a href="http://hdl.handle.net/10119/1557">http://hdl.handle.net/10119/1557</a>
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Description	Supervisor:落水 浩一郎, 情報科学研究科, 修士

# Construction of Electronic Teaching Material to Satisfy Learner's Demand

Mikio Kishi

School of Information Science,  
Japan Advanced Institute of Science and Technology

February 15, 2002

**Keywords:** Distance Learning, Web-based System, Courseware, Retrieval.

## 1 Background and Purpose

At present, many distance educational systems over network are developed and used. As compared to the conventional CD-ROM-based teaching materials, these make it possible for learners to acquire the current learning contents all the time. Moreover, the progress of WWW (World Wide Web) technology make it possible for learners to learn a new learning style and contents type using web browser. The courseware is one of the most general form of the distance educational system. This learning style implies that learners take a lecture with the teaching materials created on the basis of teacher's policy and contents, one by one. However, even if the teaching materials are used for various situations and purposes, they should be able to provide a dramatic effect against learners. For instance, when learning about a certain lecture for the first time (preparation etc.), it may be good to take a lecture with above-mentioned courseware learning system from the start to the last, one by one. However, when requiring a particular information with precision such as review about a certain matter, it should be able to access the required teaching materials in the shortest distance. It is considered that learners need to be able to take a lecture with only the interesting contents or by the way of using favorite view method regardless of teacher's policy.

In this paper, first, we clarify the problems about existing courseware system. Then, to solve these problems, we design and implement the learning system which provides required teaching materials on demand.

## 2 Design and Implementation

Design policies about our system is as follows.

- Policy 1. This system reuses the multimedia data of existing courseware system because a considerable number of cost is needed in order to re-create multimedia contents from a scratch.
- Policy 2. The teaching materials need improving incrementally as well as using their materials in the actual lecture and taking in the feedback from learners. Therefore, it is necessary to design the system which does not need changing the whole system whenever it changes one function.
- Policy 3. We construct the functions which can search only the learner's requirement contents instead of using learning contents which a teacher specifies in advance.

Moreover, we focused on the following functions in order to realize the above policy 3.

- A keyword retrieval focusing on the multimedia contents  
It is necessary to provide the retrieval function in order to acquire the part to learn uniquely from huge volumes of multimedia contents. This retrieval function provide the learning contents by a keyword retrieval which focus on the text information in multimedia contents. As such text information, there is the text spoken by teacher, slide text, title text and so on. by using them suitably, it is possible to learn more efficiently.
- A support for the restudy with bookmark function  
There is a limit in searching for learning contents with only the data which exists in contents. Therefore, by registring the learner's personal information and using them, it is possible to improve the learning efficiency further. In this system, it focus on the bookmark information in the personal information.
- A selection of multimedia contents according to the situation and intended purpose  
When learners get the learning contents from the system, all multimedia contents(video,slide and text) are played as a default. However, learners does not want to such all multimedia contents because there are difference between learners about network bandwidth and learning method. So, if learners can select these media freely, it will be very effective.

We implement on the basis of these design policies and required functions.

## 3 Evaluation and improvement

We experimented to compare the existing courseware system to this system and to evaluate the validity of this system. On a concrete target, the experiment was performed as a part of real classroom lecture of "Software Design Methodology" in JAIST. And, 12 students who took the lecture used this system, and answer the questionnaire after use. In this instance,

We used two kinds of evaluation methods to evaluate this system. The first is the evaluation method using AHP (Analytic Hierarchy Process) which developed at our research group. By using this evaluation method, it is possible to evaluate the significant difference of both systems intuitively. The second is the investigating method using the evaluation question paper. By using this evaluation method, it is possible to focus on the details of each function of the system which cannot be evaluated by AHP evaluation method.

From the evaluation results using AHP, it was able to check that this system had significant against existing courseware system about “effect on function to select media” and “ease of accessing the demanded leaning contents”. Additionally, it was able to check that this system had significant about not only these criteria concerning functionality but also sensuous criteria such as “ease of concentration”. So, by providing functions according learner’s demand such as retrieval and bookmark function, it is considered that this system supports for not only functionally field but also sensuous field.

On the other hand, from the results of the questionnaire focusing on each function, it is discovered that functions which this system provides was inadequate. As regarding “effect on function to select media”, it turned out that any combination other than video, slide, and text seldom used, but it is necessary to discuss about the grasp of learning situation and the improvement of contents. Additionally, as regarding “ease of accessing the demanded leaning contents”, as compared with the table of contents, the effect of the bookmark or retrieval function was not seen notably. It is consider that these each function should be improved further.

## 4 Conclusion

In this paper, we designed and implemented the electronic teaching material according to the learner’s demand. First, by applying the existing courseware system as a part of lecture of “Artificial Intelligence” and “Software Design Methodology” in JAIST, we analyzed these problems and clarified the required functions. Next, we implemented the system, and experimented to compare the existing courseware system to this system by applying this system as a part of lecture of “Software Design Methodology”. By applying evaluation method using AHP and investigating question paper, the validity of this system was able to be showed. Furthermore, we pointed out the improving point of this system, and showed that it is possible to improve without changing the portion of the core of this system.

In the future work, we need to improve the functions of this system and apply other courseware contents to this system.