

IJACT 19-3-21

## Early Childhood Teachers' Content Knowledge on Green Growth Education

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### **Abstract**

*The purpose of the study was to examine early childhood teachers' content knowledge on green growth education. The subjects, 45 early childhood teachers, were asked to draw concept maps about early childhood green growth education. Their concept maps were analyzed in terms of superordinate and subordinate concepts by contents and frequencies. The results showed that early childhood teachers used 182 superordinate and 1,292 subordinate concepts in the concept map of green growth education for young children. Although early childhood teachers had a wealth of content knowledge on green growth education as proposed by the Ministry of Education, their knowledge was disproportionate to some areas and sub-areas of green growth education. These results implied the needs of developing teacher education programs for early childhood green growth education.*

**Keywords:** *Green growth education, concept map, early childhood teachers*

### **1. Introduction**

The increase in greenhouse gas emissions due to environmental damage and high energy demand has brought about an environmental crisis, such as global warming. The environmental crisis is not limited to nature or some countries but a problem of human survival. In 2005, the term 'green growth' was begun to be officially used during discussion of the United Nations Economic and Social Commission for Asia and the Pacific (UNSCAP). That is, underdeveloped countries in UNSCAP decided to pursue 'green growth' as a strategy to develop economy in harmony with the environment [1]. Green growth seeks to reduce environmental damage and to secure new growth momentum through the saving and efficient use of energy and resources, thus achieving growth in harmony with 'economic development' and 'environmental conservation' [2]. In other words, green growth is a comprehensive education that aims for sustainable development and encompasses not only the environment but also economic and social problems [3-4].

Green growth has emerged in Korea since 2008. The government selected green growth as a national task in 2008 and declared 'low-carbon green growth' as a vision for the next 60 years [5]. Based on the national policy direction, 'The Plan for Green Growth Education' was announced in 2009. The Plan for Green Growth Education regarded education as a practical way to activate green growth policy and mainly included education at elementary, middle, and high schools. To achieve this, the Ministry of Education, Science, and Technology revised nation-wide curriculum in 2010. Specifically, green growth education was emphasized and dealt with through related subjects such as 'Home Economics.' In 2011, green growth education was expanded to include early childhood education.

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Manuscript received: January 25, 2019 / revised: February 10, 2019 / Accepted: March 2, 2019

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Early childhood green growth education was actively introduced in 2013 when the Nuri curriculum, a nation-level curriculum, was applied to kindergartens and childcare centers nationwide. 'Teachers' Guidebook for Nuri Curriculum' [6] stated that green growth education was nation-wide educational strategy aiming to foster the green-talented global citizenship in pursuit of harmony between economic development and environmental conservation. It also specified that green growth education could be achieved through the themes of ecosystem, energy, and climate.

Moreover, the Ministry of Education developed and disseminated 'The Green Growth Program for Young Children of Kindergarten Curriculum' in order to systematically support green growth education through regular curriculum in early childhood education [7]. According to this, early childhood green growth education has four characteristics. First, it is comprehensive education that deals with not only environment but also economy and social issues for sustainable development. Second, it is forward-looking and future-oriented education beyond environmental education. Third, it is the practice centered education that begins with the practice in daily life. Fourth, its effects would be maximized when practiced in contexts of family, educational institutions, community, country, and the whole world together.

In addition, 'The Green Growth Program for Young Children of Kindergarten Curriculum' [7] proposed four areas and ten sub-areas of early childhood green growth education. Four areas are 'understanding of earth environment,' 'awareness of environmental issues,' 'practice of green growth and sustainable life,' and 'enhancement and practice of global green citizenship.' The first area of 'understanding of earth environment' includes three sub-areas; 'living things,' 'nonliving things,' and 'relations of ecosystem.' The second area of 'awareness of environmental issues' includes 'climate change and global warming' and 'resource depletion and destruction of ecosystem.' The third area of 'practice of green growth and sustainable life' includes 'resource depletion and destruction of ecosystem,' 'right food culture,' and 'energy saving and recycling.' The fourth area of 'enhancement and practice of global green citizenship' includes 'development and use of new renewable energy,' 'knowledge and practice of roles as community residents,' and 'knowledge and practice of roles as earth citizen.'

The previous research showed that green growth educational activities had significantly enhanced young children's pro-environmental attitudes [9-10]. Participating in the activities on green growth education also had positive effects on young children's emotional development and pro-environmental literacy [11-12]. Therefore, it is important for early childhood teachers to plan and to operate green growth education in early childhood institutions.

On the other hand, early childhood teachers are important factors in that they are human resources who plan and operate the curriculum [8]. For green growth education to be activated in practice, it is necessary for early childhood teachers to have a systematic and comprehensive awareness of it. Since early childhood education aims to whole education at overall growth, teachers' impacts on young children's development and learning are significantly important. The quality of education is mainly affected by teachers, and teachers perform educational activities based on their educational values and beliefs. Considering the fact that green growth education requires actual changes in values, attitudes, and behaviors beyond simple transfer of knowledge, teachers' self-awareness of content knowledge on green growth education is the most important.

Awareness of the teacher's green growth education has been examined in a few previous studies. As results, early childhood teachers were found to have a low level of awareness about policies and regulations related to green growth education [12]. In addition, although they recognized the importance and the needs, early childhood teachers reported about difficulties in performing green growth education in practice [13]. As the reasons for difficulties, early childhood teachers pointed out the lack of their professional knowledge and understanding on green growth education [14-15]. Therefore, an investigation on early childhood teachers' content knowledge on green growth education is required prior to expand it.

One of methods to investigate teachers' content knowledge on green growth education is using the concept map. The concept map was developed by Novak and Gowin [16] based on the cognitive theory suggested by Ausubel et al. [17]. The concept map represents individual's concepts of a certain topic in visual and graphical forms. This method has been reported as a useful instrument to measure the content and structure of teachers' knowledge [18]. The level of knowledge is expressed hierarchically depending on concept map components including superordinate and subordinate concepts. As a result, superordinate concepts in the first level show

the most general and comprehensive content knowledge while subordinate concepts in lower levels show specific and narrow-downed knowledge in a specific topic. In South Korea, some studies in the area of early childhood education used this method of analyses including You and Kim [19], Ahn and Kim [20], and Chun and Kim [21]. Therefore, the present study aims to examine early childhood teachers' content knowledge of green growth education for young children by analyzing concept maps of early childhood green growth education. We expect that the study results would be useful in development of successful teacher education programs for early childhood green growth education. We proposed the following research questions.

*Research question 1:* What are the contents and frequencies of superordinate concepts presented in early childhood teachers' concept maps on green growth education?

*Research question 2:* What are the contents and frequencies of subordinate concepts presented in early childhood teachers' concept maps on green growth education?

## 2. Method

### 2.1 Participants and Procedure

The participants of the study were 45 early childhood teachers working at five childcare centers and twelve kindergartens that were located in the metropolitan area in South Korea. The convenient sampling method was used to select the participants. All the participants were females. Of the subjects, 33.3% were aged between 21 and 29, 35.5% were between 30 and 39, 28.2% were between 40 and 49, and 2.2% were 50 or over. In level of education, 24.4% graduated from 2- to 3-year colleges, 42.2% 4-year universities, and 33.3% graduated schools. In terms of years of teaching experience, 6.6% had less than 1 year, 11.1% 1 year to 3 years, 24.4% 4 to 6 years, 33.3% 7 to 9 years, and 24.4% 10 years or more.

A preliminary survey was conducted using five early childhood teachers in November 26<sup>th</sup>, 2017 in order to check out the average time that it would take and the processes in general. The data collection was conducted at the childcare centers or kindergartens where the participants were working in December, 2017 ~ February 20<sup>th</sup>, 2018. The participants were given the consistent structured instructions about how to draw concept maps with an example of a theme other than early childhood green growth education, and then asked to draw their own concept maps on early childhood green growth education. No restrictions were specified regarding the total number of concepts. There was no time limit, and the average time to draw concept map was about 60 minutes. Once the participants started drawing concept maps, they were asked to fulfill some questions on their background information. They were allowed to revise their concept maps before submitting them.

### 2.2 Instrument

In order to investigate early childhood teachers' content knowledge on early childhood green growth education, the method of concept map proposed by Novak and Gowin [17] was utilized. The participants' concept maps represented their content knowledge and cognitive structures. The level of knowledge is expressed hierarchically depending on concept map components including superordinate and subordinate concepts. The most general and comprehensive content knowledge are shown in superordinate concepts while specific and narrow-downed knowledge are arranged in the lower levels of subordinate concepts.

### 2.3 Data Analyses

Early childhood teachers' content knowledge of economic education was investigated by analyzing the superordinate and subordinate concepts. For the first research question, all the superordinate concepts were recorded and categorized using four areas and 10 concepts proposed by Ministry of Education [6]. The frequencies of superordinate concepts in each of main areas and sub-areas were calculated. For the second research question, subordinate concepts presented in the concept maps were all recorded and categorized into similar ones. And then, subordinate concepts of higher frequency were extracted. In order to raise validity and reliability in categorizing superordinate and subordinate concepts, three professionals in early childhood education as well as the researchers worked together.

### 3. Results

#### 3.1 Contents and Frequencies of Superordinate Concepts

Superordinate concepts are in the highest hierarchical level of the concept map. They reflect main concepts that early childhood teachers have in the context of early childhood green growth education. In this study, it turned out that early childhood teachers used 182 superordinate concepts in total (see Table 1). These concepts were categorized with four areas and ten sub-areas of early childhood green growth education proposed by 'The Green Growth Program for Young Children of Kindergarten Curriculum' [7]. As to the frequency (%) of superordinate concepts in each of four main areas, 'enhancement and practice of global green citizenship' was 71 (39.0%), 'understanding of earth environment' was 51 (28.0%), 'awareness of environmental issues' 38 (20.8%), and 'practice of green growth and sustainable life' 22 (12.1%) in order. As to the frequency (%) of superordinate concepts in each of ten sub-areas, 'knowledge and practice of roles as community residents' 46 (25.3%), 'resource depletion and destruction of ecosystem' 33 (18.1%), 'relations of ecosystem' 29 (15.9%), 'knowledge and practice of roles as earth citizen' 25 (13.7%), 'energy saving and recycling' 18 (9.9%), 'nonliving things' 16 (8.8%), 'living things' 6 (3.3%), 'climate change and global warming' 5 (2.7%), and 'right food culture' as well as 'development and use of new renewable energy' 2 (1.1%) in order.

The results showed that although early childhood teachers had knowledge on four areas and ten sub-areas of early childhood green growth education, their knowledge was disproportionate to some parts. Specifically, early childhood teachers had the most knowledge on 'enhancement and practice of global green citizenship' among four areas and 'knowledge and practice of roles as community residents' among ten sub-areas. This result supports previous research [14] that reported early childhood teachers had high understanding on green growth education especially in aspect of practice in related topics. In terms of sub-areas, the frequencies of four sub-areas were less than 5%; 'living things,' 'climate change and global warming,' 'right food culture,' and 'development and use of new renewable energy.' The Korean government recently announced 'New and Renewable Energy Development, Utilization, and Supply Promotion Act' and strived to supply a variety of new and renewable energy sources [22]. Considering these efforts of the government for economic development in harmony with environments, the results implied that early childhood teachers' content knowledge on green growth education needed to be more activated and enhanced. The overall results indicated that early childhood teachers' knowledge on green growth education was disproportioned to some parts of main areas and sub-areas. This gave implications for the need of teacher education on green growth education in order to support its implementation in curriculum and dissemination.

**Table 1. Contents and Frequencies of Superordinate Concepts (n, %)**

Areas	Sub-areas	Superordinate Concepts*
1. Understanding earth environment (51*, 28.0%)	① Living things (6, 3.3%)	Animal and plant (3), forest (2), growth
	② Nonliving things (16, 8.8%)	Earth (13), water (2), air
	③ Relations of ecosystem (29, 15.9%)	Earth environment (19), natural environment (10)
2. Awareness of environmental issues (38, 20.8%)	④ Climate change and global warming (5, 2.7%)	Seasons (3). climate, global warming
	⑤ Resource depletion and destruction of ecosystem (33, 18.1%)	Environmental pollution (21), awareness of environmental issues (5), forest (2), air pollution (2), awareness of issues, waste, ecosystem change
3. Practice of green growth and sustainable life (22, 12.1%)	⑥ Right food culture (2, 1.1%)	Future eating, eating
	⑦ Energy saving and recycling (18, 9.9%)	Energy (10), energy saving (2), conservation, saving, resources, resource reuse, recycling, tree-planting
	⑧ Development and use of new renewable energy	Eco-friendly energy, alternative energy

		(2, 1.1%):
4. Enhancement and practice of global green citizenship (71, 39.0%)	⑨ Knowledge and practice of roles as community residents (46, 25.3%)	Practice in curriculum (18), economy (7), education method (5), connecting with home (5), educational content (3), connecting with community (3), educational environment (3), , practice in life (2)
	⑩ Knowledge and practice of roles as earth citizen (25, 13.7%)	Green citizenship (12), global citizenship (8), education for citizenship (3), future society, education for future

\* Numbers of superordinate concepts shown in concept map

### 3.2 Contents and Frequencies of Subordinate Concepts

Subordinate concepts are relatively specific and connected to the lower levels in the concept map. It turned out that early childhood teachers in this study used 1,292 subordinate concepts in the concept map of green growth education for young children. The top 15 terms of subordinate concepts in order were as follows: 'recycling,' 'air,' 'tree,' 'plant,' 'earth,' 'water,' 'living things,' 'waste,' 'water pollution,' 'global warming,' 'air pollution,' 'toil pollution,' 'ecosystem,' 'natural conservation,' and 'energy saving.' This result indicated that early childhood teachers had various subordinate concepts of green growth education, and that they considered 'recycling' as the most important one.

**Table 2. Contents and Frequencies of Subordinate Concepts**

Order	Subordinate Concepts	<i>n</i>	Order	Subordinate Concepts	<i>n</i>	Order	Subordinate Concepts	<i>n</i>
1	Recycling	12	6	Water	8	11	Air pollution	6
2	Air	11	7	Living things	8	12	Toil pollution	6
3	Tree	8	8	Waste	7	13	Ecosystem	6
4	Plant	8	9	Water pollution	7	14	Natural conservation	6
5	Earth	8	10	Global warming	6	15	Energy saving	6

## 4. Conclusion

The purpose of the present study was to examine early childhood teachers' content knowledge on green growth education for young children. The participants were 45 early childhood teachers who worked in childcare centers and kindergartens in South Korea. In order to investigate early childhood teachers' content knowledge, the participants were asked to draw the concept map on green growth education. Superordinate concepts shown in the participants' content maps were categorized with the criteria of four areas and ten sub-areas of early childhood green growth education proposed by the Ministry of Education [7]. Then, the frequencies of superordinate and subordinate concepts were analyzed. The results showed that early childhood teachers used 182 superordinate and 1,292 subordinate concepts in the concept map of green growth education for young children. Although early childhood teachers had a wealth of content knowledge on green growth education, their knowledge was disproportionate to some areas of green growth education. In terms of the main areas, early childhood teachers had more content knowledge on 'knowledge and practice of roles as community residents' but less content knowledge on 'practice of green growth and sustainable life.' In terms of the sub-areas, early childhood teachers had more content knowledge on 'knowledge and practice of roles as community residents,' 'resource depletion and destruction of ecosystem,' and 'relations of ecosystem' but less content knowledge on 'living things,' 'climate change and global warming,' 'right food culture,' and 'development and use of new renewable energy.' These results reveal the needs to develop teacher education programs for green growth education and to enhance teachers' content knowledge comprehensively and systematically.

There are some limitations in this study, and further research is required. Concerns about the convenience sampling method raise the issue of generalizability. Another limitation involves the restriction of the participants' residence on the metropolitan area. Further research needs to take factors such as a representative national sample and multiple data sources into account. We suggest that future researchers focus on development of teacher education program for green growth education and examination of its effect on practice.

## Acknowledgement

This article is based on the master's thesis of Incheon National University, 2018.

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