Utilization Practice of the Concept Mapping Program for Nuclear Engineer Training

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1. Introduction

Knowledge is the most important factor in the safe and reliable operation of the NPP. Many methods are used to enhance the knowledge level of the personnel in the NPP. Generally, classroom lecture method is used for nuclear engineers. But this method has some pitfalls as an adult training method because students have already a lot of knowledge, so they want to participate actively in the learning process.

KNPEI undertook a research project from March 2006 to September 2007 to capture the experience knowledge from senior staff and transfer it to junior staff. As part of the research activity KNPEI introduced a Concept Mapping Program and set up a Concept Mapping server to capture the experience knowledge of the senior staff. This Concept Mapping Program has some characteristics that can be used in learning about conceptual knowledge.

The purpose of this report is to introduce the utilization method and practice at KNPEI for the nuclear engineer training using the Concept Mapping Program.

2. Characteristics of the Concept Mapping Program

Understanding conceptual knowledge means that the students know the relationship between existing concept and new concept.

A key characteristic of the Concept Mapping Program is to have the means to present the conceptual knowledge. The Concept Map presents the upper concept and the sub concept while explaining the relationship between two concepts. This presentation method for conceptual knowledge is useful in understanding conceptual knowledge. Also this presentation method is similar to the human cognitive structures for gaining conceptual knowledge.

This program also has functions to link all kinds of information electrolyzed to the related concept including other concept mapping files, which makes it possible to give additional understanding to trainees about the conceptual knowledge. In addition, the knowledge presented by storytelling can be linked to the concept node.

The second important characteristic of the Concept Mapping Program is that has a remote communication function, which makes it possible to learn about some knowledge without the restrictions of space and time. A SME can make a Concept Map file on the Concept Mapping server for a subject, and then other persons can study the subject and add related information to the Concept Map to extend the knowledge level anytime. Therefore trainees don't need to be together for the training in a fixed space and time like a classroom.

The third characteristic of the Concept Mapping Program is the excellent information sharing function. The Concept Mapping Program has the ability to present the map on the web automatically when the map file is made. It means that anyone can see the knowledge concept on the web without a separate program. Also, it is useful to upgrade the knowledge level of the plant personnel with indirect experience of a subject.

3. Utilization of the Concept Mapping Program in Classroom Training

To use the Concept Mapping Program as a training tool using the Concept Mapping Program needs to be produced.

3.1 Developing Training Material by Concept Mapping Program

At first, eight lecture subjects were selected to be used for the trial training method after training for instructors in the use of the Concept Mapping Program. It took about eight hours on average to convert each existing Power Point training presentation into Concept Mapping training. To enhance understanding by trainees, various reference materials were linked to the lecture Concept Map file like Figure 1.

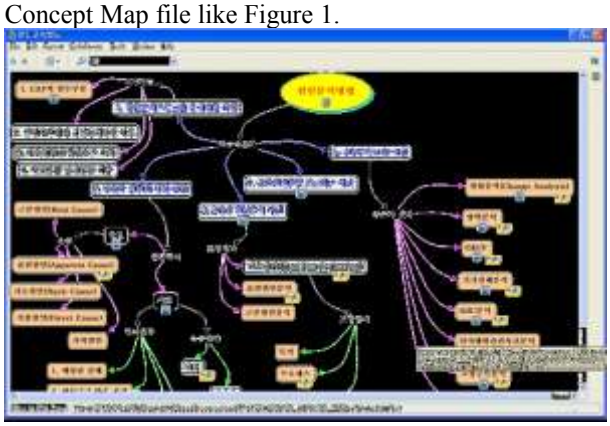

Figure 1. Training Material Example made with Concept Mapping Program about Subject of the Root Cause Analysis Method

This training material was stored in the Concept Mapping server to use in classroom training.

3.2 Utilization of the Concept Mapping Program in Classroom

Lesson plans including the use of training material made by the Concept Mapping Program were developed for eight lecture subjects in each subject.

It needs to be installed in Concept Mapping Program at each classroom computer to enable the training. In the classroom the instructor opens the Concept Map file from Concept Mapping server after executing the Concept Mapping Program. Learning objects organized with Concept Map improve learning effectiveness with a lot of reference material linked to each concept node. Also trainees don't miss the big picture for the lecture during learning period because the big picture about the lecture is presented continuously.

Courses utilizing the Concept Mapping Program were held ten times for eight subjects by five instructors in 2008 at KNPEI.

Figure 2. **Concept Mapping Server Including Training Material**

4. Analysis of Training Effectiveness by Concept Mapping Training Material

Five survey questions were developed to evaluate the effectiveness of the training using the Concept Mapping training material.

Surveys were carried out by e-mail one week after the courses finished. Nine of e-mail surveys for five subjects were carried out. Total of 86 trainees from nine training courses responded to the e-mail survey.

Figure 3 shows an example of the survey result for questions about the understanding level of the lecture material with the Concept Map compared to existing Power Point training material.

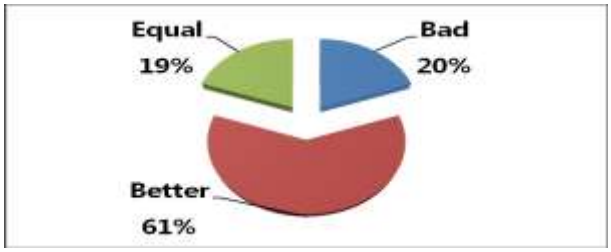

Figure 3. **Survey Result about Understanding Level for Training with Concept Mapping Training Material**

72% of the respondents said that the lectures using the Concept Mapping training material were effective in helping students achieve the learning objectives.

But there were some negative responses by some trainees due to small font size of the Concept Mapping training material.

5. Conclusions

Most of the training of nuclear engineers has been carried out by classroom lecture using Power Point training material. This training method has been used at KNPEI without change since the Power Point presentation method was introduced ten years ago. It is believed that this method is out of step with human cognitive structure. The Concept Map is more in tune human cognitive structure and results in better understanding.

KNPEI tried to enhance training performance by changing the presentation method of the training material. It needs some more time to verify the effectiveness of the training method by Concept Mapping Program. But more trainees responded positively to the method using Concept Mapping Program.

Classroom training activities for engineers can be carried out more effectively with the Concept Mapping Program due to the knowledge presentation characteristics of the program.

This report recommends that training personnel try to use the Concept Mapping Program in training activities because the presentation method of the Concept Map better matches to human cognitive structures. It encourages instructors improve the performance of training activities. It also makes it trainees possible for trainees to participate in the training process by enabling them to change and add remotely additional information to the Concept Map.

REFERENCES

[1] Concept Mapping Program description, IHMC.
[2] EPRI TR1002896 'Capturing and Using High-Value Undocumented Knowledge in Nuclear Industry' December 2002