

## A Proposed Vision for Including Green Economy Concepts in Science Textbooks for the First Intermediate Grade

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### ABSTRACT

The current research aims to provide a proposed vision for including green economy concepts in science books for the first intermediate grade. The research used the descriptive approach, and the research sample consisted of science books for the first intermediate grade in the first, second and third semesters. A list of green economy concepts was prepared, and a content analysis card was prepared. The results of the study showed a low degree of inclusion of green economy concepts in science books for the first intermediate grade, as it was very low in the science book for the first intermediate grade in the first and second semesters and intermediate in the third semester. In light of the results of the study, the researcher presented a proposal to include green economy concepts in science books for the first intermediate grade. The study recommended including green economy concepts according to the list of concepts included in the current study within the scope and sequence system for science books for the intermediate stage, encouraging female students to implement classroom activities in light of green economy concepts that develop female students' awareness of the green economy inside and outside school.

**Keywords:** Green Economy Concepts, Science Curricula, Intermediate Stage.

### INTRODUCTION

The world has recently witnessed amazing developments in industry and technology. Unfortunately, this development has been accompanied by significant environmental damage and its repercussions on human health and well-being. This has led international organizations to work together to find integrated solutions to reduce environmental damage and ensure the safe use of natural resources, thus achieving environmental and biological security in a sustainable and healthy manner.

Therefore, environmental issues have become a priority for the international community in the twenty-first century, given their close relationship to human health and safety. This is particularly true as environmental conditions have reached critical levels and have become a major concern, threatening the future of life on Earth. Demands have also begun to strike a balance between development and the environment, integrate environmental considerations into economic activities, leverage technological capabilities, and formulate preventative strategies for development projects. As a result, modern concepts have emerged for environmental protection, most notably the green economy (Al-Ananza, 2019).

The green economy, as a concept, has become a fundamental requirement to halt environmental degradation, represented by the worsening phenomenon of climate change and its expected devastating effects. The green economy represents the interconnected relationship between the economic and environmental dimensions of sustainable development, as well as the social dimension. It aims to reduce poverty, achieve prosperity, and achieve

sustainable development as a new conceptual framework that does not replace sustainable development, but rather works to integrate its economic, social, and environmental dimensions (Atiya and Abdel Wahab, 2022, 2177).

Chapple (2008, p. 1) defines the green economy as a clean energy economy and improving environmental quality by reducing greenhouse gas emissions, minimizing environmental impact, and improving the use of natural resources. It consists of several economic sectors and is not limited only to the ability to produce clean energy, but also includes technologies that enable cleaner production processes.

In this regard, numerous studies have emphasized the importance of the concept of the green economy and its associated concepts. They have called for its integration into the educational process, the development of these concepts among students, and the formation of positive, pro-environmental behavior. Among these studies are the study of El-Safty (2020), whose results emphasized the need to develop the knowledge, skills, values, and attitudes of Egyptian university students related to education for a green environment. The study of Nhamo (2014) concluded that the concept of the green economy should be adopted in higher education institutions through curricula, educational policy, and scientific research. The study of Rao & Aithal (2016) emphasized the need to integrate the green economy into curricula, address problems based on green concepts, meet green learning requirements, and use green technology in education.

In light of the Kingdom of Saudi Arabia's orientations towards a green economy, and its launch of a number of qualitative initiatives, such as the Middle East Initiative, Green Saudi Arabia (Saudi Vision 2030, 2021), and what conferences, forums, and seminars have indicated regarding the necessity of adopting the green economy in university education, including: the Academic Trends in Higher Education Conference to Build a Green Economy (2019), the United Nations Climate Change Conference (2022), the Sustainable Future Conference (2022), the Green Education and Universities Forum in Light of Saudi Vision 2030 (2022), and the Green Future Symposium (2022), in addition to what the results of some previous studies have confirmed regarding the low level of knowledge of green economy topics among students, such as the study of Hajjaj (2020), whose results showed a low level of coverage of the objectives and content of chemistry courses regarding the principles and applications of green chemistry, and the study of Leontyev (2020), which confirmed the low inclusion of green chemistry topics, with a percentage of (13%). Despite these studies emphasizing the necessity of greening education with its different objectives, curricula, tools, samples and results, the reality of Arab education is lagging behind in this aspect. This is what was shown by a study issued by UNESCO in 2021 AD, which included about (50) countries in the world, including Arab countries. It was found that more than half of the academic curricula do not contain topics that address the concepts of environmental degradation and environmental protection. This prompted the organization to set a new goal, which is to make the green economy a basic element in school curricula in all countries, by the year 2025 AD (UNESCO, 2021).

Given the environmental, social, and economic challenges and changes, science curricula have been given special importance over other curricula. This is due to educational studies and research recommending the need to develop and reform science curricula, given their significant burden in achieving educational goals and linking learners' daily lives to other multifaceted fields. This is to prepare a qualified, developed, and productive future generation capable of keeping pace with the cognitive, technological, and digital momentum (Fath Al-Bab, 2024). Accordingly, the current research aims to propose a vision for including green economy concepts in the content of the intermediate science textbook.

## METHODOLOGY

In the current study, the researcher followed a descriptive and analytical approach, which relies on describing the phenomenon in its context and reality through an accurate and objective quantitative description. The study population consisted of (3) first-grade intermediate school science textbooks taught during the academic year (1446-2024), covering the first, second, and third semesters.

The researcher designed a list of green economy concepts suitable for inclusion in intermediate school science textbooks. This list was then converted into a content analysis card to measure the degree of inclusion of green economy concepts in intermediate school science textbooks. The face validity of the analysis card was verified through the arbitration of the list of green economy concepts.

The researcher analyzed the textbooks twice, with a six-week time gap between the two analyses. The agreement coefficient between the two analyses was calculated using the Holsti equation, the overall reliability coefficient was 93.19. Thus, the content analysis card possesses a high degree of reliability and can be relied upon in analyzing the content of science textbooks for the first intermediate grade. After verifying the validity and reliability of the instrument, the researcher concluded with its final form, which contained (30) concepts distributed across (3) dimensions (environmental, economic, and social). Thus, it became suitable for application to the study sample.

**RESULTS:**

1. Results related to the degree of inclusion of green economy concepts in the content of the science textbook for the first intermediate grade, **first** semester. The instrument was applied to the study sample (the science textbook for the first intermediate grade, first semester). Frequencies, percentages, and the degree of inclusion were calculated. The following table illustrates these results:

**Table (2).** Degree of inclusion of green economy concepts in the content of the science textbook for the first intermediate grade, first semester

N	concept	implicit		explicit		total		implication level
		F	%	F	%	F	%	
The first dimension: the environmental dimension								
1	Environmental equilibrium	1	0.45%	0	0.00%	1	0.45%	very low
2	Renewable natural resources	0	0.00%	0	0.00%	0	0.00%	very low
3	Biodiversity	0	0.00%	0	0.00%	0	0.00%	very low
4	Natural Farming	0	0.00%	0	0.00%	0	0.00%	very low
5	Environmental Pollution	1	0.45%	0		1	0.45%	very low
6	Global Warming	1	0.45%	0	0.00%	1	0.45%	very low
7	Climate Change	1	0.45%	0	0.00%	1	0.45%	very low
8	Nature Reserves	1	0.45%	0	0.00%	1	0.45%	very low
9	Destructive fishing	0	0.00%	0	0.00%	0	0.00%	very low
10	Water Security	0	0.00%	0	0.00%	0	0.00%	very low
Environmental Dimension		5	2.27%	0	0.00%	5	2.27%	very low
The second dimension: the economic dimension								
1	Clean Energy	3	1.36%	0	0.00%	3	1.36%	very low
2	Green Production	1	0.45%	0	0.00%	1	0.45%	very low
3	Green Technology	0	0.00%	0	0.00%	0	0.00%	very low
4	Solid and Heavy Waste	0	0.00%	0	0.00%	0	0.00%	very low
5	Recycling	0	0.00%	0	0.00%	0	0.00%	very low
6	Green Architecture	0	0.00%	0	0.00%	0	0.00%	very low
7	Green Industries	0	0.00%	0	0.00%	0	0.00%	very low
8	Green Transportation	0	0.00%	0	0.00%	0	0.00%	very low
9	Carbon Footprint	1	0.45%	0	0.00%	1	0.45%	very low
10	Green Economy	0	0.00%	0	0.00%	0	0.00%	very low
the economic dimension		5	2.27%	0	0.00%	5	2.27%	very low
The third dimension: the social dimension								
1	Green Awareness	0	0.00%	0	0.00%	0	0.00%	very low
2	Food Waste	0	0.00%	0	0.00%	0	0.00%	very low
3	Afforestation	0	0.00%	0	0.00%	0	0.00%	very low
4	Overgrazing	0	0.00%	0	0.00%	0	0.00%	very low
5	Chemical Security	1	0.45%	0	0.00%	1	0.45%	very low
6	Ecological Footprint	1	0.45%	0	0.00%	1	0.45%	very low
7	Biodiversity Protection	0	0.00%	0	0.00%	0	0.00%	very low
8	Green Volunteering	0	0.00%	0	0.00%	0	0.00%	very low
9	Green Innovation	0	0.00%	0	0.00%	0	0.00%	very low
10	Green Well-being	0	0.00%	0	0.00%	0	0.00%	very low
Social Dimension		2	0.91%	0	0.00%	2	0.91%	very low
Green Economy Concepts		12	5.45%	0	0.00%	12	5.45%	very low

The previous table illustrated that all dimensions of the green economy concepts were implicit and not addressed explicitly. The first dimension, the environmental dimension, has a frequency of (5) represents (2.27%), with a very low degree of inclusion. The second dimension: the economic dimension has a frequency of (5) represents (2.27%) with a very low inclusion. The third dimension, the social dimension, has a frequency (2) represents (0.91%), with a very low inclusion. This demonstrates that the inclusion rate of green economy concepts

in the content of the first-year intermediate school science textbook for the first semester was very low, with (12) frequency and (5.45%) inclusion rate.

2. Results related to the degree of inclusion of green economy concepts in the content of the first-grade intermediate school science textbook for the **second** semester. The tool was applied to the study sample (the science textbook for the first intermediate grade, **second** semester). Frequencies, percentages, and the degree of inclusion were calculated. The following table shows these results:

**Table (3).** Degree of inclusion of green economy concepts in the content of the science textbook for the first intermediate grade, second semester

N	concept	implicit		explicit		total		implication level
		F	%	F	%	F	%	
The first dimension: the environmental dimension								
1	Environmental equilibrium	2	0.91%	0	0.00%	2	0.91%	very low
2	Renewable natural resources	0	0.00%	0	0.00%	0	0.00%	very low
3	Biodiversity	0	0.00%	0	0.00%	0	0.00%	very low
4	Natural Farming	0	0.00%	0	0.00%	0	0.00%	very low
5	Environmental Pollution	5	2.27%	0		5	2.27%	very low
6	Global Warming	1	0.45%	0	0.00%	1	0.45%	very low
7	Climate Change	2	0.91%	0	0.00%	2	0.91%	very low
8	Nature Reserves	0	0.00%	0	0.00%	0	0.00%	very low
9	Destructive fishing	1	0.45%	0	0.00%	1	0.45%	very low
10	Water Security	0	0.00%	1	0.45%	1	0.45%	very low
	Environmental Dimension	11	5.00%	1	0.45%	12	5.45%	very low
The second dimension: the economic dimension								
1	Clean Energy	0	0.00%	0	0.00%	0	0.00%	very low
2	Green Production	0	0.00%	0	0.00%	0	0.00%	very low
3	Green Technology	0	0.00%	0	0.00%	0	0.00%	very low
4	Solid and Heavy Waste	0	0.00%	0	0.00%	0	0.00%	very low
5	Recycling	0	0.00%	0	0.00%	0	0.00%	very low
6	Green Architecture	0	0.00%	0	0.00%	0	0.00%	very low
7	Green Industries	0	0.00%	0	0.00%	0	0.00%	very low
8	Green Transportation	0	0.00%	0	0.00%	0	0.00%	very low
9	Carbon Footprint	1	0.45%	0	0.00%	1	0.45%	very low
10	Green Economy	0	0.00%	0	0.00%	0	0.00%	very low
	the economic dimension	1	0.45%	0	0.00%	1	0.45%	very low
The third dimension: the social dimension								
1	Green Awareness	1	0.45%	0	0.00%	1	0.45%	very low
2	Food Waste	0	0.00%	0	0.00%	0	0.00%	very low
3	Afforestation	0	0.00%	0	0.00%	0	0.00%	very low
4	Overgrazing	0	0.00%	0	0.00%	0	0.00%	very low
5	Chemical Security	2	0.91%	0	0.00%	2	0.91%	very low
6	Ecological Footprint	2	0.91%	0	0.00%	2	0.91%	very low
7	Biodiversity Protection	0	0.00%	0	0.00%	0	0.00%	very low
8	Green Volunteering	0	0.00%	0	0.00%	0	0.00%	very low
9	Green Innovation	0	0.00%	0	0.00%	0	0.00%	very low
10	Green Well-being	0	0.00%	0	0.00%	0	0.00%	very low
	Social Dimension	5	2.27%	0	0.00%	5	2.27%	very low
	Green Economy Concepts	17	7.73%	1	0.45%	18	8.18%	very low

The previous table illustrated that all dimensions of the green economy concepts were implicit except for one concept that was explicit. The first dimension was the environmental dimension with a frequency of (11) represents (5.00%) with a very low degree of inclusion. The second dimension, the economic dimension has a frequency of (1) represents (0.45%), with a very low inclusion. The third dimension, the social dimension has a frequency of (5) represents (2.27%), with a very low inclusion. This demonstrates that the inclusion of green economy concepts in the content of the first-year intermediate school science textbook for the second semester was very low, occurring at a frequency of (18) and an inclusion rate of (8.18%).

3. Results related to the degree of inclusion of green economy concepts included in the content of the science textbook for the first intermediate grade, **third** semester. The instrument was applied to the study sample (the science textbook for the first intermediate grade, **third** semester). Frequencies, percentages, and the degree of inclusion were calculated. The following table illustrates these results:

**Table (4).** Degree of inclusion of green economy concepts in the content of the science textbook for the first intermediate grade, third semester

N	concept	implicit		explicit		total		implication level
		F	%	F	%	F	%	
The first dimension: the environmental dimension								
1	Environmental equilibrium	4	1.82%	0	0.00%	12	5.45%	very low
2	Renewable natural resources	0	0.00%	0	0.00%	16	7.27%	very low
3	Biodiversity	3	1.36%	0	0.00%	3	1.36%	very low
4	Natural Farming	1	0.45%	0	0.00%	1	0.45%	very low
5	Environmental Pollution	33	15.00%	0		35	15.91%	very low
6	Global Warming	0	0.00%	0	0.00%	0	0.00%	very low
7	Climate Change	3	1.36%	0	0.00%	3	1.36%	very low
8	Nature Reserves	5	2.27%	11	4.00%	16	7.27%	very low
9	Destructive fishing	3	1.36%	0	0.00%	3	1.36%	very low
10	Water Security	12	5.45%	0	0.00%	12	5.45%	very low
	Environmental Dimension	64	29.09%	37	16.82%	101	45.91%	Medium
The second dimension: the economic dimension								
1	Clean Energy	2	0.91%	0	0.00%	2	0.91%	very low
2	Green Production	1	0.45%	0	0.00%	1	0.45%	very low
3	Green Technology	0	0.00%	0	0.00%	0	0.00%	very low
4	Solid and Heavy Waste	7	3.18%	20	9.09%	27	12.27%	very low
5	Recycling	2	0.91%	31	14.09%	33	15.00%	very low
6	Green Architecture	0	0.00%	0	0.00%	0	0.00%	very low
7	Green Industries	5	2.27%	0	0.00%	5	2.27%	very low
8	Green Transportation	2	0.91%	0	0.00%	2	0.91%	very low
9	Carbon Footprint	2	0.91%	0	0.00%	2	0.91%	very low
10	Green Economy	2	0.91%	1	0.45%	3	1.36%	very low
	the economic dimension	23	10.45%	52	23.64%	75	34.09%	low
The third dimension: the social dimension								
1	Green Awareness	1	0.45%	0	0.00%	1	0.45%	very low
2	Food Waste	0	0.00%	0	0.00%	0	0.00%	very low
3	Afforestation	0	0.00%	2	0.91%	2	0.91%	very low
4	Overgrazing	2	0.91%	0	0.00%	2	0.91%	very low
5	Chemical Security	1	0.45%	0	0.00%	1	0.45%	very low
6	Ecological Footprint	3	1.36%	1	0.45%	4	1.82%	very low
7	Biodiversity Protection	2	0.91%	0	0.00%	2	0.91%	very low
8	Green Volunteering	0	0.00%	0	0.00%	0	0.00%	very low
9	Green Innovation	0	0.00%	0	0.00%	0	0.00%	very low
10	Green Well-being	3	1.36%	0	0.00%	3	1.36%	very low
	Social Dimension	12	5.45%	3	1.36%	15	6.82%	very low
	Green Economy Concepts	99	45.00%	92	41.82%	191	86.82%	Medium

The previous table illustrated that the first dimension: the environmental dimension with a frequency of (101) represents (45.91%) with a medium inclusion degree. The second dimension: the economic dimension has a frequency of (75) represents (34.09%) with a low degree of inclusion. The third dimension: the social dimension has a frequency of (15) represents (6.82%) with a very low degree of inclusion. This demonstrates that the overall degree of inclusion of green economy concepts in the content of the first-year intermediate school science textbook for the third semester is medium, with a frequency of (191) and an inclusion rate of (86.82%). The concepts included were both explicit and implicit.

4. Regarding the degree of inclusion of green economy concepts in the content of the science textbooks for the first intermediate grade, Table (5) shows the degree of inclusion of green economy concepts in the content of the science textbook for the first intermediate grade.

N	Semester	implicit		explicit		total		implication level
		F	%	F	%	F	%	
1	First Semester	12	5.45%	0	0.00%	12	5.45%	very low
2	Second Semester	17	7.73%	1	0.45%	18	8.18%	very low
3	Third Semester	99	45.00%	92	41.82%	191	86.82%	Medium
	Mean	42.67	19.39%	31	14.09%	73.67	33.48%	low

The previous table illustrated that the mean frequency of inclusion of green economy concepts in the first-year intermediate school textbooks (1<sup>st</sup> semester, 2<sup>nd</sup> semester, and 3<sup>rd</sup> semester) was (73.67), with an inclusion rate of (33.48%). This is a low degree of inclusion, as these textbooks addressed some of these concepts implicitly, with mean frequency of (42.67) and an inclusion rate of (19.39%). Meanwhile, these textbooks addressed some of these concepts explicitly, with mean frequency of (31) and an inclusion rate of (14.09%).

## DISCUSSION

The researcher believes that the low level of inclusion of green economy concepts may be due to the nature of the topics covered in the first-grade intermediate school science textbook in the first semester, which addressed the nature of science, motion, forces, simple machines, matter, its changes, and composition. Curriculum designers may have deemed it inappropriate to explicitly include green economy concepts. However, the researcher believes that many of the green economy concepts targeted in the current study align with the first-semester topics and can be included to benefit from them and link the curriculum content to the Kingdom's Vision 2030, which focuses on a knowledge-based and green economy. These results are consistent with studies by Wolff (2014), Issa (2022), and Musa (2023), all of which confirmed the low level of inclusion of green economy concepts in science textbooks at different educational levels.

The researcher believes that the low level of inclusion of green economy concepts may be due to the nature of the topics covered in the first-grade intermediate school science textbook in the second semester, which addressed rocks and minerals, the forces shaping the Earth, the dynamic atmosphere, and space exploration. Although there has indeed been a gradual shift in the treatment of green economy concepts from the first semester science textbook to the second semester, and these concepts appear explicitly in some of the book's topics, the researcher still believes that this treatment is very weak and cannot rise to the level of an important topic of global concern for the preservation of the environment and improvement of the quality of life of its people. These results are consistent with studies by Wolff (2014), Issa (2022), and Musa (2023), all of which confirmed the low inclusion of green economy concepts in science textbooks at different educational levels.

The researcher believes that the shift in the treatment of green economy concepts in the third semester science textbook, which explicitly covered 42% of the textbook and implicitly covered 45% of the textbook, is significant, but it did not take into account the balance in the treatment of green economy concepts across the three chapters. Rather, there was a sudden shift. It also ignored extremely important concepts that have contributed to climate change, such as global warming, green technology, and green architecture, in addition to other human behaviors such as food waste, green volunteering, and green innovation. These results are consistent with studies by Wolff (2014), Issa (2022), and Musa (2023), all of which confirmed the low inclusion of green economy concepts in science textbooks across academic levels.

The researcher believes there is a significant deficiency in the first and second semesters in addressing green economy concepts, and that the true inclusion rate appears in the third semester. The researcher emphasizes the need for a balanced approach to addressing green economy concepts in science textbooks across the three semesters (1<sup>st</sup> semester, 2<sup>nd</sup> semester, and 3<sup>rd</sup> semester), in addition to the need to explicitly include these concepts due to their relevance to curriculum topics and to achieve the direct goal of developing students' knowledge and attitudes toward the green economy. These results are consistent with studies by Wolff (2014), Issa (2022), and Musa (2023), all of which confirmed the low inclusion of green economy concepts in science textbooks across academic levels.

### **A proposed vision for including green economy concepts in the content of intermediate school science textbooks:**

The researcher developed a proposed vision for including green economy concepts in intermediate school science textbooks as follows:

**Aims/Objectives:**

The overall aim of the proposed concept is to include green economy concepts in first-grade intermediate school science textbooks by linking science education to green economy concepts, as science education is based on the interconnectedness and interdependence of knowledge, skills, and values in each lesson.

**Content:**

Semester	Topics	Green Economy Concepts Suggested to be Included
1 <sup>st</sup> semester	The Nature of Science	Environmental equilibrium - green production - green technology - green awareness - biodiversity protection
	Motion, Forces, and Simple Machines	Renewable natural resources - Environmental pollution - Global warming - Clean energy - Green transportation - Ecological footprint - Green innovation
	Matter and Its Changes	Biodiversity - Climate Change - Water Security - Solid and Heavy Waste - Recycling - Natural Farming - Green Well-being
	Atoms, Elements, and the Periodic Table	Global warming - climate change - Destructive fishing - carbon footprint - chemical security
2 <sup>nd</sup> semester	Rocks and minerals	Environmental equilibrium - renewable resources - environmental pollution - green production - clean energy - solid and heavy waste - ecological footprint.
	Earth's shaping forces	Climate change - nature reserves - water security - green awareness - afforestation - overgrazing - green well-being.
	moving atmosphere	Environmental pollution - global warming - climate change - clean energy - green production - green industries - carbon footprint
	space exploration	Environmental equilibrium - Renewable natural resources - climate change - water security - clean energy - green production - green technology - carbon footprint - green innovation
3 <sup>rd</sup> semester	Cells are the building blocks of life.	Renewable natural resources - Biodiversity - Clean energy - Green production - Recycling - Green awareness - Food waste - Ecological footprint - Biodiversity protection
	vertebrates	Environmental equilibrium - Renewable natural resources - biodiversity - environmental pollution - nature reserves - Destructive fishing - ecological footprint - green awareness - biodiversity protection
	invertebrates	Environmental equilibrium - Renewable natural resources - biodiversity - environmental pollution - nature reserves - Destructive fishing - ecological footprint - green awareness - biodiversity protection
	ecology	Ecological equilibrium - Renewable natural resources - Biodiversity - Natural Farming - Environmental pollution - Global warming - Climate change - Nature reserves - Destructive fishing - Clean energy - Green production - Green technology - Recycling - Green industries - Green transportation - Food waste - Afforestation - Overgrazing
	Earth's resources	Chemical security - Ecological footprint - Biodiversity protection - Green volunteering - Green innovation - Green well-being

A range and sequence matrix can be developed to include concepts in a gradual and balanced manner across the three textbooks (1<sup>st</sup> semester, 2<sup>nd</sup> semester, and 3<sup>rd</sup> semester), achieving learning objectives, reducing content, and maintaining a balanced inclusion of green economy concepts.

## RECOMMENDATIONS

Based on research results, the researcher recommends:

1. Include green economy concepts, according to the list of concepts included in the current study, within the range and sequence matrix for intermediate-level science textbooks.
2. Encourage students to implement classroom activities based on green economy concepts, which will enhance students' awareness of the green economy both inside and outside of school.
3. Include green economy activities within the requirements of students' achievement portfolios.
4. Encouraging female students to engage in voluntary cooperative work in light of the "Green Preparing" initiatives and in line with the KSA orientations in this area.

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