



Science textbooks as an education resources for sustainability: A content analysis

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Abstract

This paper presents findings from an analysis of 4th grade science textbooks used in the United Arab Emirates schools, using an analytical descriptive approach to examine their content in light of the sustainable development goals. The results reveal that the environmental dimension of sustainable development (SD) was the most frequently reflected upon in the textbooks, with an occurrence of 18.5%, followed by the economic dimension (11.7%) and the social dimension (4.9%). While the distribution of sustainability themes varied across the textbooks, all four textbooks included references to SD. However, the researchers find that the distribution of these themes was not even, with some themes being absent in some textbooks while being extensively presented in others. These findings suggest that while sustainability is present in 4th grade science textbooks, there is room for improvement in ensuring that all three dimensions of SD are adequately covered in these materials.

Keywords: science textbooks, sustainable development goals, environmental dimension, economic dimension, social dimension, content analysis

INTRODUCTION

The education sector has increasingly prioritized sustainable development (SD) in recent years, recognizing its crucial importance. SD is founded on the belief that people should be the focus, responding to the needs of the current generation without compromising the ability of future generations to meet their own needs and maintain a high standard of living. It also embraces a holistic approach that considers the benefits and goals of both present and future generations through a well-balanced mechanism (Shikho, 2015).

In 2015, United Nations Sustainable Development Summit (2015) agreed on 17 sustainable development goals (SDGs) covering different issues such as poverty, hunger, water, cities, peace, health, education, energy, job, industry, and other important issues are addressed in SDGs (**Appendix A**). One of the goals of SDG has been mentioned, as follows (United Nations Sustainable Development Summit, 2015):

“By 2030, ensure that all learners acquire the knowledge and skills needed to promote SD, including, among others, through education for

SD and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to SD.”

Recently, United Arab Emirates (UAE) announced that this year will be the “year of sustainability”, which reaffirms UAE’s commitment to addressing today challenges and promoting sustainable practices. Meanwhile, UAE launched a “net zero by 2050 strategic initiative”, which details the country’s commitment to environmental protection and efforts to create thriving communities ideal for living and working (Ministry of Foreign Affairs and International Cooperation, 2023).

Alongside, there is a significant interrelationship between SD and science education, as societies strive to impart sustainable values to their members from an early age. Science subject can be a key medium for promoting education for sustainable development (ESD). Science serves as a bridge between natural, social sciences and economics. The subject can create a mindset that is rarely present in other areas. Science facilitates the development of global thinking essential for ESD.

Contribution to the literature

- This paper significantly contributes to the literature by systematically examining the content of science textbooks in the context of sustainability education.
- Through a rigorous content analysis, the study sheds light on the representation of sustainability concepts within educational resources, providing valuable insights for educators, curriculum developers, and policymakers aiming to enhance sustainability literacy.
- The findings contribute to the ongoing discourse on integrating sustainability into formal education, offering a foundation for future research and the development of effective pedagogical strategies.

Furthermore, it helps teachers and pupils to learn about the interconnectedness and complexity of sustainability challenges, also it aids students in thinking about alternative futures beyond their own experiences (Ates, 2019).

A study by Armitage (2008) found that incorporating sustainability into science education can have a positive impact on students' environmental attitudes and behaviors. The study found that students who received sustainability-focused science education were more likely to engage in pro-environmental behaviors and to view themselves as responsible for protecting the environment.

Therefore, it is crucial to incorporate sustainability principles into science textbooks. The textbook should emphasize the importance of responsible behavior and decision-making in achieving SD. Students should be taught to make informed decisions and take responsibility for their actions and their impact on the environment and society (Mohammadnia & Moghadam, 2019).

According to Chen and Jimenez (2019) science textbooks provide comprehensive information on environmental issues such as climate change, pollution, and depletion of natural resources. Students should be educated on the causes and consequences of these issues, as well as the measures that can be taken to address them.

Also, it is essential that science textbooks provide information on economic growth, environmental protection, and social responsibility, including how economic growth is interconnected with the environment and social responsibility, and how these factors influence each other (Nair & Nair, 2020).

In addition, the textbook should provide information on the role of science and technology in SD. Students should be taught about the benefits and drawbacks of technological advancements, and how they can be used to promote SD (Mohammadnia & Moghadam, 2019).

According to UNESCO (2017), a science textbook that integrates the principles of SD should encompass economic growth, environmental protection, and social responsibility, along with a comprehensive understanding of environmental issues, renewable energy sources, and the role of science and technology. The textbook should also focus on developing

responsible behavior and decision-making skills among students, so they can address the challenges of SD more effectively. By integrating these key concepts into the science textbook, students will be better equipped to tackle the complex issues related to SD.

Problem Statement

In August 2015, SDGs were established. UAE made a commitment to "leave no one behind" and help shift the world towards a sustainable and resilient future. To achieve this vision, individuals need to possess the necessary knowledge, skills, values, and attitudes (Rieckmann, 2017). One way to cultivate these attributes is through the use of well-designed science textbooks that serve as guides to shape students' education and develop their sustainability competences. Textbooks also address community values and priorities, so an examination of textbook content will result in high-quality educational curricula (Jimenez et al., 2017).

The study's main question is, as follows:

To what extent does the content of the science textbook for 4th grade include for issues related to SDGs?

Purpose of the Study

The aim of the study is to explore how SDGs are reflected in 4th grade science textbooks (from term 1 to term 3). This study can help in highlighting the importance of certain topics or concepts that are not currently emphasized in science textbooks or educational practice. This information can be used by educators and science textbooks designers to improve the way they present information in textbooks and teach.

INTERNATIONAL CURRICULUM STUDIES ON EDUCATION FOR SUSTAINABLE DEVELOPMENT

SD has been a topic of interest in curriculum and textbook research, particularly in the fields of science education. Studies have identified the representation of SD concepts in textbooks, the integration of ESD in primary and middle school curricula, and the effectiveness of textbooks in promoting ESD.

Boehn and Hamann (2011) conducted a study on the representation of ESD in geography textbooks and found

Table 1. 4th grade science textbooks 2022-2023

Book	Publishing date	Pages number
Book 1: Energy & motion	2022/2023	67
Book 2: Using energy	2022/2023	159
Book 3: Our dynamic earth	2022/2023	129
Book 4: Information processing & living things	2022/2023	117

that the terms sustainable, sustainability, and SD were infrequently mentioned. Moreover, Andersen (2017) classified school assignments in primary education in Luxembourg according to sustainability, highlighting a lack of emphasis on sustainability in textbooks and recommended environmental issues should be addressed explicitly in tasks. In addition, Yalcinkaya (2013) examined the extent of ESD themes incorporated in the Primary Social Studies curriculum, revealing that ESD was included but lacked topics like climate change or urbanization. In the meanwhile, Ahmed et al. (2018) evaluated 7th grade science textbook used in Iraqi schools for SD principles, identifying neglected sub-issues and recommending their inclusion in the textbook.

Sahin (2016) also evaluated middle school science textbooks for ESD coverage and found that dimensions related to SD were insufficiently addressed. This is consistent with Varjas' (2022) finding that Hungarian textbooks do not give as much attention to societal sustainability as ecological sustainability, and ESD is only occasionally addressed. Additionally, Al-Ghanimawi (2021) assessed the coverage of SD dimensions in 5th grade science textbooks and revealed a lack of coverage for some dimensions.

On the other hand, a study of Haque (2014) was explored the integration of ESD into the primary education curriculum in Bangladesh, revealing that the curriculum includes a range of ESD-related subjects across all levels. Mohammadnia and Moghadam (2019) also assessed English language learning textbooks in Iran for ESD implementation, revealing that while the textbooks contain a considerable amount of sustainability-related content, there needs to be a more balanced distribution of sustainability themes across the series.

Unlike other studies, Al-Rasheed (2020) conducted a study to examine the extent to which the content of the Kingdom's 2030 vision's SD objectives was incorporated into the 3rd grade primary science textbook. The study's analysis revealed that only two dimensions of the Kingdom's vision 2030 SD objectives were present in science textbook for 3rd grade primary school. The social dimension was ranked first, followed by the environmental dimension in the second rank. However, the economic dimension was neglected, despite being just as crucial as the other dimensions.

Overall, the research literature shows that while SD is being incorporated into curricula and textbooks, there

is a need for more explicit and balanced coverage of sustainability topics and dimensions. Moreover, local needs, cultural structures, and societal sustainability issues should also be considered when designing curriculum.

METHODOLOGY

The researchers use the analytical descriptive approach to analyze the content of the science textbook for 4th grade UAE schools in light of educational concepts of SD. The study adopts the content analysis method to summarize and interpret written data, enabling valid inferences to be drawn (Novianto & Mustadi, 2015). This method can be applied to any written material and is particularly useful for examining large amounts of text (Cohen et al., 2007).

The data collect through scientific analysis of meanings, themes and pictures that may be manifest or latent in the textbooks of the science based on SD themes and through counting the number of the theme availability in the text.

Reliability is critical in content analysis research because higher reliability increases trustworthiness in coding units. Intercoder reliability will be determined in this study using Cohen's kappa, which is an appropriate measure for determining inter-rater reliability. In addition to the coders scoring at random, Cohen's kappa formula considers chance agreement (Gwet, 2008).

Textbooks Selection & Analysis

The four science textbooks that were selected for content analysis were those approved by UAE Ministry of Education to be used in 4th grade for the 2022-2023 academic year, as shown in **Table 1**.

Research Tool

The process of developing the most convenient tool was initiated with detailed research in the literature considering the purpose of the study and the research question. After the literature review, the researchers adopt and adapt the research instrument of Osman et al. (2017) using the 17 goals of SD distributed in three main dimensions (social, economic, and environment), as shown in **Table 2**.

Reliability

The researchers were agreed on the same encoding of the content. Ten pages were randomly taken from the

Table 2. Dimensions & goals of sustainable development

Dimension	Goal	Indicators
Economic sustainability	No poverty	2
	Zero hunger	6
	Good health & well-being	8
	Quality education	5
	Gender equality	5
	Reduced inequalities	4
	Peace, justice, & strong institutions	5
	Partnerships for the goals	3
Environmental sustainability	Clean water & sanitation	6
	Affordable & clean energy	4
	Climate action	4
	Life below water	5
	Life on land	3
Social sustainability	Decent work & economic growth	3
	Industry, innovation, & infrastructure	6
	Sustainable cities & communities	6
	Responsible consumption & production	5

Table 3. Frequencies & percentages of sustainable development goals in content of 4th grade science textbooks

Dimensions	Goals	Frequency (n)	Percentage (%)
1-Environmental (five goals)	Clean water & sanitation	10	0.6
	Affordable & clean energy	157	9.7
	Climate action	37	2.3
	Life below water	7	0.4
	Life on land	88	5.5
Total		299	18.5
2-Social (eight goals)	No poverty	0	0.0
	Zero hunger	0	0.0
	Good health & well-being	13	0.8
	Quality education	24	1.5
	Gender equality	2	0.1
	Reduced inequalities	0	0.0
	Peace, justice, & strong institutions	0	0.0
	Partnerships for the goals	41	2.5
Total		80	4.9
3-Economic (four goals)	Decent work & economic growth	61	3.8
	Industry, innovation, & infrastructure	39	2.4
	Sustainable cities & communities	29	1.8
	Responsible consumption & production	60	3.7
Total		189	11.7

textbook and analyzed separately to measure the level of agreement. This involved simply adding up the number of cases that were coded the same way by the two researchers and dividing by the total number of cases. The agreement ratio between analysts reached at 0.92.

In order to combat the fact that researchers were expected to agree with each other a certain percentage of the time simply based on chance, reliability was calculated by using Cohen's kappa, where one as coding is perfectly reliable and zero when there is no agreement other than what would be expected by chance. Kappa was reaching at 0.77, which represents reasonably good overall agreement as it can be considered a strong value if it is between 0.61 and 0.80 according to Stemler (2001).

Kappa was computed, as follows:

$$Kappa (\kappa) = \frac{Pa - Pc}{1 - Pc} = 0.77, \quad (1)$$

where Pa is proportion of units on which the researchers agree, Pc is the proportion of units for which agreement is expected by chance.

RESULTS & DISCUSSION

The question in the current study was: "To what extent does the content of the science textbook for 4th grade include for issues related to SDGs?"

To answer that question, a content analysis tool was constructed in the light of the list of SD dimensions in order to analyze the content of the four science textbooks of 4th grade. **Table 3** illustrate a summary of the results of the content analysis of the books.

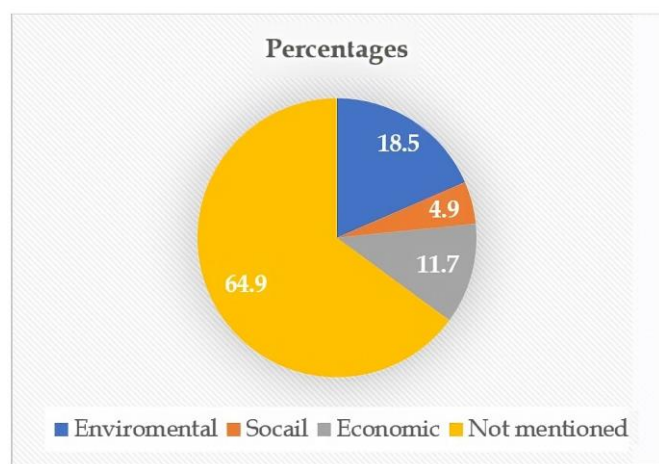


Figure 1. Mean percentages of sustainable development dimensions in content of 4th grade science textbooks (Source: Authors’ own elaboration)

Results in **Table 3** illustrate that the environmental dimension was the highly reflected among the three SD dimensions in the science textbooks of 4th grade (18.5%), then the economic (11.7%), and finally the social (4.9%).

The mean percentages of the representation of SD dimensions in the four science textbooks of 4th grade can be illustrated through **Figure 1**.

The finding shows that while there may be some variation across different sustainability topics, the environmental dimension is the most frequently discussed in 4th grade science textbooks. This might be supported by Karahan and Roehrig (2017), which found that the content of 4th grade science textbooks in the United States focus on the environmental issues, such as pollution and conservation, were the most addressed sustainability topics. The researcher determined that environmental issues were present in 24.0% of the textbook pages analyzed. Similarly, a study conducted by Jafri et al. (2019) in Pakistan also found that environmental issues were the most frequently discussed sustainability topics in 4th grade science textbooks. They reported that environmental issues were present in 31.0% of the textbook pages analyzed.

This result can be attributed to the concrete and visible of the environmental issues in compared with economic or social issues, which making them more

relatable to students. Environmental topics such as renewable energy, nonrenewable energy, and conservation are more straightforward and easier for students to relate to, compared to economic and social topics such as peace, equity, and social responsibility. Moreover, the growing awareness of environmental issues as a global challenge and a policy priority may also influenced the inclusion of environmental topics in science textbooks. According to Nguyen and Nguyen (2019), the Vietnamese government’s emphasis on SD and energy conservation has led to the integration of sustainability topics, including the environmental dimension, in primary science education.

On the other hand, environmental issues provide opportunities for students to engage in authentic and relevant scientific investigations and experiments. According to Karahan and Roehrig (2017), environmental topics provide opportunities for hands-on activities and experimentation, which can enhance students’ understanding and interest in science.

In the four books that were analyzed, the sustainability dimensions were present. However, their distribution was not even. Many themes were totally absent in some books and abundant in others. The results of the content analysis of each textbook are presented in **Table 4**.

The results show that while all textbooks included some references to sustainability, the frequency and depth of coverage varied widely across all of them. In addition, the distribution of SD goals in the textbooks was uneven, with some themes being almost absent in some textbooks, while being extensively presented in others. The findings of this study agree with those of Katsipataki et al. (2021) and Yilmaz and Altun (2017). This could be due to the fact that authors and publishers of science textbooks may have different views on the importance and relevance of sustainability themes in science education. Some authors may prioritize environmental sustainability, while others may focus more on economic or social sustainability, leading to variation in the coverage of sustainability dimensions across textbooks.

Furthermore, curriculum designers may choose to focus on topics that are deemed more essential or have

Table 4. Frequencies & percentages of sustainable development goals in content of each textbook

Dimensions	Goals	Analysis	Book 1	Book 2	Book 3	Book 4
1-Environmental (five goals)	Clean water & sanitation	Frequency (n)	0	10	0	0
		Percentage (%)	0.00	1.80	0.00	0.00
	Affordable & clean energy	Frequency (n)	26	131	0	0
		Percentage (%)	9.74	23.70	0.00	0.00
	Climate action	Frequency (n)	0	4	33	0
		Percentage (%)	0.00	0.70	8.00	0.00
	Life below water	Frequency (n)	0	3	3	1
		Percentage (%)	0.00	0.50	0.73	0.26
	Life on land	Frequency (n)	0	8	34	46
		Percentage (%)	0.00	1.50	8.30	12.10

Table 4 (continued). Frequencies & percentages of sustainable development goals in content of each textbook

Dimensions	Goals	Analysis	Book 1	Book 2	Book 3	Book 4
2-Social (eight goals)	No poverty	Frequency (n)	0	0	0	0
		Percentage (%)	0.00	0.00	0.00	0.00
	Zero hunger	Frequency (n)	0	0	0	1
		Percentage (%)	0.00	0.00	0.00	0.26
	Good health & well-being	Frequency (n)	2	0	6	5
		Percentage (%)	0.74	0.00	1.50	1.30
	Quality education	Frequency (n)	0	24	0	0
		Percentage (%)	0.00	4.30	0.00	0.00
	Gender equality	Frequency (n)	0	2	0	0
		Percentage (%)	0.00	0.40	0.00	0.00
	Reduced inequalities	Frequency (n)	0	0	0	0
		Percentage (%)	0.00	0.00	0.00	0.00
	Peace, justice, & strong institutions	Frequency (n)	0	0	0	0
		Percentage (%)	0.00	0.00	0.00	0.00
Partnerships for the goals	Frequency (n)	1	18	15	6	
	Percentage (%)	0.37	3.30	3.63	1.60	
3-Economic (four goals)	Decent work & economic growth	Frequency (n)	17	28	8	8
		Percentage (%)	6.40	5.10	2.00	2.10
	Industry, innovation, & infrastructure	Frequency (n)	3	36	0	0
		Percentage (%)	1.10	6.50	0.00	0.00
	Sustainable cities & communities	Frequency (n)	3	26	0	0
		Percentage (%)	1.10	4.70	0.00	0.00
	Responsible consumption & production	Frequency (n)	0	59	1	0
		Percentage (%)	0.00	10.70	0.25	0.00
Total	Frequency (n)	52	349	101	67	
	Percentage (%)	19.50	63.20	24.40	17.62	

greater market demand, leading to uneven distribution of sustainability goals and themes.

CONCLUSIONS

The analysis of 4th grade science textbooks in UAE schools sheds light on the extent to which SD concepts are integrated into science textbooks. The results indicate that while the environmental dimension of sustainability is the most frequently discussed in these textbooks, there is room for improvement in ensuring that all three dimensions of SD are adequately covered. The uneven distribution of sustainability themes across different textbooks highlights the need for a more systematic approach to integrating sustainability into science education. Efforts should be made to ensure that science textbooks reflect a more balanced approach to sustainability, with equal emphasis given to the environmental, economic, and social dimensions of SD. Overall, science textbooks can serve as a valuable resource for promoting sustainability education, but their content needs to be critically evaluated to ensure that they effectively contribute to building a sustainable future.

Study Limitations

This research is limited to the version (2023) of the science textbook for 4th grade. It is designed by McGraw-Hill Education.

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Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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APPENDIX A: SUSTAINABLE DEVELOPMENT GOALS

Table A1. Sustainable development goals

Goal	Indicator	F	P
1-No poverty (G1)	Explore the concept of poverty, complex issues, and differences in economic, demographic, and social characteristics between countries across the world.		
	Understand causes of global poverty, inequality & what life is like for people living in poverty.		
2-Zero hunger (G2)	Defining hunger, malnutrition, and food security.		
	Explore the problems of hunger, malnutrition, and food insecurity.		
	Explore different foods resources.		
	Storing food: Fresh, tinned, dried, & frozen.		
	Nutrition education that combines classroom learning with practical learning activities (e.g., growing fruits and vegetables in school gardens, preparing food, planning meals, practicing personal hygiene, improving school meals, and keeping a clean safe school environment).		
	Gardening activities, combined with eating foods produced, & learning about healthy dietary practices.		
3-Good health & well-being (G3)	Learning to address personal and food hygiene and sanitation, and disease and infection transmission/control.		
	Understanding healthy eating and nutrition.		
	Engage in various activities for health, fun, and development of motor skills.		
	Physical literacy to establish a basis for lifelong physical activity and active living.		
	Learning about pressures and harmful behaviors, and ways to resist them.		
	Emergency preparedness, evacuation drills, first aid, pedestrian, and cycling safety.		
	Basic understanding of physical and mental health conditions and disabilities, risk factors, etc., including non-communicable diseases.		
	Antiviolence and bullying prevention.		
4-Quality education (G4)	Right to schooling.		
	Responsibility to work hard.		
	Learning is important in my life.		
	Planning for future dream career.		
	Education in other parts of the world.		
5-Gender equality (G5)	Gender roles as social constructs.		
	Separate adjectives, jobs, domestic duties, & childcare responsibilities into female & male.		
	The impact of gender roles on the identity and rights of girls and boys.		
	Meaning of the terms 'rights' and 'equality'.		
	Learn from case studies from different countries.		
10-Reduced inequalities (G10)	Basic understanding of fairness and equality in the world.		
	Links between education & inequality—education as both a factor that conditions inequalities later in life (e.g., access to formal jobs) & a powerful instrument for advancing equity, & impact on income.		
	Examining & dismantling preconceived notions or generalizations about gender, religion, & race.		
	Ratios using inequality statistics, e.g. the number of disabled people in work compared with non-disabled people, or the number of women on boards compared with men.		
16-Peace, justice, & strong institutions (G16)	Appreciate the significance and impact of different ways of life.		
	Value justice, freedom, equality, and well-being.		
	Diversity of national and international religious and ethnic identities; the need for mutual respect and understanding at global level.		
	Religious and cultural literacy.		
	Weigh up the value of wisdom from different sources, to develop and express insights in response, and to agree or disagree respectfully.		
17-Partnerships for the goals (G17)	Creative collaboration to work in teams to design a mini project to support better partnerships later in life.		
	Work as part of a group, taking turns & sharing fairly, & understand that groups of people, including adults & children, need values & codes of behavior to work together harmoniously.		
	Show sensitivity to others' needs and feelings.		
6-Clean water & sanitation (G6)	Use of water in domestic activities for cleanliness, hygiene, relaxation, and food preparation, and formation of daily habits, routines, and lifestyles.		
	Principle of water abundance vs. water scarcity, both physical & economic & as a finite resource.		
	Potential effects of dirty water: Poor health, increased hunger, poverty, & lack of access to education.		
	Water resources & utilization by humans (agriculture, industrial, domestic, recreational, & fisheries).		
	Safe disposal of wastewater, human excreta, & solid waste.		
	Basic understanding of water science—hydrology & hydrologic cycle.		

Table A1 (Continued). Sustainable development goals

Goal	Indicator	F	P
7-Affordable & clean energy (G7)	Basic concepts of energy and consumptive uses (e.g., powering cars).		
	Different forms of energy production (e.g., fossil fuels, wind energy, etc.), associated technologies, & why different forms of energy production are best used in different geographies & contexts.		
	Commitment to energy conservation. Alternative energy at home, school, & in wider community (e.g., solar energy for cooking & heating).		
13-Climate action (G13)	Understanding of & preparedness for natural disasters (e.g., floods, tsunamis, & earthquakes).		
	Basic understanding of climate science (e.g., carbon cycles & greenhouse gas effects), & physical impacts (e.g., sea-level rise & extreme weather).		
	Foundation in economic, environmental and social concepts of climate change, and how it relates to human lives (e.g., health, energy, & food production).		
	Concepts of climate mitigation and adaptation, resilience, & sustainable development.		
14-Life below water (G14)	Introduction to understanding the role of the ocean (e.g., moderating climate, providing oxygen and food, medicine, energy, and minerals).		
	Introduction to ocean zones, and marine plants and animals, their habitats, and behaviors.		
	Knowledge of ocean animals and adaptation.		
	Introduction to recognizing the global context of challenges for local fisheries and how this affects fishermen's livelihoods.		
	Awareness and appreciation of, and respect for, the environment and nature, oceans and marine life, their fruitfulness, and the need to care for these resources.		
15-Life on land (G15)	Basic understanding of forest ecosystems, freshwater ecosystems, ecosystem health, and consequences of human impact.		
	Understand the importance of biodiversity and threats to biodiversity, habitat loss, and concept of endangered species.		
	Basic understanding of rights of other species and valuing the interdependence of species.		
8-Decent work & economic growth (G8)	Explore the different kinds of jobs in other parts of the world.		
	Learn to value different forms of work including paid work, unpaid care work, & voluntary work.		
	Work, employment, unemployment, self-employment, and enterprise.		
9-Industry, innovation, & infrastructure (G9)	Understanding of different types of infrastructure & their uses (e.g., transport, energy, & utilities).		
	Concepts of sustainability, industry, economic development, & human well-being.		
	Understanding the economic, environmental and social benefits and challenges of different types of infrastructure and industry.		
	Hard (e.g., roadways & buildings) & soft infrastructure (e.g., financial systems, hospitals, & schools). Appreciation for the provision of public services. Computer literacy.		
11-Sustainable cities & communities (G11)	Nature & components of cities & our basic needs: Food, housing, energy, transport, & water.		
	Ways in which green spaces and nature are integrated in the community.		
	Participatory design of city parks, playgrounds, large-scale public spaces, & open spaces.		
	Local ecosystems and accessible examples of sustainable lifestyles. Investigation of the urban environment, urban design, and planning. Urban environmental education.		
12-Responsible consumption & production (G12)	Sustainable and unsustainable consumption, including resource use, waste generation and disposal, and environmental and health impacts.		
	Identify examples or irresponsible & unsustainable consumption & production both locally & globally.		
	Understand impact of consumptive choices (e.g., diet).		
	Explore how technology can be harnessed & used to support responsible consumption & production. Participating in recycling, composting, and other environmental schemes.		

Note. F: Frequency (n) & P: Percentage (%)