

## A Study on the Analysis of Proficiency Distribution of Response Agents to Nuclear Emergency

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### 1. Introduction

In order to safely use the valuable nuclear & radiation technology, 'technology safety regulation & disaster prevention response system' is required. The 'technology safety regulation & disaster prevention response system' has three components. These are legal ground, response strategy, and response proficiency.

Before the accident, regulation management is needed and after the accident, intervention action is required. A reasonable legal ground is required for regulation management and intervention action. This is the first component of the 'technology safety regulation & disaster prevention response system'. And a response strategy that can be implemented by a reasonable legal ground is required. This is the second component. It is also necessary to prepare agents to have a high level of proficiency in order to be able to fulfill the response strategy. This is the third component.

The Republic of Korea has invested a lot of budget so response agents have high proficiency. And the government and TSO (Technical Support Organization) have been planning and running training programs for many years.

This study used the R program to identify the status of the proficiency of the response agents among the three components of 'technology safety regulation & disaster prevention response system'. And to present a follow up study based on visualized analysis data by R program.

### 2. Contents of training program to analyze

The TSO (Technical Support Organization), in response to the nuclear emergency, has been planning and implementing a training program with many budgets for many years to improve the proficiency of the agents to cope with the accident.

The contents of these training programs were analyzed and categorized into 15 sessions. These are summarized in table 1.

Table1. 15 Session Program to Increase Proficiency

Session	Contents
1	Propagation of Emergency Situations
2	Understanding the Response Manual of Nuclear Emergency Response
3	Table-Top Training for Commanding Ability
4	Use of Communication Devices
5	Use of Personal Protective Equipment
6	First-Aid the Injury in the Accident Site
7	Radiation Detection and Dosimetry
8	Management of Emergency Supplies
9	Maintenance and Use of Dispatch Vehicle
10	Installation and Use of Negative Pressure Tent
11	Radioactive Decontamination
12	Installation and Use of Deployment Tent
13	Utilization of Emergency Response Equipment
14	Radiation Emergency Medical Treatment
15	Stand to Extreme Circumstances

### 3. Analysis method using R program

The R program was used to analyze the proficiency of the agents for training contents with 15 sessions. The R program offers so many libraries as open courses. These were developed by the process of creating and sharing libraries to fix the inconvenience by users of R program.

In this study, R program package of 'ggplot2' and 'gridExtra' libraries were used. The R program package of 'ggplot2' is noted for its highly specialized library for visualizing data. The package of 'gridExtra' is a library for converting data into a boxplot.

### 4. Analysis Result

The results of analyzing the distribution of proficiency of agents for 15 sessions before the program execution could be expressed as green box plot in Fig 2.

In the boxplot, the square represents the quartile. The boldly drawn horizontal line means median. The vertical line means the range of the maximum value and the minimum value. Black circles mean an outlier point. Observations based on quartile values have shown that for sessions 11 and 15, the agents have high proficiency. On the other hand, session 12 had the lowest quartile. In Fig 1, the change of proficiency before and after the training program was analyzed by R program.

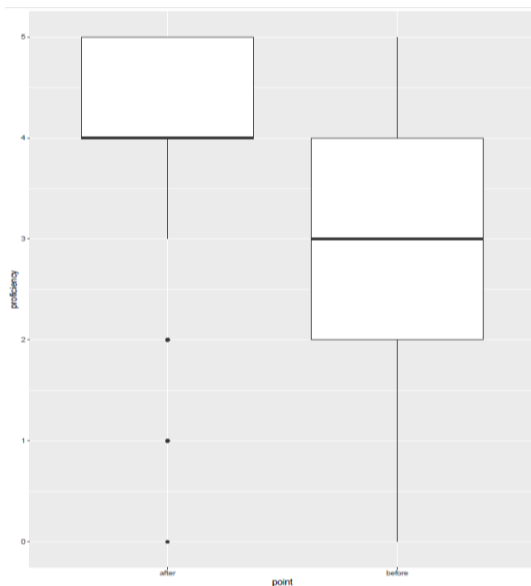


Fig1. Difference in Proficiency of Agents after and before Execution of 15 Session Program

As a result of observing the change of proficiency for the session 1 to 15, it was confirmed that the proficiency quintile of the agents increased after the program was implemented.

In fig 2, we tried to observe the changes in the quartile of proficiency for each session.

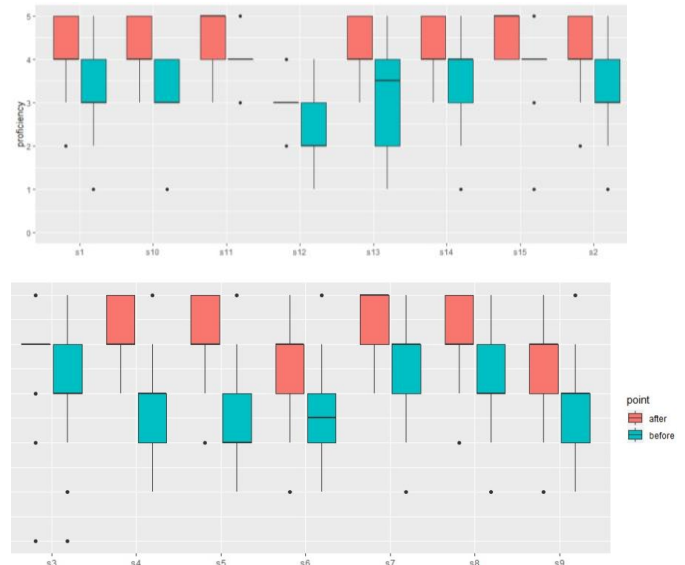


Fig2. Difference in Proficiency after each 15 Session Program

Fig 2 also shows that the quartile values increased as in fig 1. However, in the session 3, the same outlier points were observed before and after the program execution. At session 11, 12, and 15, dramatic effects were not observed.

### 5. Conclusions

In this study, the effectiveness of the 15 session program and proficiency of agents was evaluated. As results of evaluation, we can find out which session need intensive execution and contents revision in program operation. In addition, recently various studies have been conducted to derive the principles of disaster response. [1] Therefore, a follow-up study will be conducted to compare the results of this study with the principles of disaster response. The follow-up study aims to draw out the problems that are predicted in case of disaster and also to develop a method that can overcome the problems that can be predicted.

#### Acknowledgement

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#### REFERENCES

- [1] Sangho Byun, Taeyoon Kim, 'Derivation and Verification of Disaster Response Principles based on Reinterpretation of Disaster Management Policy', Korean Public Administration Review, Vol. 48, No. 2, pp. 109-136, 2014.