

RESEARCH TRENDS AND ISSUES OF EDUCATION FOR SUSTAINABLE DEVELOPMENT- RELATED RESEARCH IN SOUTH KOREA

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Introduction

Based on the benefits of science and technology, mankind has been able to enjoy a convenient life incomparable to the lifestyles of any other age. However, modern man stands face to face with gradually intensifying problems, such as climate change, ecosystem problems, starvation, poverty, and the protection of human rights. It is necessary to resolve such problems, since these problems may affect future generations. In such circumstances, the importance of sustainable development is being emphasized more.

The concept of “sustainable development” has transitioned into a concept that comprises diverse topics since initially being mentioned in a report by the World Commission on Environment and Development in 1987 (WCED, 1987). Such sustainable development was mainly discussed at the UN conference held in 1992 in Rio de Janeiro, Brazil to discuss the topic of “environment & development” (Chung, 2010). As Agenda 21, one of the documents selected during this conference, emphasized the role of education for sustainable development, such education for sustainable development created a new global education paradigm. After 10 years, in 2002, at The Johannesburg World Summit on Sustainable Development held in Johannesburg, the previous 10 years of how Agenda 21 was executed was reviewed. At this conference, through the Johannesburg Declaration, a resolution was reached to firmly execute sustainable development on a regional/national/global level (Kim, Yoo, Shin, & Park, 2013). To accomplish this, it was repeatedly emphasized that education is an essential condition for promoting sustainable development. At the US conference held in the same year, the years from 2005 to 2014 were announced as the “UN Decade of Education for Sustainable Development (UNDESD)” with the purpose of executing what was agreed upon at the Johannesburg Conference (Barthes, Alpe, & Bader, 2013). Such an announcement by the UN can be seen as a request to the world to make educational efforts to develop, reinforce, expand and settle sustainable development.

To achieve the goals of Education for Sustainable Development (ESD), the Korean government established related institutions and various legislations. Namely, in Korea, the Presidential Commission on Sustainable



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Abstract. *The aim of this research was to explore research trends and issues in Education for Sustainable Development (ESD) in South Korea. To accomplish this, we conducted an analysis of 222 peer-reviewed journal papers related to ESD in South Korea. The research concentrated on identifying four characteristics of ESD research: 1) key publication features, 2) the research topics described, 3) the research design employed, and 4) the types of sample/subjects. The results showed that the initial ESD research began in South Korea in 2005, and the number of the journal papers has increased since 2010. Regarding research topics, more research has been conducted on establishing conceptual or theoretical foundations related to ESD. Moreover, teachers' attitudes or perceptions and program development associated with sustainable development were studied in depth. There were similar ratios of the theoretical research, quantitative research, and qualitative research regarding research design but mixed methods studies indicating the least ratio. Content analysis was the most prevalent analysis technique for quantitative/mixed ESD research. Regarding data sources or participants, the most common data source was the literature. Several research suggestions were made for assessing ESD programs and in-service teachers' ESD professional development.*

Keywords: *ESD, South Korea, science education, technology education, research trends.*

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Development (PCSD) was established in 2000, and the institution established the ESD Execution Plan in 2006. In 2008, a policy was promoted to materialize sustainable development in a way suitable for the circumstances in Korea through 8.15 Green Growth Declaration. In June 2009, "ESDA Korea" was established under the Korean National Commission for UNESCO (Yoo, Kim, Shin, & Park, 2013). In particular, in Korea, the legal grounds for ESD were established through the Framework Act on Sustainable Development Law (2008.2.4), Environmental Education Promotion Law (2008.9.22), Basic Act on Low Carbon Green Growth Law (2010.1.13), and Ministry of Education and Science Technology Announcement (No. 2009-41) (Yoon, 2013).

Since prior research focused on defining the concept of ESD, it is difficult to specifically examine the information that was studied in the developmental stages of ESD. In addition, it is necessary to analyze such research focused on cases in Korea so that not only the flow of ESD being executed in Korea can be examined but also so that the educational practice for ESD can be provided.

Accordingly, this research was expected to be used as the baseline data for seeking direction for ESD research in the future through analyzing the trend of the ESD research in Korea at a time where the interest in ESD is high, and, thereby, providing related researchers with information that is relevant to their research topics and methods.

Theoretical Background

ESD in South Korea

Through the United Nations Conference on Environment and Development held in 1992, all nations were suggested to establish a National Commission on Sustainable Development with a purpose to actualize the Rio Declaration and Agenda 21 (Chung, 2010). Accordingly, the President of South Korea announced the establishment of the Presidential Commission on Sustainable Development (PCSD) in June of 2000. After the World Summit on Sustainable Development (WSSD) was held in Johannesburg in 2002, the concept of sustainable development started to expand globally. In June 2003, the PCSD issued the National SD Strategy Plan Report. In June 2005, the President announced "a new nation where its economy, society, and environment make progress" as National SD Vision. After a year, in October 2006, the National SD Execution Plan, which includes the specific execution and follow-up plans for the National SD Vision was reported at the cabinet meeting (Chung, 2010).

Based on the efforts made by the Korean government, a number of SD-related legislations were established. For example, in August 2007, the Framework Act on Sustainable Development was established. This act outlines plans to participate in the global efforts for SD for the present and future generations to enjoy better lives.

A series of policies put out by the Korean government served as the baseline for ESD in Korea. When global society announced the UN Decade of Education for Sustainable Development, Korea established a nation-wide promotion strategy to efficiently execute ESD. Namely, in June 2005, the PCSD executed "National R&D Program for UN Decade of Education for Sustainable Development", and, thereby, participated in the flow of ESD. The PCSD established the ESD Execution Plan in 2006 and promoted a policy to materialize sustainable development in a way suitable to the circumstances in Korea through the 8.15 Green Growth Declaration in 2008. In June 2009, ESD Korea was established under Korean National Commission for UNESCO (Yoo et al., 2013).

Such efforts were initially shown when Tongyeong was designated the initial Regional Centre of Expertise (RCE) in Korea in October 2005. As Incheon was designated as the second RCE, ESD was concretely executed. ESD was also applied to the national curriculums provided in Korea. For example, the Korean National Curriculum revised in 2007 specifies to execute ESD and ESD-related education (e.g., environmental education, economic education, energy education, education for international understanding and maritime education) in elementary and middle schools (National Curriculum Information Center, 2008).

As described, Korea has been executing diverse ESD-related policies according to the flow of the global society, and such policies have continued until today.

ESD-related Research Trends

Based on the trend in global society to encourage ESD, the number of ESD-related research gradually increased. Accordingly, a number of research studies were conducted to analyze trends in such ESD-related research and trends in the related educational significance. Initially, the studies conducted in Korea are as follows. Jeo (2012) analyzed trends in ESD research based on the related theses and reports published in Korea over the last 10 years.



As a result, it was proposed that the number of studies dealing with ESD-related curriculum and teaching-learning methods was greater than the number of studies dealing with other topics. In addition, it was also proposed that a lot of these studies selected elementary school students as the subjects. Seo and Cho (2015) analyzed trends in areas such as research periods, subject nations, content, and information, in 147 ESD-related journals and theses related to the developmental stages of ESD. Through such analysis, it was confirmed that the number of ESD-related studies has been continuously increasing. In addition, it was also confirmed that studies conducted overseas were more focused on teaching methods and program development, whereas studies conducted in Korea were more focused on theoretical areas. Kim and Choi (2014) analyzed areas of trends, such as research periods, research content, methods, targets, and topics, in 155 ESD-related studies presented over the last 10 years. As a result, it was proposed that the ESD studies conducted in Korea mostly consisted of qualitative and quantitative research and that most of the ESD studies conducted in Korea selected elementary school students as the subjects.

The globally analyzed research trends in ESD are as follows. Davis (2009), having analyzed 22 ESD-related studies that selected children as the research subjects, selected studies that included the concept of sustainable development in the early childhood education, and divided these studies into the three categories: 1) within the environment, 2) on the environment, 3) and for the environment. Davis (2009) confirmed that the number of child-centric studies has been gradually increasing. Wright and Pullen (2007) analyzed trends in the ESD-related theses published in the ESD-related academic journals from 1990 to 2005. They reported that the number of such ESD-related theses gradually increased at a nonlinear rate, and they reported that the ESD-related research was published in both interdisciplinary and traditional disciplinary journals. A research by Jeo (2012) was limited, in that its uncertain description on the method used for analysis made it difficult to confirm reliability of the research. In addition, studies by Davis (2009) and Seo and Cho (2015) were also limited, in that such studies only selected the child-related ESD studies as the subjects. Research by Kim and Choi (2014) was limited, because it included theses presented at symposiums. A research conducted by Wright and Pullen (2007) also showed limitations, due to the fact that it cross-retrieved terms, such as "education," "sustainable development," "sustainability," "sustain," and "sustainable" from Education Resources Information Center (ERIC), and, thereby, included theses unrelated to "education of sustainable development" as intended by UNESCO.

Accordingly, it is necessary to carry out a research that can examine the flow of ESD executed in Korea and provide direction for ESD by overcoming the limitations of previous studies.

Research Methodology

General Description

This research explored ESD research trends for ESD-related academic journal papers published in South Korea from 2005 to 2018. The research searched for academic papers related to ESD with keywords such as "educational sustainability development" using websites, such as the *Research Information Sharing Service* (<http://www.riss.kr>), the *National Assembly Digital Library* (<http://www.dlibrary.go.kr>), and *DBpia* (<http://www.dbpia.co.kr>). The searches were performed as of January 3, 2019. First, a screening process for the searched papers was conducted by reviewing the titles and abstracts of an individual academic papers. Additionally, selected papers were shortlisted after the first screening process. Furthermore, among the selected research papers, conference proceedings or journal editorials were excluded. As a result, a total of 222 papers were selected and analyzed for this research.

Criteria and Methods

The analysis criteria for the trends in Korean ESD studies have been developed by researchers by referencing the trend analyses of prior studies (Gecit, 2010; Hallinger & Chen, 2015; Heimlich, 2007; Johnson & Daugherty, 2008; Lee, Wu, & Tsai, 2009; McFarland, Williams, & Miciak, 2013; Williams, 2013). The criteria for analysis in this research were four items: year, research topic, research design, and research subject.

First, year was selected to identify trends by year. Second, the research topics were selected in order to determine what subjects were primarily dealt with in the paper. The sub-categories of research topics consist of eight items: conceptual issues, teaching/curriculum, program development, student factors, teacher factors, general factors, and combination of factors.

Third, research design was chosen to identify what kinds of research methods were used in ESD research



papers. The research design sub-category was composed of four items: quantitative research, qualitative research, theory or conceptual research, and mixed research. For the specific analysis of these research methods, additional analyses for the research design and statistical techniques were conducted. Specific research types of quantitative research design were categorized as descriptive, quasi-experimental, and tools development and measurement. Additionally, the statistical methods were categorized as descriptive statistics, testing, correlation, regression, and factor analysis. For qualitative research, the specific methods were categorized as interview, observation, content analysis, and mixed. The mixed category indicated qualitative research methods combining two or more qualitative methods in this research.

Fourth, the research subject category was selected to identify the subject of research in papers. The research subject sub-categories were kindergarten students, elementary students, middle/high school students, college students, teachers/professors, parents, the public, combination, and documents.

Data Analysis

For this research, the researchers collected papers on ESD from August 2018 to November 2018 and examined their contents. A preliminary analysis was conducted after establishing the analysis framework by reviewing the previous research. The preliminary analysis was carried out by two analysts, a trend analysis research expert and an ESD research expert, according to the analysis. The researchers randomly selected 50 papers for analysis and calculated the agreement rate. The agreement between the analysts was 98.7%. After reviewing the results of the analysis, researchers discussed the discrepancies, and revised the data analysis criteria by referring to the previous research and books. The modified analysis framework was verified by one analytical expert professor. The researchers collected additional updated papers by January 3, 2019 and analyzed the final 222 papers.

The SPSS 22.0 statistical program was used for the analysis and the results were presented as frequencies and percentages.

Research Results

The Yearly Publication of ESD-related Research

The analysis of the yearly trends for Korean ESD is presented in Table 1. As a result of the analysis, it was found that Korean ESD research was introduced in 2005 and fewer than 10 papers on ESD were published per year until 2009. However, more than 10 papers were published starting in 2010, and more than 30 papers have been published since 2014. Therefore, Korean ESD research started in 2005, and it has been confirmed that the amount of research has gradually increased.

Table 1. Yearly publication of the ESD research.

Year	<i>N</i>	%
2005	2	0.9
2006	4	1.8
2007	2	0.9
2008	1	0.5
2009	6	2.7
2010	17	7.7
2011	13	5.9
2012	14	6.3
2013	19	8.6
2014	33	14.9
2015	31	14.0
2016	34	15.3



Year	<i>N</i>	%
2017	33	14.9
2018	13	5.9
Total	222	100

Research Topics of ESD-related Research

The ESD research topic trends are presented in Table 2. Conceptual issues (38.7%) are the most popular, followed by student factors (22.1%), teacher factors (16.7%), and so on.

Table 2. Research topic for ESD-related research.

Research topics	<i>N</i>	%
Conceptual issues	86	38.7
Student factors	49	22.1
Teacher factors	37	16.7
Program development	28	12.6
Teaching/curriculum	13	5.9
Public factor	5	2.3
Combination factor	2	0.9
Parent factor	2	0.9
Total	222	100

Research Methods of ESD-related Research

The research methods of ESD-related studies are presented in Table 3. The most popular method was the theoretical or conceptual approach (34.7%), followed by qualitative research (30.2%) and quantitative research (27.5%). Mixed research showed the smallest frequency (7.7%).

Table 3. Research methods for ESD-related research.

Research methods	<i>N</i>	%
Conceptual approach	77	34.7
Qualitative research	67	30.2
Quantitative research	61	27.5
Mixed research	17	7.7
Total	222	100

For a more specific analysis of the research methods, they were further analyzed to identify the research design and statistical methods. First, the results of the analysis used in the research design in quantitative and mixed research (a total of 78 papers) are shown in Table 4.



Table 4. Research design for quantitative/mixed methods research.

Research design	<i>N</i>	%
Descriptive research design	47	60.3
Quasi-experimental design	25	32.1
Tool or instrument development	6	7.7
Total	78	100

For quantitative and mixed methods research, descriptive research has been carried out the most (60.3%). The statistical techniques used in quantitative research and mixed research are presented in Table 5. Testing has been carried out the most (53.8 %).

Table 5. Statistical technique in quantitative/mixed methods research.

Statistical technique	<i>N</i>	%
Testing	42	53.8
Descriptive statistics	25	32.1
Factor analysis	8	10.3
Correlation	2	2.6
Regression	1	1.3
Total	78	100

The qualitative methods used in qualitative research and mixed research (a total of 84 papers) are presented in Table 6. According to this, content analysis was carried out in 49 papers, accounting for the highest proportion (58.3%), followed by mixed (19.0%), interview (15.5%), and observation (4.8%).

Table 6. Methods in qualitative/mixed methods research.

Methods	<i>N</i>	%
Content analysis	49	58.3
Mixed	16	19.0
Interview	13	15.5
Observation	4	4.8
Triangulation	2	2.4
Total	84	100

The Subjects or Participants of ESD-related Research

As a result of the analysis of the subjects or participants of ESD-related research, documents or literature were used (51.4%) most frequently for the subjects of ESD-related studies. Additionally, teachers/professors (13.1%), elementary school students (10.8%), multiple targets (8.6%), kindergarten students (5.0%), college students (5.0%), the public (3.2%), middle/high school students (1.8%), and parents (1.4%) were recruited for research (Table 7).



Table 7. Subjects or participants for ESD-related research.

Subjects or participants	N	%
Literature	114	51.4
Teachers/professors	29	13.1
Elementary school students	24	10.8
Combination	19	8.6
Kindergarten students	11	5.0
College students	11	5.0
Public	7	3.2
Middle/high school students	4	1.8
Parents	3	1.4
Total	222	100

In this section, the researchers analyzed the ESD-related research conducted in Korea through four items: the year (Table 1), the topic (Table 2), the research method (Table 3), and the research subject (Table 7). Additional analysis was also performed for the sub items (Table 4-Table 6) of the research method, and the results are presented.

Discussion

Research related to ESD in Korea was initially introduced in 2005. Fewer than 10 research studies were conducted every year until 2009 and more than 10 studies were conducted per year after 2010. Namely, the number of studies related to ESD was quite small in the early stages until a significant increase was seen in 2010. Such results agree with the results the research by Kim and Choi (2014) that analyzed trends in ESD-related research in Korea. In Korea, such research was initially introduced in Korea when the concept of ESD was being globally adapted due to the announcement of US Decade of Education for Sustainable Development at the UN conference in 2002. From this point, UNESCO and various overseas nations started to discuss ESD. However, even after the concept of ESD was introduced in Korea, not that many studies related to ESD were conducted in Korea. This was not only because teachers and Education Offices were unaware of ESD, but also because the competitive entrance examination system in Korea made it difficult for middle schools to introduce ESD. The number of studies related to ESD started to increase from 2010 because the Korean government and educational institutions started making efforts to establish ESD-related policies and legislations from 2008 and also because the Korean National Curriculum was revised in 2007 to emphasize the importance of ESD. Based on such background, as the results of this research show, the amount of ESD-related research rapidly increased starting in 2010.

Secondly, the conceptual issue was mainly selected (38.7%) as the research topic in the ESD-related research conducted in Korea. This is because Korea was quite unaware of the concept of ESD at the time ESD was introduced, and, therefore, a number of studies were conducted to introduce the concept of ESD. In addition, many studies were conducted to establish ESD-related educational strategies or to explore the possibility of ESD in Korea. Some researchers introduced how ESD was executed in other countries, and some researchers focused on exploring the ESD-related factors used in the textbooks and teacher's textbooks in Korea. Prior studies with conceptual issues provided a robust foundation for further research and practices, and the studies on students' attitudes toward sustainable development (22.1%), teachers' perceptions (16.7%), and program development (12.6%) were performed. It turned out that there were largely studies on the subjects and target for ESD. Comparatively, research subjects, including parents, pre-service teachers, and communities, were not enough. For an efficient diffusion of ESD, more studies on its value and significance should be conducted for parents or the public. Therefore, further studies need to expand on research subjects like parents, the public, and pre-service teachers.

Thirdly, as a result of analyzing the studies related to ESD in Korea, there were relatively balanced figures among qualitative research (34.7%), the conceptual approach (30.2%), and quantitative research (27.5%), in terms of research design. However, the portion of mixed research design was relatively low, and most prior studies did not



clarify their research design. Globally, the mixed method design, combining quantitative and qualitative methods, has been actively conducted (Kim, Kim, & Lee, 2011). Therefore, further studies using the mixed method design should be performed for better interpretation and findings via the triangulation of collected data.

In this research, an additional analysis was conducted according to the research method. Initially, a total of 78 theses, consisting of 61 quantitative studies and 17 mixed method studies that used the quantitative method, were selected as the subjects for additionally analysis of research design and statistical techniques. As a result of analyzing the research design method used in the selected theses, it was discovered that the descriptive research design method was used most frequently. This is because a number of studies conducted an ESD awareness survey that targeted teachers and students or examined the actual status of ESD as applied in schools. As a result of analyzing the statistical techniques used in the selected theses, it was found that the testing technique and descriptive statistics technique were used the most frequently. On the other hand, tool or instrument development was the least frequently used research design method. Accordingly, in future research, it is necessary to remodel ESD-related test tools developed by other countries or newly develop a test tool that is suitable to circumstances in Korea (Lee & Cha, 2016). In addition, it was found that only a few studies were conducted based on the methods of statistical technique, factor analysis, and correlation and regression. This signifies that only a few studies were conducted to validate the related test tools and examine the influential relationship of related factors. Accordingly, it is necessary to conduct research that examines the influential relationship between variables related to the subjects of science and technology (Na, 2015) and variables related to ESD or research that examines the structural relationship between factors.

In this research, a total of 84 theses, consisting of 67 qualitative studies and 17 mixed methods studies, were selected as the subjects to additionally analyze the qualitative research method. As a result, it was found that content analysis was used most frequently. The researches that used such content analysis were mainly focused on analyzing ESD-related factors presented in kindergarten/elementary school/middle school textbooks, teacher textbooks, and curriculum provided in Korea. However, the interview method and observation method were used in a relatively low number of quantitative studies. It seems that this is because the Korean researchers preferred using the content analysis method, since this method allows a relatively convenient analysis of contents in comparison to other qualitative research methods in Korea, most of the qualitative research that analyzes the cases where ESD is applied selected children as the research subjects (Kim, Kim, & Yoo, 2016). Accordingly, it is necessary to conduct research that qualitatively analyzes the cases where ESD is applied to middle school science/technology classes.

Fourthly, as a result of analyzing the subjects of this research, it was found that the literature covered the highest percentage. As mentioned earlier, this is because ESD was introduced in Korea as a new education paradigm, and, therefore, a number of research studies focused on examining related literature. One particular point confirmed through this research is that almost no studies selected middle/high school students as the subjects. As pointed out by Lee et al. (2005) and other researchers, this is because the entrance examination-based education system in Korea made it difficult to apply ESD in a middle/high school context. To overcome this issue, middle school teachers are required to enhance their capability to execute ESD. Namely, the difficulties arising out of educational environments can be resolved through middle school teachers' passion and capability to execute ESD. In particular, the subjects of science and technology in Korea include many areas of ESD. Accordingly, it is necessary to provide science/technology teachers and pre-service teachers with ESD-related training for them to acquire the ability to include ESD in their curriculum. Moreover, it is necessary to provide support by integrating an ESD-related education program into the subjects of science and technology so that ESD can be conveniently executed in schools.

Conclusions

In this research, ESD research published from 2005 to 2018 in journals from South Korea were reviewed and analyzed to identify trends in ESD-related studies. The criteria of analysis in this research were four items: year, research topic, research design, and research subject.

First, ESD research began in 2005, and the number of ESD journal papers has gradually increased since 2010 in South Korea. It is a reasonable result that the Korean government accepted the ESD idea and supported educational researchers who studied ESD.

Second, the analysis of research methods shows that theoretical or conceptual research has been the most common method. South Korean professionals need a more stable foundation in ESD, and many studies have presented the philosophy and direction of ESD. Additionally, the proportion of factor analysis, correlation,



and regression used in statistical techniques has been very small. This means that the development of tools or instruments to measure the effectiveness of ESD has not been fully achieved yet. In addition, this means that studies measuring the relationships between related variables have not yet been carried out in the field of ESD. Therefore, it is necessary to perform further research to adapt and develop various tools related to ESD. Moreover, research needs to be conducted to determine the relationships between various science and technology educational factors related to ESD.

Third, as a result of the analysis of the subjects or participants, the document category was found to be the most common category. Many initial research studies have explored and introduced literature on ESD-related content in South Korea. However, research targeting middle school or high school students is scarce. This means that the practical and broad implementation of ESD targeting middle school or high school students in Korea has been insufficient. Therefore, further research should focus on the development and application of programs targeting these students.

Through this research, the researchers identified the trends of ESD research, methods of research, and subjects of research. Specifically, the majority of the ESD concepts were strongly associated with the learning content of science and technology curriculum. Therefore, science and technology educators need to relate the content in their science and technology courses to ESD. For example, in Korea, ESD content started being presented as one chapter in the middle school technology textbook from 2018. In addition, in middle school science textbooks, ESD content is presented in a separate section in supplementary materials (reading materials, in-depth materials). Researchers in countries that have not yet introduced ESD in science and technology courses need to add ESD in their science and technology curriculum by referring to Korea's approach.

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