

Effects of Education Concerning Radiation and Nuclear Safety and Regulation on Elementary School Students

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1. Introduction

For South Korea, which must continuously use nuclear energy for national energy security and economic growth, it has become most important to promote the social acceptability of nuclear power [1]. However, since the nuclear power plant accident in Fukushima, Japan, negative public awareness has further increased [2,3]. Despite the importance of citizen awareness and attitude in the promotion and decision making process connected to nuclear policy, negative media reports on the safety of nuclear power generation in South Korea and numerous undesirable media practices have led to a serious loss of confidence in the safety of nuclear power generation. Thus, a sufficient and reliable information and communication system is more urgent than the actual safety of nuclear power on various analyses and remedies on the various signs of nuclear power-plant risks. Particularly, because students have had little chance to learn about nuclear power and radiation during the formal education process, most of the information on this topic is likely to be obtained through media reports and rumors after the Fukushima nuclear accident. Consequently, students are in a situation prone to chaos due to groundless anxiety and being subjected to massive amounts of unfiltered negative information [4]. Due to the fact that, adults have difficulties in perceiving change through education, separate policy intervention is required. Furthermore, before failures in securing social acceptance are realized, due to the ignorance of nuclear power and radiation which continues to lead to erroneous political influences, proper education should facilitate the inculcation of proper value judgments for future generations by providing accurate information and education at educational institutes. Hence, this study is aimed at inculcating proper value judgments to elementary school students by providing these students, which the ripple effect of communication and education would be the highest among the general public, with information on safety management regarding nuclear power generation and radiation, as well as governmental safety regulations.

2. Methods and Results

As an educational method, theoretical classes, such as discussion and student presentations, were held in the classroom for one hour after the lectures by the experts and the science teachers, and in the practice, a radiation

dose detector was used at various places in the school and natural radiation measurement was performed for one hour. The contents of the lectures covered the safety management of nuclear power generation and radiation, governmental safety regulations for nuclear power generation, accidents, and responses to nuclear power plant disasters. The program was conducted for approximately 21 months from March 2016 to November 2017. The questionnaire, based on the traditional learning model, consisted of awareness, knowledge, and attitude concerning nuclear power generation and radiation safety, and the three categories of radiation usage were nuclear power generation, medical radiation, and irradiated food. Statistical analysis was performed by using SPSS/WIN 15.0 for mean and standard deviation, t-test, and regression analysis.

2.1 Educational effect concerning nuclear power generation and radiation safety and regulations

The knowledge and attitude levels regarding nuclear power generation and radiation safety in 2016 and 2017 were significantly higher following educational awareness compared to before educational awareness. However, in 2017, the level of awareness on safety was lower in elementary school students after education. Awareness regarding the need for nuclear power generation and radiation changed upward in 2016, while declining in 2017. Although it is difficult to find the causes of objective relevance within the same educational program, which shows the opposite results on the changes in awareness between 2016 and 2017, media reports and political influence concerning the new President's Declaration of Denuclearization in the first half of 2017, could have influenced the students. In this regard, it can be interpreted that the adverse effect of education with regards to safety awareness suggests that students are strongly influenced more by the social environment than by the educational environment. This observation can be explained by the theory that the problem related to human awareness is subject to the collective culture of the society as a whole, or its organizational properties [5]. Experts perceive risk through technical rationale based on statistical data, while the public perceives risk by subjective judgment, such as an individual subjective experience, knowledge, or habits [6]. According to Sjoberg (1999), experts perceive the risks of science and technology as trivial, while the risk level is much higher in public perception [7]. Thus, communication strategies based on public

awareness patterns and pedagogical understanding, should be provided in classroom instructions.

Table I: Educational Effect concerning Safety and Regulation of NPPs and radiation

Division			2016		2017	
			(mean±sd)	t(p)	(mean±sd)	t(p)
Awareness	necessity	before	3.96±0.91	-2.177 (.031)*	4.01±1.02	4.432 (.000)**
		after	4.12±0.88		3.74±1.05	
	safety	before	3.47±1.11	-0.538 (.591)	3.50±1.19	5.618 (.000)**
		after	3.52±1.06		3.11±1.23	
Objective knowledge		before	0.37±0.26	-10.492 (.000)**	0.31±0.24	-17.226 (.000)**
		after	0.57±0.27		0.48±0.23	
Attitude		before	1.49±1.18	-10.961 (.000)**	1.54±1.41	-10.582 (.000)**
		after	2.79±1.67		2.41±1.74	

*Necessity and safety awareness have a 5-point scale. The higher the score, the greater the necessity is for nuclear power and radiation use. Attitude has a 5-point scale, meaning that one can trust nuclear power generation and radiation safety, and practice evacuation actions. The higher the score, the higher is the level of safety management and evacuation procedures. Objective knowledge has a 1-point scale showing that the closer the score is to 1, the better an individual knows about nuclear power generation and radiation safety.

P<0.01, 0.05 = **, *

3. Conclusions

In the face of the nuclear communication problem, the type and method of conveying the message is the most basic consideration for effective and efficient communication policies. Nevertheless, it is no exaggeration to say that communications have failed in South Korea because to date, unilateral education has been provided on nuclear power communication targeting the general public. Because various factors such as emotion, experience, socio-cultural environment, and general values play a more important role in human judgment [8], it is necessary to help people make rational decisions by providing varied forms of information. Basically, the general public's attitude change on nuclear power could vary within each country [9], and public attitudes on science vary according to the level of knowledge involved. As knowledge accumulates, rational decisions are better facilitated. Thus, it is necessary to provide balanced information on nuclear power in any form of available education. Because individual awareness determines individual risk acceptance, an educational approach based on emotion is required henceforth. Furthermore, because the safety awareness of future generations will have a significant influence on the policy decisions surrounding nuclear power generation, education needs to be designed to match safety variables suitable to a student's level. It is well known that more consideration and concentration on learners leads to efficient education. Thus, the question of safety attitude, which is a view on safety issues, is emphasized as an important indicator of safety culture [10]. The instituted procedures incorporate safety regulations and procedures as the central conceptual elements of the safety atmosphere, and such instituted procedures should be considered as an organizational variable that has a decisive influence on the outcome of individual

safety behavior. Dealing with regulations on safety and safety management based on emotions will produce educational effects which facilitate judicious decisions regarding nuclear power generation and radiation safety from elementary school students.

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