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# DEVELOPING A SUSTAINABLE DEVELOPMENT-ORIENTED PICTURE BOOK SELECTION SYSTEM THROUGH EMPLOYING THE MODIFIED DELPHI METHOD

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## Introduction

Faced with various problems of unsustainability in the global environment, society and economy call for re-examining the past development model are increasing. In 1987, the United Nations (UN) released the report "Our Common Future." The UN advanced a clear definition of "sustainable development" and urged countries around the world to achieve sustainable development through various conferences and events. Education is considered a key factor in achieving sustainable development. Initiated by the United Nations, education for sustainable development (ESD) has become an important tool for educators to achieve sustainable development. The "Early Childhood Education" (ECE) stage is considered to be the starting point for lifelong learning in ESD (Daries et al., 2009). However, ESD is a new concept and is relatively unfamiliar to ECE teachers which makes it challenging to incorporate ESD into this education stage.

Picture books have been used to promote the environmental/ecological literacy of students or kids for a long time (Babb et al., 2018; Bhagwanji & Born 2018; Fang, 2018; Fatmah et al., 2020; Hsiao & Shih, 2016; Majdenić & Saratlija, 2019). Children's pro-environmental behavior and comprehension of complex, global sustainability issues can be improved by carefully selected children's books (Bhagwanji & Born 2018). These books can promote children's learning motivation and interest through their graphic narrative. Therefore, sustainable development-oriented picture books can be an appropriate tool for ECE teachers to introduce the concept of sustainability at an entry level and can help children understand the positional differences between global citizens as well as the rights and obligations to realize a sustainable future. Many studies propose the application of picture books in ESD (Bhagwanji & Born 2018; Goga, 2017; Wu, 2021), but compared to picture books related to environmental or ecological themes that have been around for more than 20 years and are readily available (Rule & Atkinson, 1994), the number of sustainable development-oriented picture books only increased after the 2000s (Babb et al, 2018; Spearman & Eckhoff, 2012). Therefore, it is challenging for



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**Abstract.** *The concept of "sustainable development" was proposed to re-examine the human development model. Initiated by the United Nations, education for sustainable development (ESD) has become an important tool for educators to achieve sustainable development. Although "Early Childhood Education" (ECE) is often taken as a starting point of ESD, the concept of sustainable development is difficult to integrate into ECE because of its unfamiliarity among teachers. Therefore, picture books can be used to bolster ESD in ECE. This research aims to construct an appropriate book selection guide system that can assist them in selecting picture books independently, objectively, and efficiently through a focus group and modified Delphi method. The guide system is based on three major aspects, covering 8 main guidelines and 21 sub-guidelines. A sustainable development-oriented picture book is defined as "a book that includes the core, values, and concept of sustainable development which can make readers aware of the balance between the environment, society and economy and that attempts to systematically explore problems, generate actions, and solve problems in relation to these three dimensions from a critical and global viewpoint." in this study.*

**Keywords:** *education for sustainable development, early childhood education, Delphi Method, picture book*

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ECE teachers who may not have received ESD themselves to choose a suitable sustainable development-oriented picture book from a large number of picture books, as some books may not be helpful in learning sustainable development-related concepts and issues. Materials inducing negative learning effects are also possible, which is of major concern. Most ECE teachers lack confidence in independently choosing a suitable picture book and lack a book selection system that can assist early education teachers to select picture books independently, objectively, and efficiently. Thus, a clear definition is necessary for identifying sustainable development-oriented picture books, and a corresponding discussion on how to select high-quality books for educational purposes is necessary. In recent years, more and more electronic picture books have been published together with printed books. The focus of this research is on sustainable development-oriented picture books in either form. Other online sources are also worth further studying but are not included in this research.

Currently, there already exists a sufficient book selection system for ecological and environmentally oriented picture books, which assists librarians and teachers in establishing book lists that can be used as teaching resources (Martín et al., 2019; Rule & Atkinson, 1994). However, relevant research on the selection of sustainable development-oriented picture books is not yet mature (Bhagwanji & Born, 2018; Spearman & Eckhoff, 2012). There is no clear definition of sustainable development-oriented picture books and there is a lack of in-depth discussion on how to select books. Therefore, this research aimed to construct a book selection guide system that not only lists the characteristics of picture books but can specifically assist educators in independently, objectively, and efficiently selecting suitable picture books. This is important and necessary to promote ESD in the ECE stage. This research first formulates a definition of sustainable development-oriented picture books, outlines their appearance, and explores the connotation and performance of the sustainable development-oriented picture book, its methods, and subsequent effects.

## Literature Review

After the ages of the Industrial Revolution, the rapid and global industrial development led to revolutionary changes in the production and consumption of commodities and more progress in science and technologies that reshaped human lives. These also resulted in the explosive increase of the world population according to advancement in medical and public health research. However, these leap-forwards were accompanied by the depletion of resources, the decline of environmental quality, climate change, the prevalence of infectious diseases, and other pressing issues which affected the complex network that constitutes the global environment, society, and economy. The Post-World War II period was characterized by severe environmental pollution and the overuse of resources. This raised questions among many Western scholars about the sustainability of the post-war growth model and led to the emergence of works such as "The Limit to Growth", reminding people that humanity's future is deprived by one's actions. In 1987, the UN released the report "Our Common Future", which proposed the concept of sustainable development. It argued that in order to deal with the above-mentioned problems, it is necessary to re-examine the human development model and the unsustainable pursuit of economic development. Economic development should consider environmental protection and social justice, as well as intergenerational justice to enhance and create contemporary well-being without sacrificing the well-being of future generations (United Nations, 1987).

To achieve sustainable development, education is regarded as crucial. Therefore, the UN has stimulated ESD since 1992, hoping to integrate the concept and practice of sustainable development into all stages of education. In social education curricula and activities, individuals are trained from an early age to become global citizens capable of supporting sustainable development (Foley, 2016; Hägglund & Samuelsson, 2009; Kioupi & Voulvoulis, 2019; United Nations, 1992, p. 320). Among all stages of education, ECE is "recognized as the starting point for lifelong learning within education for sustainability" (Daries, 2010). The integration of ECE into ESD, or the integration of ESD into ECE, contributes to the establishment of concepts, attitudes, values, and behaviors on a personal level related to sustainable development in the stages of early childhood (Ernst et al., 2021; Kahrman-Ozturk et al., 2012).

A picture book is a teaching tool suitable for ECE. Sustainable development-oriented picture books can be used as a medium to promote ESD in the stage of ECE due to their graphic narrative which is the main characteristic of picture books. Teaching ESD with visual effects is a powerful and effective teaching strategy (Bautista et al., 2018) and ECE teachers can guide children through picture books while discussing the issues of sustain-



ability and sustainable development (Spearman & Eckhoff, 2012). Although ECE teachers and parents are familiar with picture books related to the environment or ecology, they are less familiar with picture books oriented to sustainable development. Integrating the concept of sustainability into existing curricula is challenging for early childhood educators, as the inclusion of social and economic issues in the curriculum is different from most traditional Environmental Education (EE) models (Spearman & Eckhoff, 2012).

### *The Content of Picture Books Gradually Evolves with the Development of ESD*

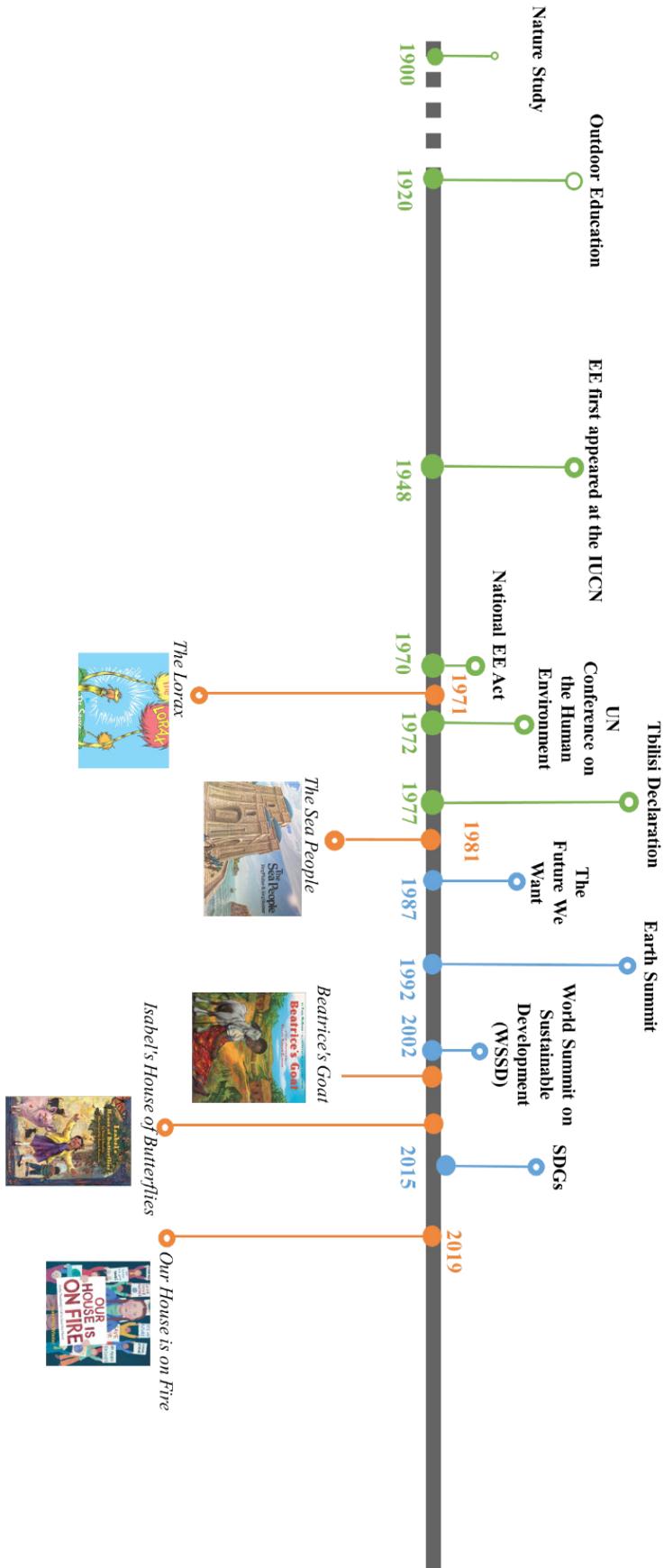
Scholars in the field of EE emphasize that early childhood is a crucial period for developing a connection with nature and cultivating a love for the natural world (Ardoin & Bowers, 2020). Picture books that include natural elements and the concept of environmental protection have become teaching tools that are often used in ECE to raise children's environmental awareness and natural-friendly behavior and also develop a sense of place (Babb et al., 2018; Bhagwanji & Born 2018; Fang, 2018; Fatmah et al., 2020; Hsiao & Shih, 2016; Majdenić & Saratlija, 2019). In the United States, with the establishment of the Environmental Protection Agency and the passage of the Environmental Education Act in the 1970s (Carter & Simmons, 2010), a number of picture books describing environmental problems that arose from industrialization were published. Examples are "Michael Bird-Boy" (DePaola, 1975), "The Giving Tree" (Silverstein, 1964), and "The Lorax" (Seuss & Random House, 1971). Marris (2011) described "The Lorax" as a "parody of a misanthropic ecologist" and "gloomy", questioning the book's narrative and its effects on young children's thinking. However, she still affirmed that the book communicates environmental issues effectively, in a way that young children can understand. Different from "The Lorax", the picture book "The Sea People" not only criticizes industrial development for causing ecological tragedy but also describes that environmental resources are finite and must be used in a limited way to let resources regenerate (Muller & Steiner, 1982). To this day, "The Sea People" is a classic picture book used to explain the sustainable use of environmental resources and intergenerational justice, echoing the "Declaration of the United Nations Conference on the Human Environment", emphasizing that "people should utilize the resources of the earth in such a way that they can be transmitted to generations yet to be born as a heritage which is not only preserved but enriched" (Sohn, 1973). It also echoes the "Tbilisi Declaration" (UNESCO, 1977) which states that "EE helps reveal the enduring continuity which links the acts of today to the consequences for tomorrow," not only emphasizing the need to solve environmental problems but also the need for generational justice, which is at the core of the sustainable development concept.

From the 1990s onwards, the UN has advanced the discourse on sustainable development, which it disseminated to countries around the world through conferences and events. The Brundtland Report put forward a formal definition of sustainable development: "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987). In 1992, the World Summit on Sustainable Development adopted Agenda 21 (United Nations, 1992). This included Chapter 25 which put emphasis on strengthening the role of children and young people in sustainable development and Chapter 36 which promoted education, public awareness, and training which could provide a global blueprint that bolstered sustainable development globally. Furthermore, the United Nations declared 2005 to 2014 as the Decade of Education for Sustainable Development (DESD), looking to further emphasize the importance of education in promoting sustainable development and gaining momentum for ESD (UNESCO, 2005). In 2015, the United Nations launched the Sustainable Development Goals (SDGs) and published the "2030 Agenda 30 Agenda for Sustainable Development Goals" the following year. The 17 SDGs serve as a basis to guide sustainable development strategies by 2030 (United Nations, 2015). SDGs have become the focus of ESD and serve as an important guiding framework for sustainable development policies of various countries.

Since the contents of ESD are evolving, picture books are as well. Babb et al. (2018) analyzed the content of 249 picture books on the shortlist of the Children's Book Council of Australia (CBCA) from 1955 to 2014. The study found that descriptions of the natural environment and wild animals decreased year by year. On the contrary, the topic of sustainability has only appeared since 2000 and has been increasing every year. The author argues that this is due to the fact that a clear definition of sustainable development has only been established since 1987. By using sustainability as the main theme, picture books that are oriented toward sustainable development can help readers understand the interaction between the three dimensions of environment, economy, and society, and try to explore problems, generate actions, and come up with solutions. For example, the picture book "Isabel's



**Figure 1**  
The Transition of the Content of Picture Books Evolved with the Development of ESD



House of Butterflies” describes the story of Isabel, a Mexican girl, whose family is affected by a drought. When the family has to cut down the firs where many butterflies live, Isabel asks her father to plant drought-tolerant corn and make cakes in the form of butterflies to sell to tourists who come to watch butterflies. This solves the family’s economic problems and protects the butterflies and firs (Johnston, 2005). Similarly, the story “Beatrice’s Goat” which is based on the true story of Beatrice Biira, a poor Ugandan girl, describes how a goat improved her family’s financial problems and gave Beatrice her dream of going to school (McBrier, 2004). The protagonists of these two picture books solve environmental, social, and economic problems of unsustainability and are representatives of picture books with a sustainable development orientation. Figure 1 shows the transition of the content of picture books from the 1970s till the current day. The negative effects of industrialization were emphasized in the 1970s, while the problems between the environment, society, and economy were designed and discussed in the 1990s. Since the origin of the 21<sup>st</sup> century, the balance between the environment, economy, and society from a more inclusive and diverse perspective could be found in many picture books.

When ECE teachers use picture books as a tool to promote ESD in the ECE stage, they often experience several problems in selecting suitable books. Not only are they unfamiliar with picture books that are oriented to sustainable development, but they might also lack a clear understanding of sustainable development. This lack of confidence in independently selecting picture books often sees teachers resort to selecting popular books or stories that are written in simple language and content (Hug, 2010). Therefore, it is necessary to define what sustainable development-oriented picture books are and construct a book selection system that can help ECE educators select picture books independently, objectively, and efficiently.

#### *Related Research on the Development of Book Selection Guides for Sustainable Development-Oriented Picture Books*

At present, research on picture book selection guidelines is based on picture books that include concepts of natural elements and environmental protection. For example, Rule and Atkinson (1994) analyzed 30 picture books about ecology between 1942 and 1992 including keywords such as endangered species, destruction of habitats and forests, pollution, land use and overpopulation. They also analyzed 10 traits (Table 1) to carry out a 5-level score of each book to provide elementary school teachers and librarians with a reference guide to select ecological-oriented picture books. Martín et al. (2019) continued and updated the research of Rule and Atkinson (1994) by analyzing 30 ecological-themed picture books published in English and Spanish from 1994 to 2019. The authors used 12 criteria to construct a 5-level score content analysis to provide primary school teachers with a guide to selecting appropriate ecological-themed picture books.

Regarding the research on sustainable development-oriented picture books, Spearman and Eckhoff (2012) propose that teachers should ask questions related to the six E’s (Ecology/Environment, Economy/Employment, and Equity/Equality) when teaching children about sustainable development using picture books. The research of Bhagwanji and Born (2018) has provided a model for emerging sustainable learning curricula supported by picture books consisting of 4 categories: Appreciation for Nature, Caring for Nature, Leading Healthy Lifestyles, and Practicing Sustainable Living. The authors also recommend selecting picture books according to the following book selection process: “choose books that approach environmental topics with sensitivity and grace”, “look carefully at the roles or responsibilities of children encouraged in the stories”, and “how is nature portrayed?” meaning that books which “will perpetuate a disconnect from the natural world and add to the children’s feelings of hopelessness” should not be selected, “be aware of how animals are portrayed”, and “make multiple copies of books available.” Although the above-mentioned studies have constructed a basic outline for what teaching with sustainable development-oriented picture books entails, they neither include a clear definition of sustainable development-oriented picture books, nor a discussion of what the conceptual content, layout, and functions of the picture books should consist of. Only after this knowledge gap is filled, it is possible to construct a book selection guide system that can assist ECE educators to select suitable picture books independently, objectively, and efficiently.



**Table 1***Research Related to the Selection of Picture Books*

| Relevant Research  | Picture Books Characteristics and Book Selection Process   |
|--|--|
| Rule & Atkinson (1994) examine how primary school teachers and librarians choose picture books about ecology to foster environmental care in children and encourage them to become global problem-solvers. | <ol style="list-style-type: none"> <li>1. Nature Appreciation</li> <li>2. Interrelatedness of Nature</li> <li>3. Realistic Ecology Problem</li> <li>4. Hope of a Solution</li> <li>5. Steps of Solution</li> <li>6. Positive Tone</li> <li>7. Non-stereotypic Portrayals</li> <li>8. Appropriate Illustrations</li> <li>9. Story Appeal</li> <li>10. Developmental appropriateness</li> </ol>  |
| Martín et al. (2019) continue the research of Rule & Atkinson (1994) and assist teachers in establishing a list of children's picture books on ecology as a reference for EE.                              | <ol style="list-style-type: none"> <li>1. Nature Appreciation</li> <li>2. Interrelatedness of Nature</li> <li>3. Realistic Ecology Problem</li> <li>4. Differing Perspectives</li> <li>5. Hope for a Solution</li> <li>6. Reflection and Responsibility</li> <li>7. Steps for a Solution</li> <li>8. Positive tone</li> <li>9. Representation of Diversity</li> <li>10. Appropriate Illustrations</li> <li>11. Story Appeal</li> <li>12. Developmental Appropriateness</li> </ol>  |
| Spearman and Eckhoff (2012) propose picture book features that can be used when teaching "young readers" about sustainability.   | <ol style="list-style-type: none"> <li>1. Ecology/Environment: knowledge of environmental resources and the fragility of the environment</li> <li>2. Economy/Employment: sensitivity concerning the limits of economic growth and its impact on society and the environment</li> <li>3. Equity/Equality: understanding social institutions and their role in change and development</li> </ol>   |
| Bhagwanji and Born (2018) propose book selection procedures that support emerging sustainable learning curricula for children  | <ol style="list-style-type: none"> <li>1. Carefully select books that deal with environmental themes</li> <li>2. Pay attention to the suitability of the roles or responsibilities given to children in the book</li> <li>3. Avoid books that include a bleak or discouraging description of the natural world</li> <li>4. Avoid descriptions of animals that are aggressive, malicious, demeaning, or anthropomorphic</li> <li>5. Provide a multiplicity of books and provide time for children to read through the books on their own</li> </ol> |

Source: Composed by the author, based on the relevant literature (Rule & Atkinson, 1994; Martín et al., 2019; Spearman & Eckhoff, 2012; Bhagwanji & Born, 2018).

### *The Definition and Conceptual Content of Sustainable Development-Oriented Picture Books*

Ideally, the conceptual content and implication of sustainable development-oriented picture books should be able to echo the environmental, sociocultural, and economic aspects of sustainable development as well as several SDGs. At least one aspect should be the main axis around which the other two aspects revolve. This can guide readers to think about these three aspects and motivate them to raise questions. If educators are willing, they can assist readers to apply these questions concerning the relationship between the three aspects to their daily lives. This can be done from a micro perspective for young learners, extending it to a macro perspective for older learners to let them understand the complex interactions between human and natural systems and the role of individuals, groups, and institutions in these systems (Bhagwanji & Born, 2018; Spearman & Eckhoff, 2012; UNESCO, 2014).

Each of the three aspects has a different function in enhancing the understanding of sustainable development. The environmental aspect shows that natural resources are limited and fragile, which encourages appreciation and care for nature. This care for nature can improve our understanding of how to maintain the natural environment



and promote sustainable resource extraction (Martín et al. et al., 2019; Rule & Atkinson, 1994). The socio-cultural aspect conveys an understanding of social institutions and their role in change and development. Furthermore, this aspect enhances our understanding of democratic systems of civic engagement which allow people to express opinions, choose governments, reach consensus, and resolve differences (Bhagwanji & Born, 2018; Martín et al., 2019; Spearman & Eckhoff, 2012; UNESCO, 2014). The economic aspect presents the limits, sensitivity, and impact of economic growth on society and the environment, assessing individual and social consumption levels from an environmental and social justice perspective (Bhagwanji & Born, 2018; Spearman & Eckhoff, 2012). A complete ESD concept should go beyond the natural environment and embrace a holistic concept of sustainability that includes social, economic, and political dimensions (Hill et al., 2014). ESD is an appropriate way to build concepts and values of sustainability, as it focuses not only on environmental sustainability but also on social justice, responsibility, and values of care for all people and the world itself (Mensah, 2019). When ESD is integrated into ECE, the latter transforms into an educational stage that values, encourages, and supports children to detect problems, solve them, and act on sustainability issues that are relevant in their own lives (Davis, 2009; Davis & Elliott, 2014). This not only cultivates children's appreciation and concern for nature but also empowers children to participate in political, social, and economic issues.

Besides the three environmental, socio-cultural, and economic aspects, the conceptual content of a picture book with a sustainable development orientation should also include the values and concepts of SD, ESD, and SDGs, which respects differences, diversity, the environment, the earth's resources (UNESCO, 2014), global citizenship and changes in the timeline which can present differences between past, present, and future perceptions of the world. This research defines such sustainable development-oriented picture books as follows: books that contain the core values and concepts of sustainable development, attract readers to pay attention to the balance between environmental, socio-cultural, and economic aspects, use critical thinking after reading, and explore sustainability problems, generate action, and solve the problems occurring in each of the aspects by using a global perspective.

#### *The Form of Expression of Sustainable Development-Oriented Picture Books*

The form of expression of picture books is mainly based on images and supplemented by text to narrate stories. This makes picture books suitable for teaching children, as these books can cater to children's nature, promote their learning motivation and interest, and have them develop a relationship with language through cognitive participation related to artistic thinking and entertainment (Elia, et al., 2010; Hsiao, 2010; Montag, et al., 2015; Saltmarsh, 2007; Tare, et al., 2010). When choosing a picture book as a carrier to promote ESD in the ECE stage, not only is it important to note the conceptual content and main connotation of picture books, but also the layout's suitability for children in the ECE stage.

Bhagwanji and Born (2018) have emphasized that the selection of books, media, and other materials to teach children in the ECE stage is an indirect experience with the real world. Therefore, attention must be paid to whether the natural environment and living things are accurately, respectfully, and sensitively depicted. Hug (2010) has pointed educators must be able to judge whether the science used in the books is accurate or misleading when using children's literature for teaching. Marriott (2002) argues that an excessive use of anthropomorphic images in picture books is also extremely misleading. If picture books contain fantasy or fictional content, teachers need to explain this to children additionally (Mantzicopoulos & Patrick, 2011). The Stages of Reading Development proposed by Jeanne Chall (Chall, 1983) shows that children under the age of 8 have difficulties with 'abstract thinking' and do not comprehend events that do not occur around them. The reading and comprehension abilities of children are not perfect. Therefore, if the content of the picture book is too detached from reality and too abstract, it is very likely to mislead children in the ECE stage. Images in picture books can arouse children's emotions about different organisms and the environment itself which can leave a lasting impression on children (Babb et al., 2018). Therefore, picture books must be used carefully with children, especially when it comes to explaining environmental sustainability and issues that are global by nature (Muthukrishnan & Kelley, 2017). Hence, the description of sustainable development-oriented picture books should closely represent what is happening in reality and should connect with realistic situations.

However, real-world issues can also create fear or limit a child's thinking space to the extent that goes far beyond a child's ability to process emotions. For example, the extinction of all living things, the end of the world, is likely to bring a sense of alienation, anxiety, guilt, or fear into a child's mind. This can cause them to feel hopeless about the future and even make children disengage from participating (Bhagwanji & Born, 2018; Marris, 2011).



Examining real-world problems, therefore, requires positive attitudes and expressions of hope for solving these problems without placing too much responsibility or culpability on the shoulders of young children (Mantzicopoulos & Patrick, 2011). Rule and Atkinson (1994) emphasized that picture books should make children happy, and active, and enable them to generate feelings towards environmental problems that are positive instead of fearful. Similarly, picture books with a sustainable development orientation should include this 'positive orientation' as well.

Adults should not merely regard children as incapable or in need of protection but should empower children as decision-makers and actors in solving problems (Boyd, 2018; Davis, 2009). A story with an open ending that is left to the reader's judgment, avoids the reinforcement of prejudice against certain norms and behaviors, prevents the imposition of the author's own beliefs and values onto children, and limits the opportunities for propagandistic narratives to be included in the story. Therefore, the layout of picture books should also include 'inclusiveness' as one of its core traits.

The form of expression of picture books is characterized by their special artistic forms. Since picture books are designed for children, it is important to assess whether the description method is suitable for certain age groups, whether the story is interesting, and whether the number of words is appropriate and comprehensible to keep children's attention to the story. Bhagwanji and Born (2018) argue that picture books that support sustainable learning curricula must attract children to read more than once since this results in a better chance of generating follow-up actions after engaging with the story.

#### *The Substantial Impact of Sustainable Development-Oriented Picture Books*

The function of picture books can be examined from multiple perspectives, including the knowledge, values, and skills of the readers, which would be reflected in their daily lives (Rule and Atkinson, 1994; Spearman and Eckhoff, 2012). The theoretical backgrounds have been explored not only through traditional behavioral studies but also via the methodologies in neuroscience. Some research works demonstrated that most of the growth and 'wiring' of brain connections occur before birth and during the first six years of life (Doria et al., 2010). The experiences of infants and young children significantly affect physical and neurological development, which are directly related to subsequent physical, psychological, and socio-emotional responses. These life experiences alter the brains of young children and many beliefs and values that are formed during early childhood are carried over to adulthood. The impact of childhood experiences is important and will affect children's emotions and feelings about the world around them, as well as their knowledge, skills, and dispositions (Bhagwanji & Born, 2018). These offered the base for the states and parties of Unicef to agree on the 1990 Convention on the Rights of the Child (CRC), addressing the inclusion of fostering respect for the natural environment and environmental issues in children's education (Unicef, 1989).

Thus, it is crucially important that concepts and values of sustainability are introduced at an early stage of life (Spearman & Eckhoff, 2012; Bhagwanji & Born, 2018). When ESD enters early education, it is a transformative education that supports children's development as problem solvers, actors, and decision-makers in sustainability-related matters and invites children to engage with real-world issues (Boyd, 2018). The ideal sustainable development-oriented picture books would therefore invite children to understand the problems that occur in the real world and help them to reflect on "what is our responsibility?" (Martín et al., 2019), appropriately encourage and empower children with roles or responsibilities (Bhagwanji & Born, 2018), and generate motivation for subsequent action; even more so, to generate action in their daily lives and even become advocates who influence others. This also reflects the characteristics of the SDGs and the TBLs of sustainable development, i.e., integration and indivisibility of all aspects and balance between the environmental, social, and economic perspectives (United Nations, 2015).

#### *Research Focus*

The concept of sustainable development was advanced to re-examine the current human development model that has caused problems of unsustainability on an environmental, societal, and economical level and is characterized by a pursuit of excessive economic growth. Education is important to successfully achieve more sustainable development models. This starts at the ECE stage, in which the foundation for lifelong learning in ESD is laid down. This foundation should create a deeper understanding of this complex, global issue and develop appropriate concepts, attitudes, values, and behaviors in relation to sustainable development (Kahriman- Ozturk et al., 2012; Spearman & Eckhoff, 2012). However, integrating the concept of sustainable development into the existing cur-



riculum is challenging for early childhood educators. Child-centered and sustainable development-oriented picture books can provide strong support for early childhood educators. However, ESD is relatively unfamiliar to these educators, and they may lack ESD-related education or an in-depth understanding of sustainable development. This creates a lack of confidence among ECE teachers to independently select books. Therefore, it is necessary to construct a book selection guide system that can help ECE teachers to be independent, objective, and efficient. This kind of guide system would be unprecedented as it does not only list the features of picture books but also helps users to independently select suitable picture books through the book selection guide system. As mentioned above, this study first defines sustainable development-oriented picture books as books that contain the core values and concepts of sustainable development and can attract readers to pay attention to the balance between the three aspects of environment, society, and economy. After reading, picture books should motivate readers to explore problems, generate action, and solve problems by using critical thinking from a global perspective. Having discussed what the conceptual content, layout, and function of sustainable development-oriented picture books entail, it is now possible to analyze how a preliminary concept of a sustainable development-oriented picture book selection guide system can be developed.

The sustainable development-oriented picture book selection guide system has the concept of sustainable development at its core and considers the characteristics of picture books and the principles of early education in its selection guide. As shown in Table 2, this system consists of several core aspects. First of all, it includes (A) 'completeness of the concept of sustainable development,' taking at least one of the three major aspects (environment, society, and economy) of sustainable development as its main focus, corresponding to the other two aspects, and being consistent with the SDGs. Second, it includes the concept of (B) 'caring for nature' to have readers understand and feel the beauty of nature, and to demonstrate the necessity of cooperation between man and nature. This aspect focuses on the natural world serving the common good of all and demonstrating the need to foster healthy ecosystems and create a sense of interconnectedness between man and nature. Third, this system includes the aspect of (C) 'literacy and artistry' which assesses the concepts, vocabulary, and sentences used in the story. These different aspects should contain an appropriate structure including pictures and texts that are designed to suit the age of children in ECE. Examples of questions that can be asked here are: Do the illustrations complement and enhance the content? Are the illustrations engaging? And do the illustrations move the story forward? Fourth, it includes the concept of (D) 'realism' which assesses if questions are presented realistically. This means avoiding the usage of oversimplifications, exaggerations, playful narratives, excessive anthropomorphisms, and portrayals of certain animal species as aggressive, non-intelligent or malicious. Fifth, the system should assess whether picture books are (E) 'inclusive' and provide readers with environmental, social, and economic perspectives. This also includes assessing whether picture books provide enough thinking space to readers (rather than subjectively nudging readers into judging the story). For example, by providing multiple outcomes or an open ending, prompting readers to think independently about various possibilities. Sixth, and last, this system assesses the (F) 'positive orientation' of picture books which includes emphasizing problem-solving rather than blame, encouraging positive and appropriate behaviors, not causing any feelings of fear, and respecting children as individuals who can think critically and logically. These six core aspects are used as the foundation for the subsequent construction of a sustainable development-oriented picture book guide system.

**Table 2**

*The Core Aspects of a Preliminary Book Selection Guide for Sustainable Development-Oriented Picture Books*

| Core Aspects  | Conceptual Explanation  |
|---|---|
| A. Completeness of the Concept of Sustainable Development | Including at least one of the three major aspects of sustainable development (environment, society, economy) as its main focus. It can also correspond to the other two aspects and relate to the SDGs. |
| B. Caring for Nature                                      | Assisting readers in understanding and feeling the beauty of nature and demonstrating the necessity to have man and nature cooperate.   |
| C. Literacy and Artistry                                  | Considering whether the core concepts, vocabulary, sentence structure, and design of pictures and texts within the book are suitable for children.  |
| D. Realism  | Assessing whether problems are raised in a realistic way, as well as assessing the usage of oversimplifications or exaggerations.   |



| Core Aspects            | Conceptual Explanation  |
|-------------------------|---|
| E. Inclusivity          | Providing enough space for readers to think critically about the story instead of subjectively guiding readers to make judgments. This can be done by including multiple endings or open endings.                 |
| F. Positive Orientation | Encouraging effective problem-solving and positive and appropriate behavior rather than blame). Fear is not induced in the story and children are regarded as individuals who can think critically and logically. |

### *Research Objectives and Questions*

The book selection guide system is a new tool that can help ECE educators or parents to select appropriate picture books independently, objectively, and efficiently. The definition of sustainable development-oriented picture books should be confirmed first, then outlining their appearance and exploring in depth the conceptual content, form of expression, and substantial impacts as the basis for constructing a sustainability-oriented picture book selection guide. Thus, this research included two main objectives:

1. Examine and understand research works on picture books and the development of book selection guides related to the broadened concept of sustainable development, and how sustainable development was framed in these picture books.
2. Construct a sustainable development-oriented picture book selection guide system.

The corresponding research questions were:

1. What are the relevant studies on the guidelines for selecting picture books for sustainable development? What are the possible benefits or shortcomings of these studies? And what are the proposed definitions and characteristics of sustainable development-oriented picture books?
2. What is the structure and content of the book selection guide system for sustainable development-oriented picture books?

## **Research Methodology**

### *General Background*

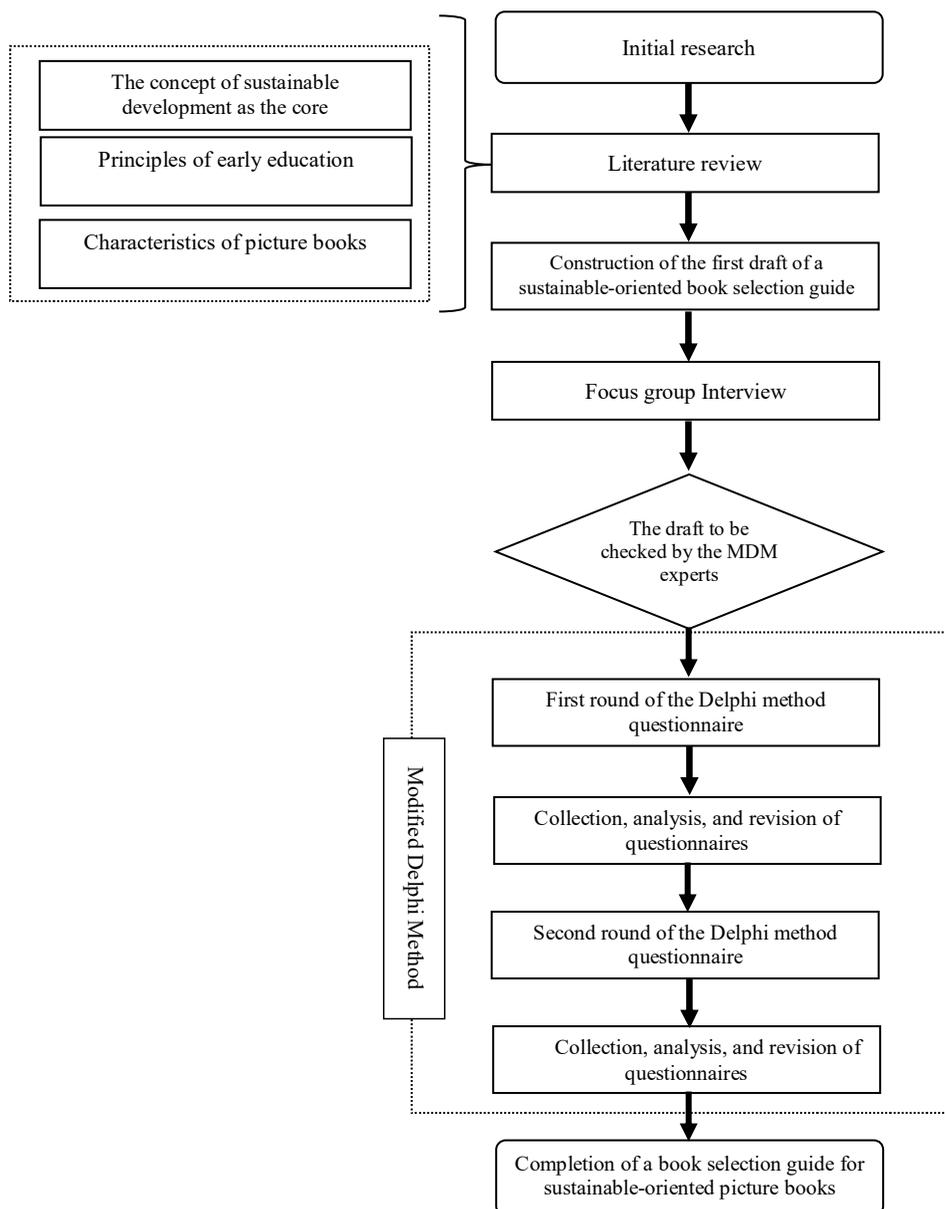
The Focus Group Interview and the Modified Delphi Methods were employed as the main research methods. As this study aims to construct a sustainable development-oriented picture book selection guide, the basic characteristics of picture books and the principles of ECE were contextualized and integrated, with sustainable development as the core concept. A group of selected experts was invited to offer comments and amendments to the original proposal of the sustainable development-oriented picture book selection guide system.

The Modified Delphi Method (MDM), proposed by Murry and Hammons (1995), captures the spirit and advantages of the Delphi Method by replacing the original first-round questionnaire with a literature review or expert interview to simplify the process of a complex open-ended questionnaire, reduce the burden on experts. The Focus Group Interview mentioned above may function as the first round of questionnaires in the MDM processes. Lanford (1972) noted that in studies conducted with the MDM, the more pronounced expert convergent thinking usually occurs between the first and second rounds. In this study, we conducted two more rounds of questionnaire surveys to achieve a stable level of consensus among more experts.

The flow of the study is shown in Figure 2.



**Figure 2**  
 Flow Chart of the Research Process



*Participants*

*Focus Group Participants*

In general, the recommended size for focus groups is six to eight participants, large enough to gain a variety of perspectives and small enough not to become disorderly or fragmented (Krueger & Casey, 2000; Chestnutt & Robson, 2001; Plummer, 2008). A group of fewer than 6 participants can make the discussion inadequate or boring. On the other hand, more than 12 participants can make the moderator difficult to control the discussion, and those participants need more time to participate actively. Academic focus groups tend to use groups of less



than 10 participants to explore the motivation and causes of participants' opinions or attitudes in depth (Stewart & Shamdasani, 2014). As constructing a sustainable development-oriented picture book guide system involves topics such as sustainable development, early education, and picture book creation-related fields, six experts in environmental education, education for sustainable development, picture book writing, picture book editing, and picture book promoting were invited to participate in the group discussion. More information on these experts is presented in Table 3. These six experts formed a moderated structured group so that the moderator could guide the experts through in-depth interactions and discussions.

**Table 3***Background Information of the Focus Group Participants*

| Expert | Job title            | Workplace                 | Expertise  |
|--------|----------------------|---------------------------|--|
| A      | University Professor | Research Institute        | Environmental interpretation, tourism and recreation management, responsible environmental behavior, ecotourism, environmental education |
| B      | Manager              | NGO                       | Environmental education, promotion of green picture books and lesson plans   |
| C      | University Professor | Centre of General Studies | Sustainable development, SDGs, sustainable development education, outdoor education, environmental education                             |
| D      | University Professor | Research Institute        | Environmental education, disaster prevention education   |
| E      | Picture Book Writer  | Publishing House          | Promoting the significance of sustainable development  |
| F      | Editor               | Publishing House          | Picture book editing, picture book marketing   |

*Delphi Survey Respondents*

This research adopts an original exploration method which is constructed and developed by using the Delphi method (Brady, 2015). The experts invited to answer to the Delphi questionnaires were selected considering the diversity of their academic or professional backgrounds, their familiarity with related topics and issues, balanced experiences and viewpoints between theory and practice, the ability to communicate, and an inclusive and open mindset. Following these, 20 experts were invited who are professors in environmental education or education for sustainable development, picture book editors, picture book creators, elementary school teachers, and early education teachers by purposive sampling.

*Research Instrument and Procedures*

The opinions of the focus group experts were compiled in the form of video, audio, and written records. Their consensus reached in the meeting was documented and then mailed to each of the participants for inquiring further opinions. As there were no more objections to the transcript received, we can conclude that data saturation was obtained and thus there was no need to conduct another group discussion. Thus, we obtained the draft of the Preliminary Book Selection Guide for Sustainable Development-Oriented Picture Books (Table 5) as the basis for the first round of the Delphi Method questionnaire, in order to simplify the process of the complex open-ended questions. The processes of two rounds of structured questionnaires were then carried out. The 20 participants were told to focus on the 3 aspects, 8 main guidelines, and 18 sub-guidelines of the sustainable development-oriented picture book selection guide. The responses were scaled using a 5-point Likert scale, 1 being 'very unimportant', 2 being 'unimportant', 3 being 'neutral', 4 being 'important', and 5 being 'very important'. A higher score indicates a higher level of agreement on the aspects, guidelines, or sub-guidelines. The experts can also propose any amendment. The statistical analysis of the two rounds of the Delphi method expert questionnaire used EXCEL software to calculate the mean, standard deviation, standard deviation coefficient, paired sample t-test, and other values.



In order to determine whether the convergence of the various guidelines has been attained, we need to establish the criteria based on some statistics, including the mean ( $M$ ), standard deviation ( $SD$ ), and coefficient of variance ( $CV$ ). The mean ( $M$ ) for each guideline, which shows the 'concentration' of 20 experts' opinions on the importance of each guideline, can represent the average strength of the guideline. The coefficient of variance ( $CV$ ), the ratio of the standard deviation to the mean, was used to measure the degree of agreement of the experts with the guidelines (Chang et al., 2002). A  $CV \leq 0.3$  indicates that the experts' opinion is highly consistent;  $0.3 \leq CV \leq 0.5$  means that the experts' opinion is consistent within an acceptable range; while the situation  $CV \geq 0.5$  shows that the difference in opinions must be explained. In addition, the paired sample t-test checks the consensus of experts in the two rounds of the questionnaire. If  $p > .05$ , we can say that the experts have the same opinion in the two questionnaire rounds. Accordingly, the collective criteria for convergence of the experts' opinions include the mean of the guidelines  $\geq 4$ ,  $CV \leq 0.5$ , and  $p > .05$ .

### *Data Analysis*

In addition to the on-site recording of the focus group's opinion, the entire discussion process was recorded and converted into a verbatim transcript. Based on the analysis of on-site records and verbatim manuscripts, the researchers reviewed and revised each guideline one by one. Furthermore, they added, deleted or merged some guidelines, and completed the preliminary sustainable development-oriented picture book selection guide system. Then, following the preliminary sustainable development-oriented picture book selection guide system, it conducted the first round of the Delphi method questionnaire.

In order to allow experts to maintain their impressions and patience in completing the questionnaire, we limited the two rounds of the Delphi questionnaire to one month. Both rounds of the Delphi Method questionnaire were set up using Google Forms. After the questionnaires were collected after each round, the qualitative and quantitative data were analyzed. The former classifies experts' opinions concerning the revision of relevant guidelines, while the latter conducts statistical analyses of the mean, standard deviation, standard deviation coefficient and paired-sample t-test according to experts' views on the importance of guidelines. For the implementation of the Delphi Method questionnaire, the recovery rate was 100%. Twenty copies of the first round of questionnaires were sent out on April 8, 2022, and the second round was collected on April 21st the same year.

## **Research Results**

### *Focus Group Results*

The main purpose of the focus group was to hold interactive discussions with experts on the first draft of the sustainable development-oriented picture book guide system. Based on the proposed revisions made by experts on the first draft of the sustainable development-oriented picture book index system, the following points were revised:

1. *Positioning as a Book Selection Guide System*: experts suggest positioning it as a book selection guide system, which clearly informs that the function of this system is to help users select sustainable development-oriented picture books suitable for ESD, rather than evaluating a single picture book, which is more in line with the purposes of this research.
2. *The Six Major Dimensions are Consolidated into Three Major Dimensions*: after the focus group meeting in this study, the researchers adopted experts' suggestions. They consolidated the six major dimensions of the first draft of the sustainable development-oriented picture book index system into three major dimensions (see Table 4). The first major aspect is (A) 'conceptual content'. The first aspects of the first draft (A and B) are integrated into this concept. The second aspect is (B) 'form of expression' which includes aspects C, D, and E of the first draft as they all include forms of expression. The third major aspect is (C) 'substantial impact' which is an adjustment of aspect F of the first draft. It now emphasizes the positive attitude and motivation picture books should bring to the readers after reading.



**Table 4***Consolidation of the First Draft's Six Major Aspects into Three*

| The six major aspects of the first draft of the sustainable development-oriented picture book selection guide system | The three major aspects of the sustainable development-oriented picture book selection guide system |
|--|---|
| A. Completeness of the Concept of Sustainable Development  | A. Conceptual Content   |
| B. Caring for Nature   |   |
| C. Literacy and Artistry   | B. Form of Expression   |
| D. Realism   |   |
| E. Inclusivity   |   |
| F. Positive Orientation  | C. Substantial Impact   |

*Establishment of Main and Sub-Guidelines:* for the establishment of the main guideline and the sub-guidelines, this research adopted the experts' suggestion to set the first main *guideline* of (A) conceptual content as (A-1) substantive content of sustainable development. This main guideline is then disassembled into the following sub-guidelines: (A-1.1) explanation of environmental aspects, (A-1.2) explanation of socio-cultural aspects, (A-1.3) explanation of economic aspects, and (A-1.4) explanation of sustainable development issues across fields. The second main guideline is set as (A-2) values and concepts of sustainable development, education for sustainable development, and sustainable development goals, and is disassembled into (A-2.1) correspondence to several sustainable development goals, (A-2.2) respected values, (A-2.3) global citizenship, and (A-2.4) timeline changes. The first main guideline of (B) form of expression is set as (B-1) degree of connection with reality. This guideline is then disassembled into (B-1.1) faithful presentation of issues in the real world and (B-1.2) realism of painting style. The second main guideline is set as (B-2) positive orientation, which is dismantled as (B-2.1) solving problems and generating hope, and (B-2.2) making steps to solve problems. The third main guideline is (B-3) inclusiveness and dismantled into (B-3.1) give readers room to judge for themselves and (B-3.2) adopt a non-didactic, non-propaganda narrative. The fourth primary guideline is (B-4) artistry, broken down into (B-4.1) appropriate text, (B-4.2) story attractiveness and interest, and (B-4.3) appropriate imagery. The two main guidelines of (C) substantial impact are (C-1) reflection and responsibility and (C-2) educational function. The respective sub-guidelines are (C-1.1) promoting follow-up actions and (C-2.1) encouraging sustainability in everyday life. According to the revised results described above (Table 5), the first Delphi method questionnaire was compiled.

**Table 5***The Preliminary Sustainable Development-Oriented Picture Book Guide System*

| Three Major Aspects      | Main guideline  | Sub-guideline   |
|--------------------------|---|---|
| A.<br>Conceptual Content | A-1 Substantive content of sustainable development                | A-1.1 Explanation of environmental aspects                        |
|                          |   | A-1.2 Explanation of socio-cultural aspects                       |
|                          |   | A-1.3 Explanation of economic aspects                             |
|                          |   | A-1.4 Explanation of sustainable development issues across fields |
|                          | A-2 Values and concepts of sustainable development, ESD, and SDGs | A-2.1 Correspondence to several SDGs                              |
|                          |   | A-2.2 Respected values  |
|                          |   | A-2.3 Global citizenship  |
|                          |   | A-2.4 Timeline changes  |



| Three Major Aspects       | Main guideline                        | Sub-guideline   |
|---------------------------|---------------------------------------|---|
| B.<br>Form of Expression  | B-1 Degree of connection with reality | B-1.1 Faithful presentation of issues in the real world |
|                           |                                       | B-1.2 Realism of painting style                         |
|                           | B-2 Positive orientation              | B-2.1 Solving problems and generating hope              |
|                           |                                       | B-2.2 Making steps to solve problems                    |
|                           | B-3 Inclusiveness                     | B-3.1 Give readers room to judge for themselves         |
|                           |                                       | B-3.2 Adopt a non-didactic and non-propaganda narrative |
|                           | B-4 Artistry                          | B-4.1 Appropriate text                                  |
|                           |                                       | B-4.2 Story attractiveness and interest                 |
| B-4.3 Appropriate imagery |                                       |   |
| C. Substantial Impact     | C-1 Reflection and responsibility     | C-1.1 Promoting follow-up actions                       |
|                           | C-2 Educational function              | C-2.1 Encouraging sustainability in everyday life       |

### Delphi Method Results

The content of the second round of the Delphi method questionnaire includes three parts: evaluation of importance, one-way comments, and comprehensive comments. The first part is based on a 5-point Likert scale, 1 being 'very unimportant', 2 being 'unimportant', 3 being 'neutral', 4 being 'important', and 5 being 'very important'. The second and third parts ask participants to revise or delete guidelines that they deem inappropriate, add new ones, and provide an explanation for their revisions. The results of the two rounds of Delphi method questionnaires are summarized and compared in Table 6.

#### *Analysis of Each of the Three Major Aspects of the Sustainable Development-oriented Picture Book Selection Guide System*

In terms of conceptual content, Table 6 shows that the *SD* of most guidelines is lower in the second round compared to the first round of the Delphi method questionnaire. The *SD* of A-2.1 in the first round is 1.076 and the *CV* is 0.269. After the concept was revised as a result of the focus group meetings, the *SD* in the second round was reduced to 0.670 and the *CV* was reduced to 0.154, indicating that the experts agreed to revise the name of this guideline. The *SD* of all guidelines in the second round was reduced to 0.154. If the coefficient is less than or equal to 0.3, and the *p*-value of all items in the t-test result is greater than .05, it means that the expert opinions have reached a high degree of consistency, and the guidelines have all been successfully converged.

The expression form also shows a high degree of consistency in terms of expert opinions as Table 6 shows that the standard deviation of the second round is reduced and most of the t-test results are insignificant (*p*-value > .05). Only on two aspects (the major aspect and sub-guideline B-4.3.) did opinions among experts vary as the *SD* increased by 0.348 with a *p*-value was .048 for the main aspect and a *p*-value of .014, for the sub-guideline.

In terms of substantial impact, Table 6 shows that the average values of sub-guidelines C-1.2 and C-2.2 are presenting a successful revision of these two sub-guidelines. Except for the two items that cannot be calculated using *p*-values, the overall *SD* are reduced in the second round and most of the t-test results are not significantly different (*p*-value > .05). Therefore, the expert opinions on this aspect are highly consistent, and all guidelines are converged successfully.

According to the evaluation results of the second round, almost all guidelines were revised successfully. Therefore, no guideline was deleted in the results of the second round of the questionnaire. Instead, only minor revisions were made to the text, which did not change the meaning of the original guidelines. Because the results of the two rounds of questionnaires reached a high degree of consistency, it was concluded that the expert opinions of the two rounds reached a consensus. Therefore, this research refrained from distributing the third questionnaire.



**Table 6**  
*Results of the Second Round of the Delphi Method Questionnaire*

| Guideline   | First round |        |       | Second round |       |       | t-test<br>p-value |
|---|-------------|--------|-------|--------------|-------|-------|-------------------|
|   | M           | SD     | CV    | M            | SD    | CV    |                   |
| A. Conceptual Content   | 4.70        | 0.571  | 0.122 | 4.70         | 0.571 | 0.121 | .500              |
| A-1 Substantive content of sustainable development                | 4.70        | 0.571  | 0.122 | 4.65         | 0.489 | 0.105 | .385              |
| A-1.1 Explanation of environmental aspects                        | 4.65        | 0.489  | 0.105 | 4.60         | 0.598 | 0.130 | .500              |
| A-1.2 Explanation of socio-cultural aspects                       | 4.40        | 0.753  | 0.171 | 4.35         | 0.670 | 0.154 | .420              |
| A-1.3 Explanation of economic aspects                             | 4.25        | 1.019* | 0.240 | 4.20         | 0.894 | 0.212 | .438              |
| A-1.4 Explanation of sustainable development issues across fields | 4.75        | 0.550  | 0.116 | 4.80         | 0.410 | 0.085 | .385              |
| A-2 Values and concepts of sustainable development, ESD, and SDGs | 4.55        | 0.759  | 0.167 | 4.60         | 0.598 | 0.130 | .357              |
| A-2.1 Correspondence to several SDGs                              | 4.00        | 1.076* | 0.269 | 4.35         | 0.670 | 0.154 | .083              |
| A-2.2 Respected values  | 4.40        | 0.820  | 0.187 | 4.55         | 0.604 | 0.132 | .252              |
| A-2.3 Global citizenship  | 4.55        | 0.759  | 0.167 | 4.60         | 0.598 | 0.119 | .401              |
| A-2.4 Timeline changes: past, current, and future changes         | 4.25        | 0.786  | 0.185 | 4.35         | 0.587 | 0.146 | .314              |
| B. Form of Expression   | 4.95        | 0.223  | 0.045 | 4.70         | 0.571 | 0.121 | .048*             |
| B-1 Degree of connection with reality                             | 4.40        | 0.882  | 0.201 | 4.20         | 0.833 | 0.198 | .223              |
| B-1.1 Faithful presentation of issues in the real world           | 4.00        | 1.076  | 0.269 | 4.00         | 0.917 | 0.229 | .500              |
| B-1.2 Realism of painting style                                   | 3.25        | 1.208  | 0.372 | 3.25         | 0.786 | 0.242 | .500              |
| B-2 Positive orientation  | 3.95        | 1.099  | 0.278 | 4.10         | 0.788 | 0.192 | .301              |
| B-2.1 Solving problems and generating hope                        | 4.20        | 0.951  | 0.227 | 4.50         | 0.760 | 0.169 | .150              |
| B-2.2 Making steps to solve problems                              | 3.40        | 1.046  | 0.308 | 3.90         | 0.911 | 0.233 | .053              |
| B-3 Inclusiveness   | 4.20        | 0.951  | 0.227 | 4.20         | 0.767 | 0.182 | .500              |
| B-3.1 Give readers room to judge for themselves                   | 4.25        | 0.910  | 0.214 | 4.45         | 0.825 | 0.185 | .259              |
| B-3.2 Adopt a non-didactic and non-propaganda narrative           | 4.55        | 0.686  | 0.151 | 4.60         | 0.680 | 0.147 | .412              |
| B-4 Artistry  | 3.80        | 1.196  | 0.315 | 3.80         | 0.767 | 0.202 | .500              |
| B-4.1 Appropriate text  | 4.40        | 0.820  | 0.187 | 4.45         | 0.510 | 0.114 | .416              |
| B-4.2 Story attractiveness and interest                           | 4.80        | 0.410  | 0.085 | 4.90         | 0.307 | 0.062 | .164              |
| B-4.3 Appropriate imagery   | 4.50        | 0.688  | 0.153 | 4.65         | 0.587 | 0.126 | .014*             |
| C. Substantial Impact   | 4.50        | 0.688  | 0.153 | 4.65         | 0.489 | 0.105 | .226              |
| C-1 Reflection and responsibility (behavior)                      | 4.40        | 0.753  | 0.171 | 4.60         | 0.598 | 0.130 | .179              |
| C-1.1 Promoting follow-up actions                                 | 4.35        | 0.606  | 0.171 | 4.60         | 0.598 | 0.130 | .117              |
| C-1.2 Triggers self-reflection and thinking                       |             |        |       | 4.60         | 0.502 | 0.109 |                   |
| C-2 Educational function (action)                                 | 4.05        | 1.050  | 0.259 | 4.45         | 0.604 | 0.135 | .088              |
| C-2.1 Encouraging sustainability in everyday life                 | 4.50        | 0.745  | 0.135 | 4.70         | 0.470 | 0.100 | .148              |
| C-2.2 Facilitate persuasive actions to others                     |             |        |       | 4.05         | 0.604 | 0.149 |                   |

Note: \* SD  $\geq 1$ , \*\*CV  $\geq 0.5$ 

### Importance Analysis

Table 7 shows the results of the importance analysis of the two rounds of Delphi method questionnaires. The A-1 guideline (substantive content of sustainable development) has an average of 4.5 and above, and the ratio of main and sub-guidelines is 60%, showing that experts attach the most importance to this guideline. This is followed by B-4 (artistry) with a ratio of 50%, A-2 (values and concepts of sustainable development, ESD, and SDGs) with a ratio of 40%, and B-3 (inclusiveness) with a ratio of 33%. Similar results were shown by the importance analysis of the guidelines discussed in the previous paragraph (Table 6). The results show that the analysis of major aspect C (substantial impact) resulted in an average of more than 4.5 in both rounds and the ratio of the number of main- and sub-guidelines is 0%. Compared to the other three sub-guidelines, the number of each guidance is generally low and consistent with the results in Table 8. However, after the end of the first round of the expert questionnaire, an additional guideline was added to the two main guidelines following suggestions made by the experts. This affected the average.

**Table 7**

*Statistical Analysis of the Importance of the Main and Sub-Guidelines of the Delphi Method Questionnaire*

| Three Major Aspects     | Main guideline  | Total number of main and sub-guidelines | Total number of main and sub-guidelines with an average of over 4.5 in both rounds | The ratio of main and sub-guidelines with an average of over 4.5 in both rounds % | Importance Ranking of the main guidelines |
|-------------------------|---|---|--|---|---|
| A. Conceptual A Content | A-1 substantive content of sustainable development                | 5                                       | 3  | 60  | 1   |
|                         | A-2 values and concepts of sustainable development, ESD, and SDGs | 5                                       | 2  | 40  | 3   |
| B. Expression Form      | B-1 degree of connection with reality                             | 3                                       | 0  | 0   | 5   |
|                         | B-2 positive orientation  | 3                                       | 0  | 0   | 5   |
|                         | B-3 inclusiveness   | 3                                       | 1  | 33  | 4   |
|                         | B-4 artistry  | 4                                       | 2  | 50  | 2   |
| C. Substantial Impact   | C-1 reflection and responsibility                                 | 3                                       | 0  | 0   | 5   |
|                         | C-2 educational function  | 3                                       | 0  | 0   | 5   |

### Adjustment of the Guidelines

The aforementioned results of the *SD*, *CV*, and *t*-test *p*-value indicate that the three major aspects of the sustainable development-oriented picture book selection guide system have all been converged successfully. Therefore, there is no need to further revise any of the guidelines. The adjustments to the descriptions of the guidelines are made in accordance with expert opinions. Table 8 shows the three guidelines that have a *M* of 4 or less, ranging from 3.25 to 3.90. The *CV* after the first round of the questionnaire was between 0.3 and 0.5, showing average consistency. However, after the second round, the *CV* was less than 0.3, showing a high degree of consistency and indicating a successful convergence. Therefore, this study argues that the guidelines can be retained after the statistical analyses.



**Table 8***Overview of Guidelines with a Mean Below 4.0*

| Guidelines                           | First round |           |           | Second round |           |           | t-test<br>p-value |
|--------------------------------------|-------------|-----------|-----------|--------------|-----------|-----------|-------------------|
|                                      | <i>M</i>    | <i>SD</i> | <i>CV</i> | <i>M</i>     | <i>SD</i> | <i>CV</i> |                   |
| B-1.2 realism of painting style      | 3.25        | 1.208     | 0.372     | 3.25         | 0.786     | 0.242     | .500              |
| B-2.2 making steps to solve problems | 3.40        | 1.046     | 0.308     | 3.90         | 0.911     | 0.233     | .053              |
| B-4 artistry                         | 3.80        | 1.196     | 0.315     | 3.80         | 0.767     | 0.202     | .500              |

### Integration of Expert Opinions into the Delphi Method Questionnaire

While conducting the Delphi method questionnaire survey, experts provided suggestions on the description of the guidelines and the applicability of the guidelines for each major aspect, the main guideline, and the sub-guideline. These suggestions are summarized as follows and can be used as a reference for further revisions:

1. The description of the guideline should be precise, but not too concise. For example, C-1.1 (promoting follow-up actions) which emphasizes the attitudes of people is revised to "motives for generating follow-up actions", which avoids confusion with guideline C-2.1 (encouraging sustainability in everyday life).
2. The age of picture book readers needs to be taken into account. Most experts mentioned that age is an important factor and should be included in the guidelines. Moreover, they suggested that the focus and content of book selections should be tweaked in a way that suits different age groups. Age must also be included as a reference item for subsequent revision of the guidelines.
3. It is necessary to consider the degree of correspondence between the guidelines and picture books. If the purpose of the guidelines is to serve as a framework for sustainable development-oriented picture books, it is necessary to assign weights to the guidelines. Since the purpose of this study is to construct a book selection guide system for educators, future research can suggest weighted guidelines for this guide system.

### Discussion

Although ECE is seen as the natural starting point for lifelong learning in ESD (Daries et al., 2009; Davis et al., 2008; Kahrman-Ozturk et al., 2012; UNESCO, 2016), ESD entered ECE as a transformative education that is still challenging for educators (Spearman & Eckhoff, 2012). To actually implement this transformative framework, educators must move beyond the traditional ECE view of children as a vulnerable group in need of protection and support children to explore real-world issues and develop as problem solvers, actors, and decision-makers in matters related to sustainable development (Boyd, 2018). Thus, the teachers' challenges when they plan to use picture books to offer the students educational opportunities on real-world issues with the framing of sustainable development include how to define sustainable development-oriented picture books, as well as the guidelines for selecting high-quality books for educational purposes.

Past research has focused on picture books that promote students' or children's environmental/ecological literacy. These picture books mainly focused on the identification of biology, the importance of recycling, and criticism of environmental pollution and ecological degradation (Bhagwanji & Born, 2018; Martín et al., 2019; Rule & Atkinson, 1994). One research on picture books related to sustainable development just proposed a basic teaching outline and mentioned the triple bottom lines of sustainable development, i.e., ecology/environment, economy/jobs, and fair/equity, which was closer to real-world scenarios (Spearman & Eckhoff, 2012). Warren (2016) suggested that teachers and parents need a transparent and systemic framework for examining and selecting picture books. This especially applies to the sustainable development-oriented picture books that educators might not be familiar with.

As the sustainable development-oriented picture book has not been defined explicitly so far, and neither has been developed a book selection guideline, this study sought to define sustainable development-oriented picture books in terms of conceptual content, the form of expression, and substantive impact. The 'conceptual content' refers to the value,



focus, and framework of the core concept of 'sustainable development' or 'sustainability', which Delphi experts consider to be the most important components of a sustainable development-oriented picture book. The 'form of expression' refers to the way the picture book is presented, whether the illustrations can attract readers or relate to reality, etc. It is related to the principles of picture book design and early education. The 'substantial impact' refers to the impact of picture books on readers and the educational function of picture books. Through these three dimensions, we define a sustainable development-oriented picture book as "a book that includes the core, values, and concept of sustainable development which can make readers aware of the balance between the environment, society and economy and that attempts to systematically explore problems, generate actions, and solve problems in relation to these three dimensions from a critical and global viewpoint." The book selection guide for sustainable development-oriented picture books has also been established to fill the gap in research on sustainability-oriented picture books. The results are shown in Table 9.

Whether our book selection guide for sustainable development-oriented picture books can truly assist ECE teachers and parents in selecting sustainable development-oriented picture books independently, objectively, and efficiently requires further practical verification and can be used as a reference for subsequent research.

### Conclusion and Implications

This study defines sustainable development-oriented picture books as books that "contain the core values and concepts of sustainable development and can attract readers to pay attention to the balance between the three aspects of environment, society and economy; after reading, picture books should motivate readers to explore problems, generate action, and solve problems by using critical thinking from a global perspective." The selection guide system that was constructed in this research puts the concept of ESD at its core. The entire framework is made to be comprehensive and complete. In practice, the guide system should be handled flexibly according to practical conditions and in the context of space and time. For example, if the user is a first-time teacher in the field of ECE, he can strengthen the guidelines of the conceptual content and expression form by assessing and evaluating the guide system. By doing so, the teacher can reflect on his or her ESD teaching without being restricted by all the guidelines.

For educational administrative agencies, the sustainable development-oriented picture book selection guide system constructed by this research can assist educational administrative agencies to establish sustainable development-oriented picture book lists as ESD teaching materials. This research suggests incorporating the concept of sustainability in picture books that are used as teaching materials in pre-service education courses. For example, Australia, a pioneer in implementing Early Childhood Education for Sustainability (ECEfS) which integrates ECE and ESD, includes picture books with the concept of sustainability in the pre-service education curriculum as teaching materials, such as: "Lester and Clyde" (Reece, 1991), "The Waterhole" (Base, 2001), "Window" (Baker, 1991), "Belonging" (Baker, 2004) and so on.

For relevant educators, the introduction of ESD in the ECE stage is to lay the foundation for a deeper understanding of global issues and to establish appropriate concepts, attitudes, values, and behaviors for sustainable development in the ECE stage. The book selection guide system for sustainable development-oriented picture books is not only a reliable source to assist ECE teachers and elementary school teachers in selecting ESD resources, but the system contains 3 major aspects, 8 main guidelines and 21 secondary guidelines, which can help educators, primary caregivers of children and all adults interested in ESD to get familiar with the concept of sustainable development. For parents, we suggest that they can use this picture book selection guide to pick up picture books that can help the children build their holistic worldview with both value and reality.

The purpose of this research is to construct a sustainable development-oriented picture book selection guide system. The constructed system has been completed, yet further practical applications are to be designed and implemented to verify the actual effectiveness of the book selection guide system. Thus, follow-up research based on the results of this study can be carried out to identify and analyze the actual selection of picture books for sustainable development, and to verify the actual performance of the framework constructed in this study.

### Declaration of Interest

The authors declare no competing interest.



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## Appendix

**Table 9**

*A Complete Book Selection Guide for Sustainable Development-Oriented Picture Books Based On Expert Advice and Analysis Results*

| Three Major aspects       | Main Guideline  | Sub-Guideline   |
|---------------------------|---|---|
| A. Conceptual Content     | A-1 Substantive content of sustainable development                | A-1.1 Explanation of environmental aspects  |
|                           |   | A-1.2 Explanation of socio-cultural aspects   |
|                           |   | A-1.3 Explanation of economic aspects   |
|                           |   | A-1.4 Explanation of sustainable development issues across fields (considering at least two of the following aspects: environmental, economic, or socio-cultural aspects) |
|                           | A-2 Values and concepts of sustainable development, ESD, and SDGs | A-2.1 Correspondence to several SDGs  |
|                           |   | A-2.2 Respected values  |
|                           |   | A-2.3 Global citizenship  |
|                           |   | A-2.4 Timeline changes: past, current, and future changes   |
| B. Form of Expression     | B-1 Degree of connection with reality                             | B-1.1 Faithful presentation of issues in the real world   |
|                           |   | B-1.2 Realism of painting style   |
|                           | B-2 Positive orientation  | B-2.1 Solving problems and generating hope  |
|                           |   | B-2.2 Making steps to solve problems  |
|                           | B-3 Inclusiveness   | B-3.1 Give readers room to judge for themselves   |
|                           |   | B-3.2 Adopt a non-didactic and non-propaganda narrative   |
|                           | B-4 Artistry  | B-4.1 Appropriate text  |
|                           |   | B-4.2 Story attractiveness and interest   |
| B-4.3 Appropriate imagery |   |   |
| C. Substantial Impact     | C-1 Reflection and responsibility (behavior)                      | C-1.1 Promoting follow-up actions   |
|                           |   | C-1.2 Triggers self-reflection and thinking   |
|                           | C-2 Educational function (action)                                 | C-2.1 Encouraging sustainability in everyday life   |
|                           |   | C-2.2 facilitate persuasive actions to others   |

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