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# Research on The Design of AHP Hierarchy Diagram for Evaluation Method of Web-based Learning Systems

Yuki Fujibayashi (110112)

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

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## 1 Background and Purpose

At present, many new educational systems are developed and used by the spread of the technical improvement of the network technology and information media and the Internet by which it is accompanied. In order to make comfortable and effective study environment, the evaluation method needs to be established. But there are a lot of evaluations, which are only shown the advantage and the fault of the function of the system by questionnaire. To improve such a situation, Inomata developed "Evaluation Method by AHP pays attention to learner's satisfaction of Teaching Materials in Distance Learning". AHP (Analytic Hierarchy Process) helps us choose one of several alternatives effectively based on some criteria. We extract major evaluation parameters by analyzing data got from investigation using the factor analysis. We can obtain the evaluation parameter by using the process of the AHP evaluation along a systematic procedure. But there are two problems in this process. One is that there is a correlation between evaluation parameters. In AHP, it is necessary that the evaluation parameter should be mutually independent. Another one is extraction of the point that should be improved. Those who execute the improvement are not decided, because factor by function of system and by teacher exists

together.

In this paper, designing the AHP hierarchy diagram is proposed through improvement of these two problems. And we aim at the improvement of the evaluation method of Web-based teaching materials so that the danger of making a judgment which was mistaken in selection of alternatives may be decreased.

## 2 Design of AHP hierarchy diagram

In AHP, it is preferable that there is no correlation between the elements of the same level. But if there is a correlation between elements, we cope well with the problem by two methods.

- The inner dependence method
- Elements with correlation brings it together

The inner dependence method is often used when the integration of elements is difficult and we can show the influence between elements by the pair comparison. But the evaluation becomes complex by using the inner dependence method. So we cope well with problem by the other method. The AHP hierarchy diagram having been designed by Inomata had the correlation between "Learner's Satisfaction" and other criterions. We thought that "Learner's Satisfaction" has been influenced from various factors such as "Teacher's presentation". We brought the element with the correlation together. That is, it will evaluate Web-based learning system only by "Reaction".

Moreover, to improve Web-based learning system, the factor which influences the learner's reaction is important. That is, we measure the degree of influence given to "Reaction" by "Teacher's Presentation" and "Learning Environment". And we propose the extraction method of the criterion into which each role of "Learner", "Teacher", and "System design person" is clearly divided.

## 3 Results of Experiment

We executed the experiment to confirm the effectiveness of this eval-

uation method. The experiment was conducted based on the improved AHP hierarchy diagram and effective evaluation parameters are extracted. The one experiment was performed as a part of real classroom lecture of "Artificial Intelligence" in JAIST. These experiment results were compared with the experiment result of Inomata. And the effectiveness of the proposed evaluation method was confirmed. Evaluation parameters which were not important and didn't have a significant difference were lost. It is because the correlation coefficient between evaluation parameters has become small. Another experiment was performed of "Software Design Methodology". We obtained no evaluation parameter by using an AHP. So we classified students by the cluster analysis, and we investigated the difference of students' ideas of Web-based teaching materials. We show such a technique to apply to improvement of Web-based teaching materials.

## 4 Conclusion and Future Works

In this paper, we propose the design of AHP hierarchy diagram for evaluation method of Web-based learning system. It is possible to evaluate Web-based teaching materials based on subjective judgment of students by using the AHP evaluation process. And we can extract the part that should improve Web-based teaching materials. We explain the design method of AHP hierarchy diagram as follows. We divided the AHP hierarchy diagram into two stages. The first is a stage where the students' reaction is measured. The second is a stage where the improvement part of the teaching material is selected. Moreover, we investigate the difference of students' ideas of Web-based learning system using cluster analysis.

As future works, at first, we must examine the design method of the question item of the questionnaire survey. Furthermore, it screens to the freedom description sentence. And we use it to decide to policy when we improve the Web-based learning system.