



## Education for Sustainable Development in Science National Exam Questions of Elementary School

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### ABSTRACTS

The purpose of this study is to describe the theme of Education for Sustainable Development (ESD) and the system thinking skills set out in the 2016-2018 National Science Examination Questions for Elementary Schools. This study uses qualitative research with content analysis methods presented through descriptive delivery techniques. The results of this study indicate that the average result of the highest percentage of ESD theme content on the 2016-2018 Elementary School National Science Examination questions is on biodiversity subject as many as 52.2%, while the average result is the highest percentage of systems thinking competency on the exam questions. 65.9% of the National Science Elementary School from 2016 to 2018 is in the ability to perform complex analysis because students are asked more questions on the plants and animals body parts shape and function; type of animal; ecosystem components; how living things conform; and natural resources. Also, students are given more questions in system component analysis.

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## 1. INTRODUCTION

Education for Sustainable Development (ESD) is a key driver in achieving the Sustainable Development Goals (SDGs). ESD themes and systems thinking competencies are forms of ESD application. UNESCO has defined eleven themes in the implementation of ESD in schools including biodiversity, climate change education, disaster risk reduction, cultural diversity, poverty alleviation, gender equality, health promotion, sustainable lifestyles, human peace and security, water, and sustainable urbanization (Kemendikbud, 2014). Systems thinking competencies include the ability to know and understand relationships, analyze complex things, think about how systems are embedded in different domains and at different scales, and to deal with uncertainty (UNESCO, 2017).

The ESD concept has been implemented in Indonesia at various levels of education including elementary schools (Kemendikbud, 2014). In line with that, the researcher intends to raise the title "Education for Sustainable Development on Elementary School Science National Exam Questions" to describe the ESD theme and what systems thinking competencies have been implemented in Indonesia, especially at the school level basis.

At present, there are many studies on the analysis of the National Examination questions:

(i) Mujib, et al. (2018) conducted an analysis of the SD / MI Science UN questions for 2015-2017 based on Bloom's taxonomy; (ii) Asiasi, M.F., & Ridlo, Z.R. (2018) conducted a comparative analysis of the SD UN 2011-2017 and IMSO 2006-2017 questions; (iii) Sari & Cahyaningsing (2020) analyzed HOTS questions in the Science UN 2018.

## 2. MATERIALS AND METHODS

This research uses a qualitative research type with the content analysis method presented using descriptive delivery techniques. During this research process, researchers also collected qualitative documents in the form of public documents or private documents.

The analysis carried out in this study was through question review by reading, question review, and writing questions to calculate the percentage of item content based on the ESD theme and systems thinking competencies. Accordingly, **Table 1** shows the analysis instruments based on the ESD theme. Meanwhile, **Table 2** shows the analysis instruments based on systems thinking competencies.

**Tabel 1.** The ESD Theme Analysis Instrument for the 2016-2018 Elementary School National Science Exam Questions.

ESD theme according to UNESCO	Indicator
Biodiversity	Form and function of body parts in animals; Types of animals; Tools of movement in animals and their functions; Respiratory in animals; Digestive organs in animals and their functions; Circulatory organs in animals and their functions; Body shape in plants and their functions; The life cycle of living things; Ecosystem components; Neighborhood food webs; How to propagate plants; How to reproduce animals; The way living things adapt to the environment; Natural resources
Climate Change Education	Temperature changes; Photosynthesis relationship with global warming; Climate factors for natural disasters
Disaster Risk Reduction	Environmental pollution; Maintain the ecosystem

Cultural Diversity	Social diversity; Cultural diversity; Ethnic diversity; Social life in the surrounding environment to the province; Cultural life in the surrounding environment to the province; Geographical characteristics of Indonesia as an archipelago / Matirim country and its influence on cultural life; The geographical characteristics of Indonesia as an agricultural country and its influence on cultural life
Poverty Reduction	Utilization of natural resources for community welfare; Economic activities and their relationship with various fields of work; The geographic characteristics of Indonesia as an archipelago / Matirim country and its effects on economic life; The geographical characteristics of Indonesia as an agricultural country and its influence on economic life; The role of the economy in efforts to improve people's lives
Gender Promotion	Characteristics of puberty in boys; Characteristics of puberty in girls
Health Promotion	Form and function of organs in humans; Human locomotion and how to maintain the health of locomotion in humans; Respiratory organs in humans and how to maintain the health of respiratory organs in humans; Digestive organs in humans and how to maintain the health of digestive organs in humans; Blood circulatory organs in humans and how to maintain the health of human circulatory organs; How to maintain reproductive health
Sustainable Lifestyles	Efforts to balance and conserve natural resources in the environment; How to save electrical energy
Peace and Human Security	Accept the diversity of individual characteristics; Accept diversity in school; Identify the types of diversity in individual characteristics in schools; Understand the meaning of being united in diversity in schools; Being grateful for the diversity of religious communities in society as a gift from the Only Task in the context of Bhineka Tunggal Ika; Unity and unity towards the life of the nation and nation and its impacts
Water	Alternative energy sources; Water cycle; The impact of the water cycle on events on earth and the survival of living things; The form of a liquid object
Sustainable urbanization	Urbanization

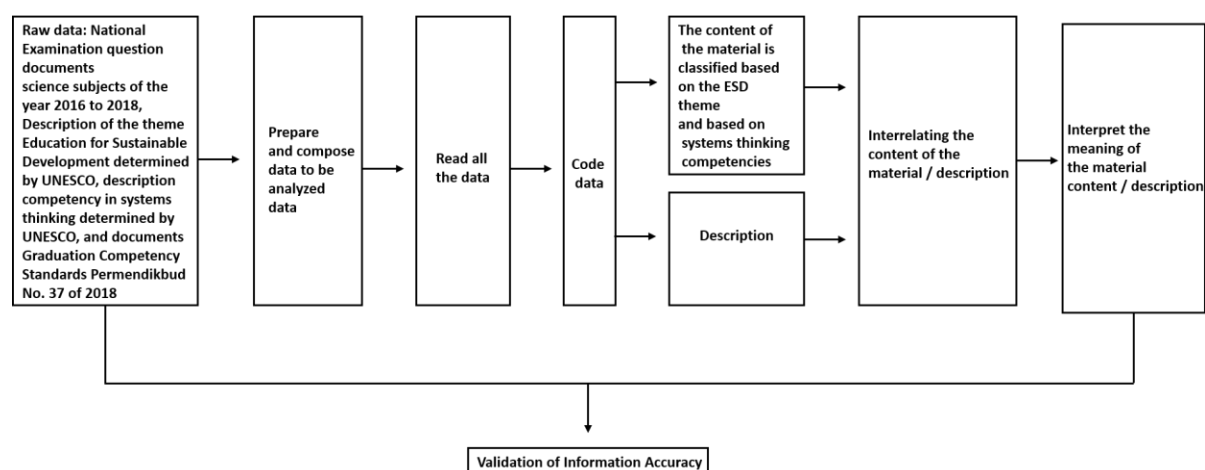
**Tabel 2.** Analysis Instruments for System Thinking Competency Themes on the 2016-2018 Elementary School Science National Exam Questions.

Competency of thinking systems according to UNESCO	System thinking indicator according to Karaarslan Semiz & Teksöz
Ability to know and understand relationships	Identify relationships between environments; Seeing nature as a system
Ability to analyze anything complex	Analyze system components; Analyzing the relationship between aspects (interconnection); Recognizing hidden dimensions; Describing a place from a complex and diverse perspective
Ability to think about how a system is embedded in different domains and at different scales	Acknowledge one's responsibility in the system; Consider the relationship between the past, present, and future actions; Recognizing the cyclical nature of the system

Ability to deal with  
uncertainty

Develop empathy for others; Developing empathy for living  
things other than humans; Adjusting the perspective of systems  
thinking with personal life

The analysis conducted in this study was through reviewing questions by reading, reviewing questions, and writing questions to calculate the percentage of item content based on the ESD theme and systems thinking competencies. This study used a data collection instrument in the form of a data recording sheet. The analysis procedure in this study is shown in **Figure 1**.



**Figure 1.** Analysis procedure.

### 3. RESULTS AND DISCUSSION

#### 3.1. Percentage of the ESD theme on the Science National Exam Questions

The results of the ESD theme analysis on the Science National Exam questions are shown in **Table 3**.

**Tabel 3.** ESD Themes Percentage from 2016 to 2018.

ESD theme according to UNESCO	Percentage			
	2016	2017	2018	Mean
Biodiversity	50%	62%	44%	52,2%
Climate Change Education	3,8%	0%	0%	1,3%
Disaster Risk Reducation	11,5%	12,5%	4%	9,3%
Cultural Diversity	0%	0%	0%	0%
Poverty Reduction	0%	0%	4%	1,3%
Gender Promotion	0%	0%	4%	1,3%
Health Promotion	15,4%	16,6%	28%	20%
Sustainable Lifestyles	7,7%	4,2%	4%	5,3%
Peace and Human Security	0%	0%	0%	0%
Water	11,5%	4,2%	12%	9,2%
Sustainable urbanization	0%	0%	0%	0%

Based on the table above, the highest average percentage of ESD themes is biodiversity, namely 52.2%. This is in line with the research conducted by Listiawati (2013) that ESD which is carried out in education units mostly focuses on an environmental perspective. The

environmental dimension taught is an effort to instill awareness and responsibility of students individually and collectively in creating a clean, healthy, comfortable, and cultured environment to behave green (Shantini, Y., 2015). Therefore, the results of the analysis showed that students were asked more questions in the form of material form and function of body parts in plants and animals; type of animal; ecosystem components; the way living things conform; and natural resources.

### 3.2. Percentage of systems thinking competencies on the National Science Examination questions

The results of the system thinking competency analysis on the Science National Exam questions are shown in **Table 4**.

**Tabel 4.** Percentage of competency in system thinking 2016 to 2018.

Competency of thinking systems according to UNESCO	Percentage			
	2016	2017	2018	Mean
Ability to know and understand relationships	15,4%	17,4%	25,8%	19,5%
Ability to analyze anything complex	69,2%	73,9%	54,8%	65,9%
Ability to think about how a system is embedded in different domains and at different scales	7,7%	8,7%	16,2%	10,9%
Ability to deal with uncertainty	7,7%	0%	3,2%	3,6%

Based on the table, the highest average percentage of systems thinking competency content is the ability to analyze something complex at 65.9%. This is in line with the research by Mujid, et al., (2018) on the 2015-2017 Natural Science Elementary National Examination questions at the analysis level of 17.5%, 15%, and 20% respectively. Analyzing, evaluating, and making are also contained in IMSO questions (Asiasi, M.F., & Ridlo, Z.R., 2018). Also, in the 2018 Science School Examination questions using analysis, evaluation, and making 30% (Sari & Cahyaningsing., 2020). Thus, the exam questions that are often given to students in Indonesia are mostly in the form of analysis. Therefore, in the National Science Exam questions, students are given more questions in the form of system component analysis.

## 4. CONCLUSION

The results of this study indicate that the highest average percentage of ESD themes in the 2016-2018 Elementary School National Science Examination is on the theme of biodiversity of 52.2%, while the highest average percentage of systems thinking competence is in the ability to analyze something complex as much as 65.9%. Students were mostly asked questions in the form of material on the form and function of body parts in plants and animals; type of animal; ecosystem components; the way living things conform; and natural resources. Also, students are given more questions in the form of system component analysis.

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## 6. AUTHORS' NOTE

The author(s) declare(s) that there is no conflict of interest regarding the publication of this article. Authors confirmed that the data and the paper are free of plagiarism.

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