

Exploring Education for Sustainable Development in a Chinese Kindergarten: An Action Research

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Abstract

Purpose: This article was intended to share and reflect on experiences concerning the education for sustainable development (ESD) project at Hongqiao Kindergarten in Shanghai. The project aimed to explore how ESD could be implemented in a current curriculum and to provide useful examples of educational activities and experiences.

Design/Approach/Methods: The action research included two cycles with four steps. The first cycle involved the integration of ESD into a traditional science curriculum. The second cycle involved the validation and optimization of the ESD objectives. The implementation strategies were reviewed and refined.

Findings: First, a variety of strategies can be used to identify the theme and choose the content. Second, the objectives should be developed on children's life experiences and interests. Third, the idea of ESD can be implemented in multiple ways. Fourth, a reasonable objective system involving ESD was constructed for children by ages. Fifth, there were many effective ways to integrate

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ESD activities into other domains of curriculum. The challenges and implications were also discussed.

Originality/Value: The study had a positive effect on teachers' ability to practice ESD. This was a pioneer project in early childhood education in China, which provided valuable information for those aiming to implement ESD practices in Chinese kindergartens.

Keywords

Action research, education for sustainable development (ESD) practices, implementation strategies, integration

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Introduction

Origin of OMEP-ESD

At the 1992 Earth Summit in Rio de Janeiro, the United Nations Conference on Environment and Development (UNCED) proposed that "Education is critical for promoting sustainable development and effective public participation in decision-making. . . . It is also the key to the formation of environmental and moral awareness, values, attitudes, skills, and behavior for sustainable development" (UNCED, 1992, p. 39). Education for sustainable development (ESD) is currently one of the most important goals within the field of early childhood education (ECE).

The World Organization for Preschool Education (OMEP) initiated an international cooperative project on ESD in 2009. The purpose of this project was to strengthen awareness of and implement ESD in ECE. OMEP China participated in the second stage of the project, which was an ECE project based on the 7Rs: respect, reflect, rethink, reuse, reduce, recycle, and redistribute (OMEP, 2010).

Traditional environmental protection activities in Chinese kindergarten

Although ESD was a relatively new concept in ECE in China when the OMEP project started in Shanghai, there was a long history of education about environmental protection within the Chinese kindergarten curriculum (Zhou et al., 2016). Kindergarten in China is an early education program for children aged 3–6. Since the 1990s, environmental protection activities in Chinese kindergartens have usually been situated within the science curriculum. The traditional objectives and content of science education were to help children understand the various sources of sewage and its toxicity to humans, the importance of preventing air pollution, and the harmful effects of noise pollution as well as to teach children ways to protect themselves from these sources of pollution (Wang, 1990). In recent years, teachers and parents have worked with children to find

environmental problems in their communities and have worked with local communities to distribute information and take action. For example, children, teachers, and parents have worked together to make use of old materials and/or recycle them. Teachers and parents have used children's television programming, picture books, magazines, posters, and children's stories to educate children about environmental protection. However, ESD content that aligns with the 7Rs recommended by the OMEP is much broader than traditional environmental protection content in China, and the implementation of ESD has been a great challenge for ECE teachers.

The purpose of the study in Hongqiao Kindergarten

Hongqiao Kindergarten in Changning district of Shanghai, China, has participated in the OMEP-ESD practice project for 9 years. The teachers in the kindergarten and the first author of this study have worked as an action research team since the beginning of the project. The study aimed to develop ESD awareness among teachers, children, and their parents and to foster their ability to take action to promote sustainable societal development. In addition, the study aimed to explore how ESD can be implemented into a current kindergarten curriculum with the hope of providing useful information for those aiming to implement ESD practices in other Chinese kindergartens.

This article is a summary and reflection on the exploration of an ESD curriculum at Hongqiao Kindergarten in Shanghai. It illustrates and discusses the problems teachers encountered during the process of ESD implementation and the strategies they tried. Finally, from the viewpoint of policy and classroom practice, this article proposes recommendations for implementing ESD in ECE in China.

Method

Participants

Hongqiao Kindergarten was established in 2007 and has been financially supported by the government. In Shanghai, there is a system for ranking the quality of ECE programs that contain five levels: demonstration program, Class I, Class II, Class III, and unranked. Currently, there are about 1,620 ECE programs in the city, and about 25% are ranked as Class I. Hongqiao Kindergarten has been ranked as Class I since 2014. This kindergarten contains approximately 36 staff members and 190 children distributed into 7 classes. Children are divided into three age groups: children aged 3–4 comprise the junior class, those aged 4–5 comprise the middle class, and those aged 5–6 comprise the senior class. The mission of Hongqiao Kindergarten is to nurture “happy children who are healthy, lively and curious to explore” (Changning Hongqiao Kindergarten, 2019). Science education is strength of the kindergarten.

All the teachers in Hongqiao Kindergarten participated in the ESD practice project. Among the staff, 22 are teachers, all of whom are qualified and have bachelor's degrees. About 50% of the

teachers were trained in ECE, and the rest were trained in other fields, such as science education, biology science, or environmental science.

A core study team comprised of 10 persons was established to take the lead in the exploration of ESD practices in the kindergarten. The members of this study team included the director of the kindergarten, teacher leaders for the three age groups, and the first author of this article.

Procedures

Action research was the main approach adopted by the team to implement ESD practices. In line with Lewin's (1946) action-research model, two cycles with four steps were performed: planning, action, observation, and reflection. During the first cycle, ESD practice was explored to answer the following question: How can ESD activities be designed and implemented in the science curriculum of a kindergarten? Then, during the second cycle, the following three questions were raised: What are effective ways to extend ESD activities to other domains of the curriculum? Are the goals of ESD activities scientific, appropriate, and feasible? Is it possible to integrate ESD activities into the daily routine of the kindergarten?

When the action research was being implemented, the team reviewed and refined ESD implementation strategies through observation, focused discussions, case analysis, and reflection on teachings. Records of these activities were used for the data analysis.

Results

The first cycle of action research: Initial trial in science education

There are five domains in the Chinese kindergarten curriculum: physical education and health, social learning, language, science (including mathematics), and art. Although China has adopted an integrated pedagogy in ECE programs, some kindergartens may choose to focus on one of the domains. Hongqiao Kindergarten focuses on science education. Therefore, we implemented the initial ESD practice in the science curriculum. Another reason we implemented ESD in the science curriculum was that the content of the environmental domain of ESD overlapped with the traditional environmental protection content in this curriculum. Thus, teachers were familiar with the content. Also, some objectives of Chinese science curricula are similar to the educational objectives of the environmental domain of ESD. For instance, to know about life in relation to the environment is the objective both in Chinese kindergarten science education and in the environmental domain of ESD.

The study team at Hongqiao Kindergarten adopted a concentric circle way to select themes and contents. That was, it identified a theme in science education for children of all age groups and then multiple activities were designed and implemented based on the characteristics of children's development, experiences, and interests in different age groups. The ESD-related activities were

implemented through different methods, such as group activities, individualized learning center activities, program–family cooperation, and daily routine integration. It was recommended that at least one R of the 7Rs should be integrated into the objectives and each activity. A three-dimensional system was implemented with the participation and interaction of children, teachers, and parents.

Identification of themes for the activities. The ESD activities were all conducted with certain themes. Themes in traditional science education that suited our implementation of ESD were identified. When selecting the theme, the first consideration was children’s life experiences and possible interests.

Children’s life experiences included experiences in daily life related to the science domain. Certain themes, such as garbage, were easy to relate to ESD. Children’s life experiences also included teachers’ reference books and the content of the traditional group teaching, which revealed themes like useful plants and magnets. These topics were ones about which children were naturally curious and were willing to explore.

Children’s learning interests were identified in questions they asked teachers, interests they displayed in teacher-directed learning activities or in play, and children-directed activities, such as materials they wanted to explore. These were all thematic resources for the integration of ESD content.

Guidelines for choosing activity content. After selecting the thematic resources in science education for ESD, the next step was to identify the appropriate concentric circle and conduct ESD activities in three age groups at the same time. In the initial stage, the team started with two domains of ESD, environment and economy. The themes included magnets, sound, air, toys, and water. To well integrate science education and ESD, teachers adopted three guidelines for the development of activities (Study Team in Hongqiao Kindergarten, 2017).

First, teachers selected one R as the main focus of the ESD activity. This allowed children to understand the meaning and behavior associated with the R. Second, children needed to manipulate materials in the activity, which could help children understand the characteristics and specific performance of the R. Third, teachers’ language during interactions needed to be concrete, simple, and easy for children to understand. For example, they said “recycled materials,” “environment protection,” “save,” “any better methods?,” and “what else can we do with the rest of the materials?” instead of saying “redistribution” and “products for usage of one-time.”

Teachers discovered that they did not need to develop a totally new ESD activity. Instead, they could add ESD to the original curriculum content, and in fact, many ESD ideas and much content already existed in current kindergarten educational activities. However, teachers might have not paid attention to these ideas in the past or simply treated ESD as an environmental protection issue,

Table 1. The initial objectives of ESD for children at Hongqiao Kindergarten.

Domain	Objective
Environment	To be familiar with the surrounding environment and having knowledge of relevant resources in the environment.
	To know that some resources are recyclable and it is important to protect natural resources.
	To know not to do things that may affect others' quality of life now or in the future.
	To be able to support the sustainable development of the environment.
Economy	To understand that the production, use, and discarding of goods and services can be reduced.
	To understand the impact of public facilities on people's lives.
	To practice lifestyles and distribute concepts that support sustainable consumption during educational activities or in daily life.
Social-cultural	To understand local and other cultures.
	To be able to enjoy different cultures.
	To be able to make friends with children from different places, enjoy participating in activities, and experience the joy of living together.

Source: Wang et al. (2012).

which might have made it difficult for them to carry out practical activities from a real ESD perspective.

Exploration of ESD objectives for children's development. The scope of ESD content is far broader than the scope of traditional science education. ESD includes not only environmental protection in the environment domain but also sustainable consumption in the economy domain and respect for differences, equity, and justice in the social-cultural domain. The initial attempt to implement ESD in the curriculum of Hongqiao Kindergarten was intended to integrate the ideas, values, and methods of ESD into traditional science education to help teachers understand the idea of ESD and discover that ESD might be a key way to enrich current kindergarten curricula.

At the beginning of the project, the study team at Hongqiao Kindergarten provided ESD training to teachers. This training emphasized core concepts in the economic and social-cultural domains as well as the OMEP's explanation of the 7Rs. Based on three elements—the key concepts of ESD, the kindergarten's current curriculum and practices, and children's interests and prior experiences—we developed ESD learning objectives for the children enrolled at Hongqiao Kindergarten (see Table 1). It was the original version and was hoped that these objectives would provide good, comprehensive guidelines for thoroughly integrating ESD practices into the kindergarten curriculum after the project.

Because some of the objectives, such as social justice in the social-cultural domain, were not in the traditional Chinese kindergarten curriculum, were challenging for children aged 3–4 to

understand, and were difficult to implement in the initial stage of the project, these objectives are not reflected in Table 1. However, they were included as objectives later in the project.

The second cycle of action research: Validation and optimization of ESD objectives

The second cycle of our action research was focused on validation of the ESD objective system and expansion of the scope of ESD to other domains in the curriculum.

A more reasonable objective system for children of different ages. The initial ESD objective was developed in the science domain and was based on the 7Rs recommended by OMEP and the characteristics of children's development. To better integrate ESD into the educational objectives of the current kindergarten curriculum and ensure teachers have the evidence needed to carry out ESD activities, the study team continued to optimize the ESD objectives in the second cycle. The team divided the three major components of ESD into several subdomains, and based on the characteristics of children's development, objectives for the three age groups were formulated in the subdomains.

There were two main ways to optimize ESD objectives in Hongqiao Kindergarten. The first was the top-down path, which introduced the objectives recommended by the OMEP's ESD project and identified the ESD objectives that were suitable for a Chinese ECE program. The second was the bottom-up path, which was based on the current kindergarten curriculum and summarized and refined the specific objectives of each integrated ESD activity to form a high-level objective. After combining both paths, the ESD objectives for children of different ages were formed.

The objective system included three domains, and each domain was further divided into three subdomains (Wang, 2019). The ESD in the environment domain was divided into three subdomains: natural environment, social environment, and surrounding environment. The environmental objectives were determined based on the scope of the environment accessible to children, expanding from close setting to distant setting. The social-cultural domain was divided into my home, my kindergarten, and little society. The objectives were based on children's roles in different social groups and the relationships between social groups. The economy domain was divided into purchase, cherish, and share. The objectives were identified based on the economic behavior that young children could understand, decide on, and achieve. Currently, the objective system is still undergoing improvement and verification.

Integration of ESD activities with current curriculum. In the later practice period, the team reflected on ESD classroom practices in the initial period and raised some questions: How can multitype ESD activities be created based on children's interests? How can the objectives and content of ESD activities be naturally integrated into a current kindergarten curriculum? How can the corresponding ESD objectives be effectively integrated into the design and implementation of the activity?

To answer these questions, efforts were made to combine the thematic concentric ESD activities with the thematic activities in the current Chinese kindergarten curriculum. Special attention was paid to integrating these ESD activities into daily classroom routines. Eventually, a framework for ESD implementation consisting of four components was formed. The first component, group teaching activity, was composed of 26 activities for three different age groups. The number of themes integrated into the current kindergarten curriculum was 4, 5, and 6 for children aged 3, 4, and 5 years, respectively. The second component, individualized learning activity, was composed of 12 activities for three different age groups. The number of themes integrated into the current kindergarten curriculum was 1, 5, and 1 for children aged 3, 4, and 5 years, respectively. The third component was family–program cooperation activity, and there was one theme integrated into the current curriculum for each age-group. There were several family–program cooperation activities, such as a science and technology festival and “parents and children play science.” A guided ESD activity within “family bedtime story collection” was also created. The fourth component, permeability activities, included activities integrated into different parts of the daily routine, such as arrival time, activities in the classroom for a special purpose (e.g. science exploration), an afternoon walk, and time for leaving kindergarten. The behavioral requirements to promote ESD were specified for children, teachers, and parents.

On the whole, integration of ESD activities and the current kindergarten curriculum mostly occurred in three domains: science, language, and art. There were a number of comprehensive activities. The integration in other domains—health and social learning—was weak. To some extent, this is due to the fact that there were few ESD activities within the social–cultural domain.

Discussion

There were two stages of the exploration of ESD practices at Hongqiao Kindergarten (Wang, 2011). In the first stage, ESD was implemented by integrating ESD objectives and content into the strongest domain of the kindergarten curriculum: science education. The study team initiated training on ESD theories and was responsible for the development and implementation of ESD activities in some classrooms. In the second stage, it focused on combining the themes and ESD objectives into the other domains of the kindergarten curriculum. It is hoped that this exploration of ESD practices in Hongqiao Kindergarten will provide rich experiences that will be useful to other kindergartens in China.

Experience from the first cycle of action research

ESD is intended to transmit the concept and values of sustainable development and to help children understand which behaviors are consistent with the idea of sustainable development. If teachers only used conversations or videos to explain the concept and values of sustainable development to

young children, they would likely feel bored. Therefore, a pedagogy that took into consideration children's learning interests and learning methods and aimed to improve children's experiences and understanding through doing was an effective way to carry out ESD and achieve educational goals.

It was revealed in the first phase of the study that, during ESD practices, by using the method of presentation of visual images and involvement of projects, teachers can enrich children's experiences and achieve the objectives of ESD, such as by helping children understand that water can be harnessed as a clean source of energy to benefit human life; however, it is also the source of natural disasters that disturb people's normal lives. By participating in an experiment in which water is used to wash beads out of a plastic pipe, children might feel the magical power of water.

In addition, teachers can help children operate explorative materials and solve problems as well as stimulate active learning about ESD. For example, in this study, teachers encouraged children to think of ways to rescue "small animals in a hole" (i.e., ways to use magnets to get iron products out of bottles), linking this activity to children's care for small animals.

Furthermore, teachers can simulate real situations so that children experience ESD values while solving "real" problems. For example, during this research, children watched two videos: "The old man's noon break" and "The children playing beautiful piano etudes." Then, the children were encouraged to discuss the events in the videos and think about what would happen if the events happened together. The purpose of this activity was to cultivate learning by *reflection to rethink* the situation.

Experiences during the second cycle of action research

Designing ESD activities based on children's life experience. To implement ESD, the teacher first needed to understand the concept, connotations, and objectives of ESD. Then, the teacher needed to know the developmental characteristics of children in the different age groups and required core learning experiences in different domains of the curriculum. When these two areas had something in common, the teacher could add ESD objectives and content to current kindergarten educational activities. For example, in the traditional curriculum, children needed to learn to cherish goods, which is consistent with the objective of recycling in the economy domain of ESD: developing a sustainable consumption concept and lifestyle "Reducing production, use, and discarding of goods and services" (Zhou, 2012). Therefore, teachers for the 5-year-old age-group established a corner of the classroom for repairing picture books for subsequent reuse, in which children would participate.

Since the content of ESD relates to all aspects of daily life, teachers should be very sensitive to potential ESD content. When questions raised during children's daily activities coincide with ESD content, teachers could capture this interest and generate a special ESD activity. For example,

many children were curious about where dirty water goes during their daily routine. In response, the teachers generated a sewage treatment activity about the recycling of water to develop children's understanding of resource recycling and reduction.

Moving ESD from teacher-directed activities to children's daily life. ESD activities did not only take the form of teacher-directed activities; the explorative materials and learning content that children liked could also convey concepts of sustainable development. Only by extending ESD to daily routines in the kindergarten, children's homes, and children's daily lives could children gradually develop habits that are conducive to sustainable development, a sustainable way of thinking and values that support sustainable development. There were some ways to connect ESD to children's daily life as follows.

First, teachers provided children with materials that reflect sustainable development, so that the children could acquire relevant environmental knowledge and understanding. For example, in areas for playing with sand and water, wastewater pipes and small drinking buckets could be used to make devices for catching rainwater during children's play. Children asked where water comes from and the knowledge they gained led them to understand that water comes from the sky. After they asked where the water in the sky comes from, they were introduced to content on the water cycle. This increased children's awareness of the relationship between ecology and people's lives.

Second, ESD content was integrated into the daily routines of the kindergarten, so that children subconsciously fostered ESD ideas. For example, children used dirty water from caring for turtles to water flowers instead of pouring it down the drain. Children also used waste paper left in the art area as raw material for a toy paper machine, which created a paper that was put in the art area for drawing. Then, children posted their drawings on the wall to decorate the classroom.

It is also important for teachers in ECE programs to partner with parents (Tutkun & Haktanir, 2013). In this research, parents were invited to participate in activities so that they also had the chance to understand and practice ESD. The families and kindergarten could thus work together to promote children's learning about ESD. For example, after learning about electric and windup toys, children understood that the batteries in electric toys could pollute the environment, so they went home and asked their parents to buy fewer electric toys. Additionally, they also learned that waste batteries from electric toys should be put into designated hazardous garbage collection bins. Further, they brought toys with which they no longer enjoyed playing to the kindergarten and exchanged them with other children, reducing the need to discard toys.

Difficulties and coping strategies in the practice of ESD in the classroom

During ESD practices, teachers at Hongqiao Kindergarten not only accumulated rich experiences but also encountered some problems. Some of the problems were gradually solved through practice

and research, while others still served as a bottleneck for ESD practices in the kindergarten. Through observation in practice, taking records during project meetings, and recording individual teacher dialogs, the authors of this article were able to summarize the main difficulties encountered by the teachers during the implementation of ESD activities and the solutions they achieved.

How to understand the connotations of the 7Rs and implement them in activities? The 7Rs were first proposed in a report by Brundtland (1987). Then, the domains and related content for ECE were defined by the OMEP (2010). This ESD content served as a very important guideline for kindergarten teachers aiming to carry out ESD activities. However, the connotations of the 7Rs were very theoretical and abstract, and the content was relatively broad. This framework had value as a guideline for kindergarten teachers grasping the general scope of ESD. By reading books, discussing topics in groups, and brainstorming on key issues, the study team at Hongqiao Kindergarten tried to enrich the interpretation of each R based on their own understanding of the goals and concepts of ESD. The team also tried to develop and implement activities based on the 7Rs in light of the content in the kindergarten's curriculum, children's experiences, and children's family situations.

For example, "reuse" and "redistribute" corresponded to the economic domain, and their educational objectives included fostering sustainable consumption concepts and lifestyles. To address these two concepts, teachers at Hongqiao Kindergarten launched a toy sale activity. At the beginning of the activity, teachers and children discussed what a toy charity sale was. Then, children were divided into small groups and worked on task sheets in groups. They defined the roles and tasks of each group participating in the toy charity sale, including collection and screening of toys and settlement of coins after toys were sold. After toy collection, group selection, price negotiation, and sales strategy discussions, teachers sent a toy charity sale proposal to parents, so that parents could understand the significance and arrangement of the activities. Finally, the toy charity sale was successfully conducted. After the sale, the teacher discussed with the children how to use the money they earned. It was decided that part of the money would be donated and the rest would be reserved for children to purchase school supplies in preparation for primary school. Children then actively discussed what kinds of school supplies they wanted to buy. Some children proposed that every little bit made a difference, as it allowed them to buy more expensive goods. The activity involved children in the process of toy reuse and redistribution, and children gradually formed a concept of the value and use of currency.

During the process of expanding the connotations of the 7Rs, the OMEP-ESD project defined the fields that correspond to different Rs. "Respect," "reflect," and "rethink" correspond to social and cultural sustainable development. "Reuse" and "reduce" correspond to environmentally sustainable development. "Recycle" and "redistribute" correspond to sustainable economic

development. Through practice, we found that the correspondence between the 7Rs and ESD domain was not fixed. For example, reflection could provide children with experience in areas other than social and cultural activities. In addition, the toy charity sale seemed to belong to the economic field, but it involved the reuse of resources, which is said to correspond to the environment. Therefore, the relationship between ESD and the 7Rs may require further consideration and optimization. In our study, since the support for the implementation of ESD was limited, the understanding of the connotations of the 7Rs and their implementation in specific activities conducted at the kindergarten was mostly based on teachers' exploration and adoption of action research methods to try, discuss, and practice ESD. Few reference materials regarding the practice of ESD in kindergartens exist, and so the effectiveness of the activities conducted in this study must be validated.

How can the objectives of ESD be adapted to fitting children's development? The practice of ESD at Hongqiao Kindergarten has been guided by the 7Rs, but the 7Rs were not specifically proposed for kindergarten-aged children; they were intended to be applied to society as a whole. Thus, how to adapt the 7Rs, as core concepts, and the objectives and content of the three domains of ESD suitable for young children was the second major problem facing teachers' practice.

As mentioned above, to make ESD activities suitable for children at their current stage of development, it is important to consider children's life experiences and possible interests. Children usually like images, hands-on activities, and learning in situations that relate to their real life. Strategies also included the integration of ESD with the objectives and themes of the current kindergarten curriculum.

It was found in practice that the difficulty of implementing each R in ESD activities in the classroom varied (Kahriman-Ozturk et al., 2012). "Reuse," "reduce," "recycle," and "redistribute" were relatively easier for kindergarten children to understand and act upon because they were closely related to aspects of children's lives, such as garbage classification, toy sales, and water saving. However, "respect," "reflection," and "rethink" were more difficult for children, especially those aged 3–4, to understand because these concepts were more abstract and children had less experience with them in their daily lives. Moreover, it was difficult for teachers to judge whether children had these abilities by observing their behavior. Therefore, it was challenging for teachers to develop and implement activities concerning these concepts.

In addition to the two main problems mentioned above, there were additional unsolved problems and challenges for the teachers at Hongqiao Kindergarten. First, there is little literature on ESD in early childhood, especially in Chinese. Thus, teachers lack theoretical support and learning models to support their ESD practice. Second, since there had been no official guidance regarding the implementation of ESD, it was difficult for teachers to implement ESD in a thorough way and

integrate it into the current kindergarten curriculum; they had to try independently. Third, it was difficult for teachers to grasp the specific connotations and performance characteristics of the 7Rs within the context of ESD in early childhood as well as the ESD learning objectives for children at different levels of development.

Implications

Implications for policy development

ESD has been recognized as a natural part of quality education (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2014) and an important driving force for sustainable development. However, for a long time, ESD in China was mostly implemented in only primary and secondary schools. In 2003, the Ministry of Education of the People's Republic of China (MOE) issued the *Special Outline of Environmental Education for Primary and Secondary School Students* (MOE, 2003b) and the *Guidelines for the Implementation of Environmental Education for Primary and Secondary Schools (Trial Version)* (MOE, 2003a). In 2007, the Beijing Municipal Education Commission (2007) issued the *Guidelines for ESD for Primary and Secondary Schools in Beijing (trial version)*. However, there have been no relevant ESD policy documents regarding ECE. As the foundational stage of primary and secondary education, ECE plays an important role in ESD practice. Early childhood is an important period in which children form values, attitudes, lifestyles, and habits. Therefore, the formation of an ESD system and curriculum should be one of the priorities for kindergarten education. In particular, it is the key to develop policy documents at the national level that consider the necessary guidance and provisions for implementing ESD practices in kindergartens.

Developing special guidelines for ESD practice in ECE programs. In recent years, UNESCO has launched a number of reports on ESD, including the *International Decade of Education for Sustainable Development (2005–2014)*, the *Global Plan of Action for Education for Sustainable Development (2015–2019)*, and *Transforming Our World: The 2030 Agenda for Sustainable Development* (General Assembly of the United Nations, 2015). The third document identified 17 sustainable development goals. *Education for Sustainable Development Goals: Learning Objectives* (UNESCO, 2017) also proposed 17 sustainable development goals; relevant educational themes and activities; and related learning objectives within the cognitive, social–emotional, and behavioral domains. It has become the guideline for the implementation of ESD practice.

Young children's learning and development have unique characteristics, so these documents mentioned above may be used as references and recommendations for the development of ESD objectives for kindergarten children. One of the objectives should be to provide layered explanations to children of different ages. In particular, the specific connotations of ESD content and

behavior of children aged 3–6 should be illustrated and explained in regard to the eight key competencies for sustainability to kindergarten teachers and parents (UNESCO, 2017).

In addition, to support teachers, governments may provide some recommendations regarding the implementation of sustainable development learning objectives as well as ESD themes and content that is suitable for young children. Teachers may need help understanding what ESD is and how to implement it in their own kindergarten environment and kindergarten classroom. Thus, it is important to provide teachers with some relatively mature ESD practice models to aid their practice. It is also essential to give teachers relevant systematic ESD training.

Adding ESD content in current kindergarten education policy documents. At present, the Chinese Kindergarten Education Guideline (MOE, 2001) divides the kindergarten curriculum into five domains. Although ESD content has not been systematically integrated into the guideline, similar to the current national curriculum for young children in other Asian countries, such as South Korea (Park et al., 2016), there are many curriculum objectives that relate to ESD. For example, Article 30 of the *Regulations for Work in the Kindergarten* (MOE, 2016) states that “kindergartens should create an atmosphere of respect, acceptance, and love, and establish a good relationship among peers, as well as between teachers and children.” This reflects the social–cultural domain of ESD: a sustainable society is a just and inclusive society, reflecting the characteristics of participation, equality, and democracy, the development of that requires compassion, and respect for differences, equality, and justice (Zhou, 2012).

In the *Guidelines for Kindergarten Education (Trial Version)*, the second section “Education content and requirements” shows that the objective in the science domain is to develop children’s “interest in the things and phenomena around, [making them] curious and eager to know everything” (MOE, 2001, p. 10). In addition, it also specifies that “encouraging children to have the interest and desire to explore the characteristics and changing rules of common things and the phenomena around them” is important (MOE, 2001, p. 10). The guiding points offer further recommendations: “science education should be closely related to the actual life of young children, using the things and phenomena around them as the object of scientific exploration” (MOE, 2001, p. 11). These educational values and content are consistent with the basic environmental goal of ESD, which is to provide relevant experience and acquire life-related environmental knowledge and understanding (Zhou, 2012).

The *Guideline for Learning and Development of Children Aged 3–6* (MOE, 2012) also divides children’s learning and development into five domains: health, language, social learning, science, and art. The guideline describes what children aged 3–4, 4–5, and 5–6 should know and what they can do and roughly which level of development they can achieve. The same ESD content appears in different educational domains in this policy document. For example, Goal 3 in the social

learning domain and interpersonal communication subdomain states, “[c]hildren [should] be able to display the behavior of self-esteem, self-confidence and autonomy” and “[c]hildren aged 5–6 should be able to insist on their own opinions and give reasons when their opinions are different from others” (MOE, 2012, p. 22). In addition, Goal 2 in the subdomain of scientific inquiry within the domain of science states, “[c]hildren have preliminary inquiry abilities,” and it expects that children aged 5–6 “[s]hould be able to cooperate and communicate with others in inquiry” (MOE, 2012, p. 22). These two goals correspond to content within the social–cultural domain of ESD. There are some ESD-related educational goals and content in China’s kindergarten education policy documents, but they are not systematically addressed.

To supplement the ESD content in current kindergarten education policy documents, it is first necessary to identify the overlaps between China’s ECE policy documents and the objectives and content of ESD. Second, work should be done to identify important ESD goals that may not be included in current Chinese ECE documents and to add them to these documents after consideration of cultural issues. For effective implementation of ESD in the classroom, the documents may include illustrations of children’s developmental characteristics and behavioral performance regarding ESD within different age groups.

Implications for ESD classroom practices

On teacher training. Only by improving their understanding and recognition of the concept of ESD can teachers effectively implement practical activities in the classroom. Books, research articles on ESD, and good practice models of ESD based on other countries or regions need to be provided to teachers. If possible, systematic teacher training should also be provided to enhance teachers’ abilities and accomplishments regarding the promotion of sustainable development. Moreover, teachers should have a good grasp of the ESD objectives and content that is suitable for children of different ages (Wang, 2015).

On the design and implementation of ESD activities. During the process of implementing ESD, teachers should learn how to transform the concept of sustainable development into activities that are interesting and doable for young children. This recommendation is closely related to an understanding of children’s level of development. ESD ideas and values should be not only transmitted orally but also adapted to the thinking modes and characteristics of young children and cater to their experiences and interests, so that children are willing to participate in ESD activities. The 5 T framework for action learning (think, touch, talk, take action, and tune in) proposed in the report *Issues and Trends in Education for Sustainable Development* (Leicht et al., 2018) emphasizes the important methods of innovating in regard to ESD through action learning.

Active learning based on this framework should consider the characteristics of different age groups undergoing early childhood development.

On the cultivation of children's ability to think. Encouraging children to learn to think is an important objective of ESD. Among the 7Rs, “reflect” and “rethink” are particularly difficult for young children. Children should learn to think by first looking at the problem dialectically and then independently from the ability to think and solve problems, instead of blindly imitating others. This should be an important part of ESD activities in the kindergarten. ESD should encourage children to analyze and solve problems in real life by breaking the conventional modes of thinking and encouraging innovative thinking, which also plays a positive role in the implementation of several other Rs.

On daily integration of ESD into ECE programs and family life. In addition to special ESD-related activities, daily integration of ESD into ECE programs and family life is important. The aim of ESD is to cultivate children's concepts, values, and self-conscious behaviors to promote sustainable development. The behavior to promote sustainable development must be consistent, extending from program-based activities to daily life. In other words, ESD must be inseparable from children's daily lives. For example, the classification of garbage, such as garbage is classified into four types: residual waste, household food waste, recyclable waste, and hazardous waste, has been implemented in some urban areas in China. Social events like this provide children with real-life experiences and are the best way to achieve effective results in ESD.

In regard to children's families, close cooperation between the ECE program and the children's family is obviously indispensable. Interventions to teach parents, the concept of sustainable development and appropriate behavior must be included in the implementation of ESD activities in ECE programs. Engaging parents in practical ESD activities may improve their enthusiasm for participation, and parents could become role models and supporters of their children.

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