

A Study on Program of Education for Sustainable Development utilizing Oriental White Stork

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Abstract: Global hazards such as climate change, non-renewable energy depletion, and biodiversity loss threaten mankind making the role of sustainable development and education absolutely necessary to overcome these crises. Given this need, the study aimed to develop a sustainable development educational program utilizing the challenges surrounding conservation of the endangered oriental white stork as an example. The plight of the species was used to develop a high-quality sustainable development educational program for the third-grade students of the OWS village in Yesan County, South Korea. The educational program was developed systematically using the four stages of planning, preparation, development, and improvement.

The first step of the study involved extraction of elements of the concept behind sustainable development defined in the oriental white stork conservation plan and as presented by the Korea Committee for Sustainable Development Education of the United Nations Educational, Scientific, and Cultural Organization (UNESCO).

The second step involved a synthesis of the results of a 2015 third grade curriculum analysis covering scholastic achievement standards including education for sustainable development (ESD) concepts and core competence-related areas. Such results were applied to achieve sustainable development at the school.

Finally, the five integrated curriculum themes linking sustainable development and oriental white stork conservation were developed: "the life cycle of the oriental white stork", "habitats of the oriental white stork", "we are guardians of the oriental white stork", "the children's business union in the OWS village", and "our design of the OWS village".

Key Words: ESD Program, Regional Sustainable Development, Restoration Project of Oriental White Stork, 2015 Revised Curriculum

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I. Introduction

In the 21st century, human beings are increasingly threatened with global challenges such as climate change, energy depletion, population and food shortages, water shortages and pollution, biodiversity crises, war and nuclear risks. These problems are perceived to be serious enough to threaten human survival. The importance of Sustainable Development has been highlighted in this sense of crisis, and the role of education in fundamentally changing human thought and behavior in the long run (Lee and Kang, 2009).

ESD is an important strategy for developing a better future for mankind by exploring and establishing a new value system (Mo et al., 2010). And by containing the philosophy and educational value of Sustainable Development in their education places, students should be able to actively reflect on so that they can grow into people with a Sustainable Development perspective and knowledge-utilizing capability (Ji and Nam, 2007).

Environmental problems such as natural environmental destruction and pollution caused by the adverse functions of industrial development have not only hindered Sustainable Development, but also accelerated the extinction of life on Earth (Gu, 2005). Although at least 296 species of vertebrates and 313 species of invertebrates have completely disappeared from the Earth since 1600, The figure is far from real, and biologist David Rauff estimated that if the habitat were destroyed at its current rate, there would be as many as 100,000 species that would disappear each year in the late 21st century (Sciama, 2011).

According to the Ministry of Environment's Comprehensive Plan for Endangered Species, Plant-Animal Growth and Restoration (2006-2015),

a quarter of the world's living species will be extinct within the next 50 years (Ministry of Environment, 2006). When a species dies out, its genetic resources disappear forever. In this regard, conservation and restoration of species is an urgent task and an obligation for mankind.

Among them, oriental white stork designated internationally as Class I of endangered species can enhance their educational effectiveness in that they can specifically address the importance of biodiversity, and it is a good material for ESD (Gu, 2005). The restoration of the Oriental White Stock is a very important project both nationally and internationally. This is because it is a treasure house reporting that realizes the value of biodiversity and also shows examples of sustainability in various examples of sustainability and non-sustainability experienced by humans. Kim et al. (2010) showed that the restoration of oriental white stork includes research on the breeding of oriental white stork populations and restoration of biodiversity in wetlands including rice fields. The restoration of oriental white stork is closely related to the harmony of the human and ecosystem, the restoration of the local community and Sustainable Development that ultimately pursues in the biodiversity recovery project (Nam et al., 2018, pp.99-100).

In the preceding study on conservation of endangered species and biodiversity, there are several studies (Kim, 2005; Kim, 2008; Yoon, 2008) that suggested the effects after applying biodiversity education program developed by researchers to students. Kim (2005), Kim (2008), and Yoon (2008) developed biodiversity programs for middle and high school students. Park (2009) and Kim and Lee (2010) studied the effect on environmental awareness and environmental attitude by applying biodiversity programs to elementary school students. Cho et

al. (2016) studied the effects of environmental education programs for kindergarden children on infants' environmental sensitivity and a life-respecting mind.

Son (2014) mentioned the need to strengthen elementary school teachers' knowledge of the conservation of endangered species in elementary schools.

A study on education programs related to endangered species are as follow.

Gu (2005) emphasized the need to develop an environmental education program based on oriental white stork by comparing the knowledge and attitude of middle school students in Korea and Japan about oriental white stork. Kim et al. (2010) mentioned that it was effective in improving awareness and attitude about the conservation of biodiversity in elementary and middle school girl by developing and applying biodiversity education programs linked to the restoration of endangered species of oriental white stork.

Oh (2014) developed the Oriental White Stock's ecological application for elementary school students, raising students' interest and concern in observation learning and Park (2016) developed and applied an exploration program using oriental white stork restoration work.

Lyu and Nam (2017) emphasized the need to develop various levels and contents related to restoration of the oriental white stork through a comparative study of the oriental white stork Restoration Project in Toyooka-city and Yesan County.

As such, research on conservation of biodiversity utilizing endangered species and the restoration of oriental white stork has continued, and the need for developing various education programs

has been steadily raised. But, it was analyzed that a program based on the school curriculum related to the oriental white stork are remarkably deficient in elementary school in Yesan County, South Korea.

Therefore, it is necessary to develop a program of ESD that utilizes the oriental white stork for Sustainable Development of the region. Developing a program of ESD that utilizes oriental white stork, a valuable from the perspective of biodiversity and sustainability, will have great significance at this point in the crisis of climate change and biodiversity.

The purpose of this study is to develop a program of ESD that utilizes oriental white stork. Specific research issues to achieve this research objective are as follows:

First, what are the key elements of the restoration of oriental white stork that can be used for ESD?

Second, what are the analysis method and contents of the 2015 revised curriculum for application to the program of ESD?

The third, how will we develop a program of ESD that is suitable for the third grade of elementary school?

II . Theoretical background

1. The Restoration of the Oriental White Stork

1) The Ecological Features and Restoration of Oriental White Stork

The oriental white stork lives in large rivers, wetlands around them, and large fields. It is a carnivorous bird that eats frogs, snakes,

freshwater fish, and insects. It nests and breeds in tall trees on the edge of the wetlands. They lay three to five eggs in March and May, then hatch after 30 days of brooding of eggs. Chicks can fly in about 50 days and fly out after 60 days. Life spans 25 to 30 years (Ministry of Environment, 2018; National Biological Resources Agency, 2018).

The number of oriental white stork on the Korean Peninsula was completely extinct in the early 1970s due to environmental pollution such as artificial fertilizers, herbicides, pesticides, and habitat damage. but through the restoration project which started in 1996 the number of the species was increased to 200 as of 2018. Since its natural release from 2015, 40 oriental white stork have been living in the wild, monitoring for full adaptation in the wild (Eco-Institute for Oriental Stork, 2018). The oriental white stork is the top predator and umbrella species in the ecosystem, and it is a measure of the degree of ecosystem destruction and ecological recovery.

2) Status of Restoration of the Oriental White Stork

The oriental white stork, which is believed to be alive 1,000 to 2499 individuals survived internationally, was a common resident bird on the Korean Peninsula in the early 1900s, but quickly decreased in the process of industrialization (Ministry of Environment/BOC). In 1971, the last oriental white stork couple was found in Gwansung-ri, Eumsung County, Chungbuk Province, but male oriental white stork were shot to death by hunters and female oriental white stork collapsed due to agricultural poisoning in 1983.

Since then, restoration of the oriental white stork, which had been exterminated on the Korean Peninsula, began with two oriental white storks introduced from Russia in 1996 and succeeded in artificial

breeding in 2002.

To restore the oriental white stork habitats, the Cultural Heritage Administration selected oriental white stork village (OWS village)¹⁾ in Yesan County, South Korea. In 2014, 60 oriental white storks were moved to the Yesan oriental white stork park with the Cultural Center, Open Place, Ecology Wetlands, and a breeding ground on the 135,669m² site.

A pair of oriental white stork, which were sent back to nature in 2015, gave birth to three eggs in May 2016, successfully hatching two eggs of them.

The oriental white stork radiated or born from the Yesan County, South Korea are found to be inhabiting all over the Korean Peninsula and found to have traveled to Japan, China and North Korea (Eco-Institute for Oriental Stork, 2018).

2. ESD and School Education

1) Sustainable Development and ESD

“Our Common Future,” published by the World Council on Environment and Development in 1987, defined Sustainable Development as “an improvement that meets the needs of the current generation without compromising the ability to meet the needs of future generations.” Since Agenda 21 was announced as a practice in the 1992 Rio Declaration, the concept of Sustainable Development has evolved into a concept that emphasizes the harmonization of

1) In 2010, the Cultural Heritage Administration determined that the five villages (Daeri, Gadukni, Simokni etc) in Yesan County, South Korea. which were suitable for the habitate of the oriental white stork.

development and environment as defined by “the equivalent of the developmental and environmental needs of current and future generations” (Korea Committee of UNESCO, 2008).

Recent Sustainable Development has been accepted as a core concept for the universal development of human beings in the 21st century, combining three interdependent aspects of environmental protection, economic development, and social development, with the ultimate human orientation of freedom, justice and democracy (Mo et al., 2010).

For Sustainable Development to succeed, people’s attitudes and thoughts about our lives must change. Elementary school education for conservation of endangered species and ESD was born based on the idea that education was the most efficient and smooth means of achieving this change.

ESD aims to engage and strengthen people to transform unsustainable social structures and practices (Kim et al., 2010). It also specifies that topics encompassing environmental, social and economic perspectives should be presented and taught not only the knowledge and understanding of them, but also the values and practices involved (Korea Committee of UNESCO, 2008). On the other hand, the general discussion of the 2015 revised curriculum suggests the relationship between pan-school science habits and ESD as follows, so a clear definition of the concept of ESD is necessary.

The subject of pan-textbook study should be dealt with in an integrated manner throughout education activities such as classes and creative activities, and is directed in conjunction with local communities and homes.

Character education, career education, democratic civic education, human rights education, safety and health education, multicultural education, economic and financial education, environmental and ESD

Source: Ministry of Education, 2015

In this study, the concept of ESD²⁾ is not selected in the general discussion of the revised education process in 2015, but in the viewpoint of through Korea Committee of UNESCO

2) Elementary School Education for Conservation of Endangered Species and ESD

The growing number of endangered species means that the natural environment of the human species is in danger enough to threaten human survival and cause fatal damage, so preserving species is a moral obligation and a promise to future generations.

Therefore, the school should develop a society that has the will to secure biodiversity with the right perception of preserving endangered species through education in schools. Environmental education during elementary school is very important as it forms an environmentally friendly behavior such as attitudes, values, beliefs and sensibility as well as basic concepts such as general knowledge about the environment (Seo, 1999).

In elementary school, there was flexibility in environmental awareness and value therefore the education on preservation of endangered species more timely and more efficient in elementary

2) Education for Sustainable Development refers to all categories of subject education including factors of Sustainable Development, including environmental education, peace education, human rights education, consumer education, health education, multi-cultural education, civic education, and social, cultural and economic methods (Korea Committee of UNESCO, 2008).

schools than in later stages of education (Son, 2014).

The recent surge in endangered species is due to excessive direct and indirect human intervention in the natural environment such as habitat destruction, pesticides spraying, and poaching. Eliminating habitat and making it no longer possible to live on Earth is obviously an unsustainable activity that suggests that humans could one day completely disappear with extinct creatures from Earth.

ESD is essential to prevent such backward activities of humans and to know that we must live in harmony with lives beside humans on the Earth to spread the importance of biodiversity.

3) Curriculum and ESD

The nation's national education process has been steadily revised to reflect national and social needs in school curriculum to effectively respond to changes in future society (Ministry of Education, 2015). Our society has a task of dealing with climate change, energy depletion, poverty and inequality, diversity crises, and environmental problems. Reflecting such realistic demands, it was found that the relevance of ESD in the educational process has intensified. Comparison of the 7th and 2007 revised curriculums showed that the relevance of ESD has increased in quantity (Cho et al., 2015). And it turned out that there was more relevance among the ESD and the revised curriculum in 2009 and the revised curriculum 2015 (Shin, 2017).

Developing programs of ESD utilizing oriental white stork for application in schools can be said to be in line with the direction of revising the curriculum, which has become increasingly relevant to ESD.

III . Research methods and contents

1. Research Subject

The subject of this study is the third grade of elementary school. The reasons for selecting the research subject as the third grade of the elementary school are to able to explore the value pursued in the ESD through the concern and interest induction utilizing the elements of the oriental white stork restoration, the operation of the outdoor experiential learning and because the grade appropriate for attaining the achievement standard presented in the curriculum was judged to be grade 3. In particular, the achievement standards of elementary school students in social, science, moral, and physical education curriculum seemed to be most appropriate when compared with curriculum of other grade to realize the value of ESD utilizing endangered species oriental white stork.

2. Research Methods

This study was conducted with a document research, and interview method.

First, the document research methods included keywords such as ‘the oriental white stork’, ‘endangered species’, ‘sustainable development’, and ‘2015 revision education course’ that were searched in RISS, DBPIA, and NDSL. In addition, the contents of elementary school seniors and their performance criteria and activities to learn textbooks were analyzed in the 2015 revised curriculum.

Second, expert opinion was collected using interview method. Firstly, we interviewed three Ph.D. researchers, two masters, and two

staffs from Yesan OWS village in order to derive the key elements of restoration of oriental white stork.

Next, to verify the validity of the programs developed in this study, the opinions were collected by one Ph.D. majoring in environment education and four elementary school teachers who majored in environment education for five years or more.

3. Research Procedures and Contents

The program development process in this study was based on the program design procedures of Kim and Lee (2010). Based on prior research and related literature, the planning phase for reviewing theories and the preparation stage for collecting and analyzing data were carried out based on theoretical considerations. In the development phase of the education program, the program was modified and improved through the improvement phase, which verifies the validity of the group of experts after selecting interesting themes considering the characteristics of elementary school students. Specific procedures are as follows (see <Fig. 1>).

〈Figure 1〉 Procedure and contents of the research

Stage	Implementation task	Implementation details
Planning	<ul style="list-style-type: none">•Task analysis•Environmental analysis	<ul style="list-style-type: none">•Theoretical research and Document Research•Extracting elements of the restoration of The oriental white stork•Analysis of the third grade curriculum in the revision of 2015
Preparation	<ul style="list-style-type: none">•Detailedization of implementation goals•Selecting professors' strategies and media•Structuralize evaluation tool design	<ul style="list-style-type: none">•Extracting key elements of the restoration of The Oriental White Stork and convergence with ESD• Proposal of key capacity of ESD• Teaching · Learning strategy•Establishing a project learning evaluation plan
Development	<ul style="list-style-type: none">•Development of data	<ul style="list-style-type: none">•Development of ESD Program utilizing oriental white stork
Improvement	<ul style="list-style-type: none">•Expert review	<ul style="list-style-type: none">•Review appropriateness of subject selection•Review the purpose of program development and course guidance

IV. Results and Discussions

1. Extracting the Key Elements of Restoration of Oriental White Stork that can be used for ESD

The factors extracted from the social, environmental, economic, and cultural 23 aspect³⁾ of ESD

3) Park and Sung (2007) proposed 23 perspectives for the ESD (Korea committee of UNESCO). as follows: Social perspectives (human rights·peace·safety, unification, gender equality, health·food, social justice, governance, citizen participation, globalization·international responsibility), Environmental perspectives (natural

are as follows; Building governance, International cooperation of the restoration of oriental white stork, Unification of the Korean peninsula, Conservation of biodiversity, Conservation of the habitat of oriental white stork, Farming methods utilizing oriental white stork⁴⁾, Rice farming, A farming firm, Dancing of oriental white stork' rice, Environment-friendly agricultural marketing, Sapkyo stream·Muhan stream, Wetland protection, A parenting activity for the oriental white stork, The movement of oriental white stork, Artificial nest, Utility pole landfill project, Forest green, The harmony of man and oriental white stork, Cooperation and discussion with residents, Ecological city, A study on the supporting methods of aging society, The oriental white stork park, Yedang reservoir, Creative city utilizing the humanities of oriental white stork. There are 24 items.

Twelve items were selected as key elements after collecting opinions from experts and staffs on restoration of oriental white stork (<Table 1>).


The five experts and two staffs showed slightly different aspects depending on the environment, human and society, and the view of the restoration of the oriental white stork. Among the elements, they said that the most important element of the restoration of oriental

resource-water·air·soil, energy, climate change, biodiversity, environmental problems, sustainable food production, sustainable villages and cities), Economic perspectives (sustainable production and consumption, the sustainability of the enterprise, the market economy, the mitigation of the gap between the rich and the poor, and the fair distribution and sharing of the parts), Cultural perspectives (cultural diversity, cultural heritage·cultural value, cultural preservation, and a creative city).

4) It is also possible to grow up to 5,000 species to connect and grow water systems such as Biotop, rice fields, rivers, lakes and rivers for securing and growing paddy field biodiversity. Creatures that grow in these fields become food for oriental white stork.

white stork is ‘Respect for life’(2 persons), ‘Dialogue and compromise’, required in the process of resolving conflict(1 person), ‘Formation of relationship with village people and oriental white stork’(2 persons), ‘Governance construction’(1 person), ‘Announcing the restoration of oriental white stork’(1 person).

〈Table 1〉 Extracting the key elements of the restoration of oriental white stork

On the basis of 23 points of ESD extracted restore element of oriental white stork, (24 items)		After collecting expert opinion (12 items)
Building governance, International cooperation of the restoration of oriental white stork, Unification of the korean peninsula, Conservation of biodiversity, Conservation of the habitat of oriental Wwhite stork, Farming methods utilizing oriental white stork, Rice farming, A farming firm, Dancing of oriental white stork' rice, Environment-friendly agricultural marketing, Sapkyo stream·Muhan stream, Wetland protection, A parenting activity for the oriental white stork, The movement of oriental white stork, Artificial nest, Utility pole landfill project, Forest green, The harmony of man and oriental white stork, Cooperation and discussion with residents, Ecological city, A study on the supporting methods of aging society, The oriental white stork park, Yedang reservoir, Creative city utilizing the humanities of oriental white stork	 Collecting ex- pert opinion	The ecology of oriental white stork, Respect for life, Governance, International cooperation of the restoration of oriental white stork, Unification of the korean peninsula, Biodiversity, Conservation of the habitat of oriental white stork, The safety of the oriental white stork, Announcing the restoration of oriental white stork, Marketing of eco-friendly agricultural products, The relationship between man and oriental white stork, A livable village

The process and correlation of selecting the key elements of the restoration of oriental white stork are as follows.

First, they selected ‘Respect for life’, which is not included in 24 categories but were emphasized by experts and staffs related to oriental white stork. ‘Respect for life’ is oriental white stork’s central spirit of overall content.

Second, 'Cooperation and discussion with residents' was included in 'Governance'.

Third, 'Sapkyo stream·Muhan stream', 'Wetland protection', 'Forest green', and 'Yedang reservoir' were included in 'Conservation of the habitat of oriental white stork'.

Fourth, 'Artificial nest', 'Utilitypole landfill project', and 'The movement of the oriental white stork' were included in 'The safety of the oriental white stork'.

Fifth, 'oriental white stork park', 'A parenting activity for the oriental white stork', were included in 'Announcing the restoration of oriental white stork'.

Sixth, 'A farming firm', 'Dancing of oriental white stork's rice' and 'Rice farming' were included in 'Marketing of eco-friendly agricultural products'.

Seventh, 'Ecological city', 'A study on the supporting methods of aging society', and 'Creative city utilizing the humanities of oriental white stork' were included in 'A livable village'.

The 12 core elements of OWS village are derived from the process of extracting and extracting elements related to OWS village in Yesan County, South Korea from the perspective of Sustainable Development. The above items encompass all social, environmental, cultural and economic aspects of ESD and ultimately pursue the harmonization of human and ecological communities, restoration and Sustainable Development, including the restoration of oriental white stork

2. Results of the Third Grade Elementary School Textbook Analysis for ESD

1) Analysis of ESD-Related Contents through the Reorganization of Curriculum

Contents through the reorganization of curriculum was based on textbooks and guidebook for teacher, and the unit, sanctions, and activities related to ESD were extracted, and the areas related to ESD core concepts and the level of ESD related were displayed (〈Table 2〉).

〈Table 2〉 Example of ESD content extraction table for the third grade curriculum

Curriculum	School year/ semester	Unit	Semester criteria for achievement	class	Contents related to ESD reconfiguration (concept)	Key competency related ESD	ESD- related levels
A national language	3-2	6. Write with a heart	Writing thoughts in consideration of the reader's mind	7-8/10	Write a note to a friend in North Korea (unification)	Society	○
Morality	3-1	1. Me and you, together	Knowing the importance of friends, understanding and acknowledging each other's positions	1/4	Know how to get along with friends of nature (peace)	Society	◎
Society	3-2	1. Different lives depending on environment	Exploring the circumstances of our hometown and the lifestyle that follows it	10/15	Sustainable food for people in Gwang-si (sustainable food production)	Environment	◎
Mathematics	3-1	1. Addition and subtraction	Understand the adding and subtracting of three digits	10/10	See calories in your life (health, food)	Society	○
Science	3-1	2. Soil and fossil	Understand the process of creating fossils	7/7	Creative Decoration of Natural History Museums Focused on Gwang si-myeon (Culture Heritage)	Culture	◎
Physical education	3-1	1. Health and physical strength	Explain the relationship between exercise and health	4-5/12	How to live healthy (health)	Society	◎

* The text is marked as '◎' if the text is closely related to Sustainable Development or '○' if it is slightly related

After reorganizing the curriculum for each subject, we analyzed the contents of the third grade curriculum based on four key concepts related to Sustainable Development. The results are as follows (〈Table 3〉).

〈Table 3〉 Analysis results of the third grade curriculum

Analysis per- spective	Subject								
	sum	a national language	morality	Society	mathe- matics	Science	Physical Education	Music	the fine arts
Social	32 (18)	8 (2)	4 (4)	5 (5)	2 (0)	3 (3)	7 (6)	1 (0)	1 (0)
Environmental	37 (30)	7 (0)	2 (2)	2 (2)	8 (0)	15 (15)	0 (0)	2 (0)	1 (1)
Economic	9 (4)	4 (0)	2 (2)	2 (2)	0 (0)	1 (0)	0 (0)	0 (0)	0 (0)
Cultural	14 (0)	3 (0)	1 (1)	5 (5)	1 (1)	1 (0)	0	1 (1)	2 (2)
Sum	91 (52)	22 (0)	9 (9)	14 (14)	11 (1)	20 (18)	7 (6)	4 (1)	4 (3)

* The number in () refers to the number of reconstructed contents and implementation criteria directly contains the meaning, value, etc. of ESD

The results of the textbook analysis are as follows.

First, all the subjects except English included the concept of ESD, and in the case of Korean language and science, the number of ESD-related concepts was highest at 22 and 20 respectively.

Second, morality, social studies, science and physical education had a far higher percentage of content whose main content of performance standards and educational activities directly related to the meaning and value of ESD than other subjects.

Third, in terms of frequency, ethics, social studies and science departments, ESD-related contents were included throughout the curriculum, but the frequency decreased as we avoided duplication in the same unit during the curriculum reorganization process.

Fourth, concerning ESD, there are environmental perspectives (37),

and social perspectives (31), cultural perspectives (14), and economic perspectives (9). This suggests a growing interest in learning about environmental issues, biodiversity and natural resources in the curriculum. It also shows that the emphasis on human rights, peace, and safety was reflected in the era of globalization.

3. Development of a Program of ESD utilizing Oriental White Stork

1) Purpose of Development of Program of ESD utilizing Oriental White Stork

The restoration of oriental white stork is a project that can realize the value of Sustainable Development that is emphasized all over the world including UNESCO.

Program of ESD utilizing oriental white stork, which is the core material of restoration of oriental white stork, leads the interest and participation of the third grade students of the elementary school in the village of oriental white stork in the restoration of oriental white stork. At the same time, they are teaching will and attitude for ESD.

2) A Basic Direction of Program of ESD utilizing Oriental White Stork

The basic direction of the program for ESD utilizing oriental white stork for third grade in elementary school students is as follows.

First, from the viewpoint of the four areas of ESD presented by the Korea Committee of UNESCO, the contents of the unit, sanctions and activities were reconstructed by analyzing the textbooks and the guidebooks for teacher of the third grade of the 2015 revised curriculum.

Second, the program organization developed a field-based learning program that links current curriculum and creative experience activities by selecting contents that can be experienced while directly engaged in activities related to restoration of oriental white stork and Sustainable Development that students often encounter around them.

Third, the four key areas of ESD were evenly distributed, so that the core achievement factors of the grade level curriculum and the integrated elements of environment, economy, society, and culture were integrated.

Third, the core four areas of ESD were distributed evenly so that key performance factors of each school year and integrated elements of environment, economy, society and culture, which are values sought in ESD, were developed.

Fourth, through participation in the program, the core competence components⁵⁾, such as knowledge, systematic thinking, emotion, ethics and values, actions and practice, developed by UNECE (2008) were developed.

Fifth, we have developed a ESD program by topic so that students can make self - directed learning by taking advantage of the characteristics of project learning and construct meaningful knowledge through integrated experience in one topic.

3) Selection of Topics for ESD utilizing Oriental White Stork

The third grade of elementary school is a time when concepts are less diverse than those of higher grade students and when mental and physical growth is radical. Therefore, because integrated learning is

5) UNECE, 2008, Discussion paper on competence in ESD in the education sector.

more effective than separate learning by topics, similar contents were collected and selected for topics.

The criteria for selecting the topics of the ESD program utilizing the oriental white stork are as follows.

First, the theme was organized so that the meaning of Sustainable Development can be well understood, including the key elements that make up the restoration of the oriental white stork.

Second, the topics were organized with contents that can achieve the performance criteria of each subject and unit of the 2015 revised curriculum through the expression of the topics that are comprised.

Third, the topics were organized so that students could be self-directed and interesting when reorganizing the program by converging with each subject and creative experience activity.

Fourth, contents are selected that can stimulate emotions and foster natural emotion through interaction with living creatures in the ecosystem to lead to actions and practice among core competences for ESD.

Fifth, according to the development stages of third-year elementary school students who failed to get out of self-centered thinking, the contents of the study were selected as learning contents that could be experienced around them and provided experiences to them.

The key competences, curricula, and timing of Sustainable Development to guide selected topics, contents, ESD Core capability, related textbooks and timelines are as follows (Table 4).

The program of ESD utilizing oriental white stork can be operated by using the curriculum and the creative activity time. It contains five topics: “the life cycle of the oriental white stork”, “habitats of the oriental white stork”, “we are guardians of the oriental white stork”,

〈Table 4〉 Topics and related subjects for ESD utilizing oriental white stork

Order	Topic	Contents	ESD Core capability	Related textbooks and timelines
1	The life cycle of the oriental white stork. 1.Find the oriental white stork. 2.I'm the gender equalizer.	<ul style="list-style-type: none"> •The shape of the Oriental White Stork, special signs and ecology •The growth of Oriental White Stork child-rearing behavior •Changing the role of family members 	Knowledge Emotional Systematic thinking ethical values	Korean 3-1-4. Put my heart in letter (1) Morals 3-6. We respect life (1) Social 3-2-3. Changes in family form and role (1) Science 3-2-2. The life of animals (1)
2	Habitats of the oriental white stork. 3.What a oriental white stork likes. 4.Living creatures in a rice fields.	<ul style="list-style-type: none"> •Forests and wetlands •Biodiversity •The creatures living in the paddy field 	Knowledge Emotional	Science 3-1-1. Let's explore like a scientist (1) Science 3-2-2. Life of animals (1) Art 3-4 Nature is a fun habitats (1) Creative experience activity -Self-regulatory activities (1)
3	We are guardians of the oriental white stork. 5.I'm sorry! oriental white stork. 6.Oriental white stork, cheer up!	<ul style="list-style-type: none"> •Respect for life •Safe life •Safety of Oriental White Stork 	Ethics and values conduct and practice System accident	Morals 3-6. We respect life (1) Physical education 3-5. Safety (1) Creative experience activities - Service activities (1) Creative activities - Autonomous activities (1)
4	The children's business union in the OWL village. 7.Visit to the OWS village.	<ul style="list-style-type: none"> •Farm produce •Oriental White Stork ecology act •The distribution process of the products of OWS village •Experience the flee market 	Knowledge conduct and practice	Social 3-2-1. Exposed to environment (1) Morals 3-2). Roads for all of us (1) Creative experience - Career (2)
5	Our design of the OWL village. 8.Our village, Can I install it? 9.Hey, guys, do move to our town?	<ul style="list-style-type: none"> •Anti-foul facility •Dialogue and compromise •The Oriental White Stork and the man •Planning a future village 	Ethics and values Emotional	Korean 3-1-8. I have an opinion (1) Korean 3-2-9. I'm the one in the work(1) Morals 3-5. Happy world to keep together (1) Creative activities - Autonomous activities (1)

“the children’s business union in the OWS village”, and “our design of the OWS village”.

Each topics can proceed to 4 times and is made up of sub-categories ; 1.find the oriental white stork, 2.i’m the gender equalizer, 3.what a oriental white stork likes, 4.living creatures in a rice field, 5.i’m sorry! oriental white stork, 6.oriental white stork, cheer up!, 7.visit to the OWS village, 8.our village, can I install it?, 9.hey, guys, do move to our town?

Among the twelve key elements of restoration of the oriental white stork after reassembling opinion of the five experts and two staffs, the items of ‘international cooperation of the restoration of oriental white stork’, and ‘unification of the korean peninsula’ were excluded because they were somewhat difficult to be considered as independent items. In the case of ‘unification of the korean peninsula’ item, it is possible to refer to the movement of oriental white stork imigrating to and from North Korea and Russia freely in the item ‘safety of oriental white stork’. The item ‘international cooperation’ could guide the need and importance of international cooperation in the item ‘we need to protect the oriental white stork’.

The teaching and learning process is a project-type program that can internalize the value of Sustainable Development that can be utilized in restoration of oriental white stork. It uses news stories and storytelling to create interest and build up a good sense of Sustainable Development. It was guided by activities such as game activities, NIE, letter writing, discussion activities, drawing, and expressing with gestures. This is an example of the teaching and learning process topic 2. habitats of the oriental white stork, sub-categories. 4. living creatures in a rice fields (<Table 5>).

〈Table 5〉 Professor-learning courses (example)

Topic	Habitats of the oriental white stork Living creatures in rice fields		
Related textbooks and lessons	Science 3-1-1. Let's explore like a scientist (1) Creative Experience Activity - Self-regulatory Activities (1)		
Aims of the lesson	We can examine the organisms living in the rice fields and talk about the meaning of biodiversity		
ESD Core capability	Emotion	ESD-related areas	Biodiversity environmental problems
Stage (minutes)	Teaching and learning activities		
Introduction (10)	<ul style="list-style-type: none"> ◦ Motivation <ul style="list-style-type: none"> - Imagine the name of this one. - Imagine the role of this ◦ Establishing learning topics <ul style="list-style-type: none"> - Set a topic - Set it the group 		
Development (50)	<ul style="list-style-type: none"> ◦ Establishing a topic by group <ul style="list-style-type: none"> - Investigate small living things in a rice field - Investigate the plants that live in the rice fields - Investigate the living creatures in a stream - Comparison of organisms in paddy fields and streams - Understanding the food webs of non-ecological and stream ecosystems ◦ Precautions and safety training <ul style="list-style-type: none"> - Learn how to use the collection network, how to observe, and safety accidents in outdoor activities ◦ Meaning of biodiversity <ul style="list-style-type: none"> - Understand the meaning and importance of biodiversity 		
Arrangement (20)	<ul style="list-style-type: none"> ◦ Organizing <ul style="list-style-type: none"> - Establishing presentation methods - Presentation by group 		
The significance	<ul style="list-style-type: none"> ◦ This in the motivation is 'Dumbeong'. 'Dumbeong' is often used as a small pond called ecological pond for farming purposes and it is a pool used to store water by creating a small puddle near the center of the paddy for the purpose of continuously supplying water to the paddy ◦ During the development phase, it may be a little difficult to select a topic for each group of elementary school children so that the teacher stimulates the thinking process in various ways ◦ When observing the biological and river creatures, thoroughly educate the safety and be sure to accompany the guidance instructor and the assistant teacher so that safety accidents do not occur ◦ When guiding the meaning of biodiversity, lead in connection with restoration of endangered species 		
Evaluation plan	Area	Assessment contents	Evaluation method
	Knowledge and understanding	Is it possible to investigate organisms living in rice fields and explain their food web relationship?	Observation evaluation
	Value and attitude	Do you have an attitude that values biodiversity?	
	action and activity	Did the rice paddies actively participate in various biological surveys?	

The above mention examples of the teaching and learning process topic 2. habitats of the oriental white stork, sub-categories. 4. living creatures in a rice fields.

‘It’ in motivation consists of the forest and wetlands of our country, biodiversity, and the life of rice paddies. ESD-related areas include biodiversity, environmental issues, and ESD’s core capacity to grow is the environment and life sensibility that can be grown by experiencing the fields and wetlands directly.

The course of teaching and learning in the above program goes through the process of introduction, development, and arrangement and then the process of project learning. It is important to note that it may be somewhat difficult to select a learning topic for elementary school seniors at the top level, so teachers should stimulate the thinking process in a variety of ways, and safety education should be important throughout the process to prevent accidents.

4. Improvement of Program of ESD utilizing Oriental White Stork

In order to verify the validity of the program developed in this study, it was evaluated by experts in environmental education. The appropriateness of the selection of the learning topic, the specificity of the learning goal statement, the linkage of the learning objectives, the validity and effectiveness of the learning materials.

It has undergone the process of revision and supplementation with expert evaluation based on appropriateness of grade level, systematic structure of content composition, and validity of evaluation contents.

In selecting the learning topics, it is generally considered that the program implies that the content to be pursued in restoration of the oriental white stork is appropriately implied in terms of Sustainable

Development. The relevance of the learning objectives and the validity and effectiveness of the learning materials, and the validity of the evaluation content are also consistent and appropriate to achieve the learning objectives. However, there are many opinions that grade level may be somewhat difficult for the elementary school 3th grade children. There is a somewhat unnatural part in the development of project learning. Expert opinions on 7 basic items for program verification are summarized as follows (Table 6).

Table 6) Education program evaluation areas and their expert opinion

Number	Evaluation area	Expert opinion
1	Adequacy of the selection of learning topics	In the learning topic, the overall content of the restoration of the oriental white stork is contained
2	The specificity of a learning objective statement	The statement of the learning objective is specific
3	Linkage of learning objectives	The goals and sub-targets pursued in ESD are interlinked
4	Feasibility of learning materials and effectiveness	Learning materials are not only interesting to students, but are also linked to the real world and are expected to be effective
5	Grade-level fitness	Some difficult contents are included for children in third grade of elementary school
6	Systematicity of content composition	There are some areas where motivation and development process are somewhat awkward. There is a slight degree of difficulty in proceeding with project learning
7	Validity of assessment	Consistency between learning objectives and assessments

Although the program was finalized based on expert assessment opinions, the program leaves open the possibility of revision, supplementation or reorganization, depending on the school site, the timing of education, teachers in charge, and students in charge.

The restoration of oriental white stork is an activity that can realize the value of the project while having the meaning of Sustainable

Development, which is emphasized globally, including UNESCO. A program of ESD was developed utilizing the oriental white stork, a key material of the restoration of the oriental white stork, through the stage of planning, preparation, development, improvement. The program drew the attention and participation of children in the third grade of OWS village in Yesan County, South Korea. In addition to achieving the achievement standards set out in the curriculum of the 2015 revised curriculum, students are achieved the ability to think, practice, will, and attitude necessary for sustainable education.

V. Conclusions and Suggestions

This study is to develop a program of ESD utilizing the oriental white stork to help children in third grade living near OWS village in Yesan County, South Korea. They can learn the value of Sustainable Development while achieving the achievement standards presented in the revised 2015 curriculum.

The development of the program was completed in four stages, planning, preparation, development and improvement, and developed 20 classes ESD programs on five integrated topics.

The results of the study are as follows:

First, the key elements of the concept of Sustainable Development, which constitutes the restoration of the oriental white stork according to the perspective of the concept of Sustainable Development proposed by Park and Sung (2007) in the Korea Committee of UNESCO, are extracted and revealed the relationship between the restoration of the oriental white stork and the Sustainable

Development.

Second, through the restructuring process of the analysis results of the curriculum of 2015 revised third grade, it was to reconstruct the achievement standards, ESD related concepts, core competency related areas, and ESD related levels that are aimed in all curriculum and creative experiential activities, and to create a foundation for.

Third, it was developed total of 20 classes under five topics; “the life cycle of the oriental white stork”, “habitats of the oriental white stork”, “we are guardians of the oriental white stork”, “the children’s business union in the OWS village”, and “our design of the OWS village”.

The conclusions are as follows:

First, the program of ESD, which utilizes oriental white stork, is an effective program to communicate the concepts, values and life patterns presented in the education of Sustainable Development to elementary school children near OWS village in Yesan County, South Korea.

Second, through classes and guidance related to local ecological resources, students were encouraged to understand the community and to take pride in themselves as members of the community and to participate in it with interest.

Third, this program is effective in educating not only biodiversity education but also in realizing a harmonious life with oriental white stork and community dwellers pursued by the restoration of oriental white stork.

Fourth, the study will help develop education programs in various local governments, environmental groups, and the local education office that have biological resources related to endangered species.

This study was developed to help children in the Third grade of the elementary schools around the OWS village in Yesan County, South Korea learn and practice the value of Sustainable Development, and it is lacked that the school year applied to the region is limited. To develop and apply a better ESD program, I would like to propose the following.

First, in this study, the study produced a learning program for children in the third grade of elementary school near OWS village in Yesan County, South Korea, but it is necessary to link the education of kindergarten, the education of elementary school through sixth grade, the education of middle school, the education of highschool, the education of university, the education of society.

Second, although this study sought to address the key concepts of ESD extensively, there were limitations in organizing education programs that included corporate sustainability, reduction of the gap between rich and poor, and fair distribution and sharing of wealth at key values. Various programs are required to be developed so that the concept of Sustainable Development is absorbed into the education program and students can correctly accept the meaning of the concept of Sustainable Development.

Third, as the purpose of this study was to develop programs of ESD utilizing oriental white stork, the application and execution of the programs could not be performed. More research related to restoration of oriental white stork is needed through the application and implementation of ESD program utilizing oriental white stork through follow-up research.

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Received: 05 December 2018
Revised: 09 December 2018
Accepted: 14 December 2018