The Educational Effects of basic Nuclear Power and Radiation Education on Elementary-, Middle-, and High-School Students in 2012-2013

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1. Introduction

Due to the cognitive anchoring of both powerful and negative images, such as those concerning the Chernobyl accident and the Fukushima nuclear accident, as well as insufficient post-accident management following such events, the general population's perception of risk regarding technology or institutions related to nuclear energy is heavily affected by the occurrence of these nuclear accidents [1]. Because the acceptability of local and general residents serves as a prerequisite to nuclear power institutions and policies, increasing the social acceptability of nuclear power is important in South Korea, where the continuous use of nuclear power is necessary for the security of its nationwide energy supply and economic growth [2]. By focusing education regarding nuclear power generation and radiation use on elementary-, middle-, and high-school students, who will, out of the general population, likely experience some of the greatest ripple effects from this focused education, the relationship between perception, knowledge, and attitude regarding nuclear power generation and radiation were then analyzed. The goals of this analysis were to help form an extensive and national social consensus regarding nuclear power generation and radiation use that is appropriate to South Korea, and improve the understanding and public perceptions of the aforementioned technology of the people of South Korea.

2. Methods

Elementary-, middle-, and high-school students were provided with one hour of education within the classroom, and given pre- and post-intervention surveys regarding nuclear power and uses of radiation. Statistical analysis employed SPSS/WIN 15.0 in order to determine the frequency and percentage, mean, and standard deviation of the collected data. Cronbach's α values, which assess the stability, consistency, and predictability of each item in the collected surveys, indicated reliability, being greater than approximately 0.6 for all items. Work-study activities contained theories and practical training. Theory education includes watching a video (10 minutes) and attending lectures (25 minutes) that contain contents covering seven sectors that use radiation. Practice education includes a practical activity for students to measure natural radiation levels.

3. Results

3.1 General features of the 2012 and 2013 intervention participants

In 2013, the number of students participating in the study experience totaled 3,998 (100.0%) prior to the intervention and 3,914 (100.0%) after the intervention, which was higher than those who participated in 2012, which totaled 3,399 (100.0%) before the intervention and 3,157 (100.0%) after the intervention. Statistical analysis aside, as of the end of July for each year of the study, 5,463 participants from 114 schools received the education in 2012, while 10,567 participants from 183 schools— significantly more than those in the previous year—received the education in 2013. After the study experience, which was administered by the Korea Academy of Nuclear Safety, results were assessed by each school based on learning interest and effectiveness. The number of schools and students registering for the study experience has been dramatically increasing. Furthermore, 84.1% (3,348) of study recipients indicated, after receiving the intervention, that the study was an interesting learning experience, and 89.5% (3,566) of study recipients expressed that the experience should be administered on a nationwide basis. Thus, the study experience should continue to be administered, based on the prevailing position that it improves understanding in South Korean residents and satisfies their right to know about radiation technology and nuclear power<Table 1>.

3.2 Changes before and after the intervention

The intervention was effective, as all aspects of perception, knowledge, and attitude regarding radiation use and nuclear power generation increased after the study experience. This pattern was similar to the educational effect observed in 2012. Thus, the study should be continuously supplied on a nationwide basis so that the knowledge, perception, and attitude of residents in South Korea regarding radiation and nuclear power may be improved<Table 2>..

4. Conclusion

In order for radiation technology to power national developments through the next generation, understanding and acceptance of for radiation technology by the general population must come first. In order to effectively provide data about this

understanding and acceptance, elementary-, middle-, and high-school students—all of whom will constitute the majority of public opinion in the near future—were provided basic education regarding radiation use and nuclear power. Their perceptions before and after the intervention, as well as their knowledge and attitude as based on traditional learning models, were analyzed. The results indicated that, for both 2012 and 2013, necessity, safety, acquisition of information, perception (including subjective knowledge), objective knowledge, and attitude increased after the intervention. This implies that the intended results could be obtained by continuously providing education aiming at increasing social acceptability in South Korea, where nuclear power is in demand.

Table 1. General Features of the Participants

Categories		2013		2012	
		Before Education	After Education	Before Education	After Education
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
School Level	Elementary School	2,107(52.7)	2,057(52.5)	2,029(59.7)	1,827(57.9)
	Middle School	777(19.4)	793(20.2)	430(12.7)	419(13.3)
	High School	1,114(27.8)	1,064(27.1)	940(27.7)	911(28.9)
Sex	Male	2,147(53.7)	2,072(52.9)	1,785(52.5)	1,652(52.3)
	Female	1,832(45.8)	1,822(46.5)	1,537(45.2)	1,390(44.0)
	No Response	19(0.4)	20(0.5)	77(2.3)	115(3.6)
Thoughts on Radiation Study Experience	Interesting Class	3,210(78.7)	3,348(84.1)	2,656(78.1)	2,624(83.1)
	Uninteresting Class	407(10.0)	282(7.1)	377(11.1)	257(8.1)
	Miscellaneous	460(11.3)	353(7.3)	366(10.8)	276(8.7)
Experience with Medical Uses of Radiation	Yes	1,967(48.2)		1,393(41.0)	-
	No	1,076(26.4)		1,009(29.7)	-
	Unknown	1,034(25.4)		997(29.3)	-
Thoughts on Completion of Radiation and Nuclear Power Education by Entire Nation	Absolutely Necessary		1,487(37.3)		1,187(37.6)
	Necessary		2,079(52.2)		1,622(51.4)
	Unnecessary		218(5.5)		179(5.7)
	Absolutely Unnecessary		63(1.6)		46(1.5)
	No Response		136(3.4)		123(3.9)
Total		3,998(100.0)	3,914(100.0)	3,399(100.0)	3,157(100.0)

<Table 2> Changes in Perception, Knowledge, and Attitude Levels regarding Radiation Use and Nuclear Power Generation before and after the Study Experience

Categories	2013		2012	
	Before Education (mean ± S • D)	After Education (mean ± S • D)	Before Education (mean ± S • D)	After Education (mean ± S • D)
Level of Necessity (Out of 5)	3.97±0.665	4.12±0.710	3.94±0.677	4.12±0.717
Level of Safety (Out of 5)	3.08±0.745	3.58±0.804	3.14±0.745	3.58±0.798
Level of Acquisition of Information (Out of 5)	2.25±0.951	3.04±0.839	2.27±0.949	3.00±0.902
Level of Subjective Knowledge (Out of 5)	2.45±0.838	3.24±0.811	2.46±0.837	3.18±0.842
Level of Attitude (Out of 5)	3.35±0.783	3.84±0.825	3.42±0.764	3.84±0.822
Level of Objective Knowledge (Out of 100)	39±25.8	65±26.6	41±29.6	60±22.5

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