

UNIVERSITY OF BAHRAIN

College of Science

**Environmental and Sustainable
Development Program**



**Towards the Implementation of the
Environmental Sustainable Development
Goals within the Secondary Schools in the
Kingdom of Bahrain**

A Thesis Submitted in Partial Fulfillment of the Requirement for the
Ph.D Degree in Environment and Sustainable Development

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The student is awarded a grade A in the thesis subject.

- ☐ Without making any changes to the thesis.
- ☒ After making the modifications attached with this decision.

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**Towards the Implementation of the
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Abstract

Education is the path to developing the knowledge, attitudes and practices that individuals need to build sustainable societies. Therefore, the Sustainable Development Goals are concerned with education, especially school curricula, as the same indicator refers to "extent education for sustainable development are mainstreamed in curricula" in both Goals 12 and 13. Hence, this research aims to implement the environmental Sustainable Development Goals within the secondary schools in The Kingdom of Bahrain.

The study collected primary data using three methods: interviews were conducted with industrial environment officials, content analysis of science and social studies textbooks, and a survey measuring environmental awareness was distributed to first-year 2020/2021 electrical and mechanical engineering students in the Associate Diploma Program at the Applied College in University of Bahrain as a research sample of graduating secondary school students. The data were analyzed by using a content analysis and SPSS.

According to the research results, content analysis shows that the following courses Sci 201, Sci 211, AJA 211, and AJA 214 had the highest frequencies of environmental SDG terms. It was also found that there is a correlation between knowledge, attitudes and practices, while there is no effect of the level of parental education or the student's specialization in the secondary school, whether (science or vocational) on raising awareness of the goals of Environmental Sustainable Development. The results confirmed the need to design the environmental enrichment unit as worksheets that focus on teaching methods, methods, and tools such as project-based learning, problem solving, video, digital stories, learning outside the classroom, corporate field trips, and environmental clean-up campaigns.

Keywords: environment, sustainable development, environmental awareness, secondary school, Bahrain

Dedication

To the soul of my dear late father, may God have mercy upon him, the reason of what I become today.

To my mother, who always encourages me. Thank you for your constant care and great support, you have provided me with the moral support that gave me strength when I thought of giving up.

And lastly, to my sons, my husband, my brother, my sisters, my relatives, my friends, who encourage me and share their words with me to finish this PhD.

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I would like to thank the Bahrain free Labour Unions Federation (Al-Hurr) and Unions (GRAMCO National Trade Union, Free Trade Union of BAPCO Employees, GPIC Labour Union, and Alba Labor Union) for facilitating the communication with officials of industrial companies.

Finally, I would like to offer my sincere gratitude to my husband and sons for their true love and support.

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Chapter One

Introduction

1.1 Background

The United Nations report “Our Common Future” in 1987 also known as the Brundtland Report, defined sustainable development as "development that meets the needs of current generations without compromising the ability of future generations to meet their needs and aspirations" (WCED, 1987), where it was formulated as an integrated concept aimed at achieving a balance between both economic and environmental issues in a way that benefits both parties. At the beginning of the nineties of the previous century, this concept was expanded and deepened as economic and social issues related to environmental concerns were dealt with and developed into dimensions or pillars of equal importance in sustainable development. Today, it is a popular social guiding model that demands an integration of environmental, social and economic issues on all the societal levels in the short and long term (Mondini, 2019).

The Millennium Development Goals (MDGs) are the first sustainable development framework for governments, and it is a comprehensive global framework adopted in 2000 (UN, 2000). The MDGs embodied more focus on sustainable human development, and economic development (Fukuda-Parr et al., 2014). It consists of 8 goals, and 18 targets, to be achieved by 2015 in the field of hunger, income poverty, education, gender equality, health and survival, environment, and global partnerships (UN, 2000). The MDGs proffered a one size fits all approach, without any strategies to implement at the local or national levels (Andresen & Iguchi, 2017).

The 2030 Agenda for Sustainable Development was built on the MDGs, with Sustainable Development Goals (SDGs) containing 17 goals and 169 targets. It is a comprehensive framework for sustainable development for governments that includes goals and objectives as well as indicators in the

areas of environmental protection, peace, and poverty reduction (UN, 2015a). It also provides more space for priorities (national or local), rather than a one-size-fits-all approach of the MDGs (Biermann et al., 2017; Jong & Vijge, 2021).

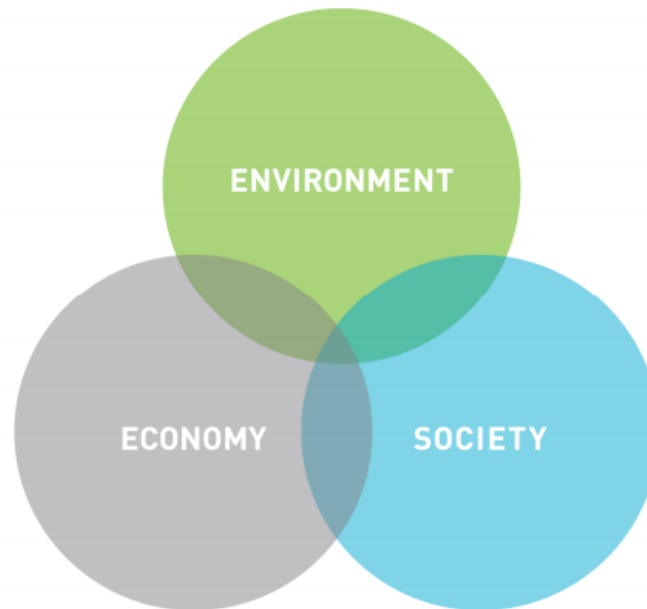


Figure (1): Sustainability dimensions

SDGs consists of three main dimensions which are environmental, social, and economic (Khan et al., 2016; Svensson & Wagner, 2015).

The environmental dimension concerns all basic life support systems related to human existence (Goodland, 1995). It includes relevant factors such as waste treatment, hygiene, land use, and energy and water consumption. It also supports the following principles: pollution should not exceed the capacity of the environment, the depletion of non-renewable resources should not exceed the rate of development of renewable alternatives, and the rate of their use of renewable resources should not exceed the rate of renewal (Khan et al., 2016).

The social dimension refers to preserving the common social capital, including the morals and values of society, through a strong civil society

and community participation. It focuses on the relationship between stakeholders and companies and factors like safety, social, and health aspects (Khan et al., 2016). To maintain social capital, investment is required in areas like education (Goodland, 1995).

The economic dimension refers to " capital preservation " (Goodland, 1995), which includes the resource base for providing exhaustible and renewable inputs to production processes, and consists of factors such as costs, profits, and new business creation (Svensson & Wagner, 2015).

In the SDG there are six goals concerned with the environment. These goals are 6,7,12,13,14, and 15.

Goal 6, "Ensure availability and sustainable management of water and sanitation for all". It consists of 8 targets, 7 of which are related to the environment. Access to water, hygiene and sanitation is a human right, yet billions still face challenges accessing basic services every day. Wastewater due to human activity flows into the sea or rivers without any treatment, leading to pollution. Therefore, goal 6 is concerned with providing safe water sources and sanitation for all by 2030. It focuses on how to improve water quality and minimize the emission of hazardous chemicals and materials. It is also concerned with halving the percentage of untreated wastewater, and increasing sustainable withdrawal, recycling, and fresh water supplies. It focuses on implementing integrated water resources management to restore and protect water related ecosystems.

Goal 7, "Ensure access to affordable, reliable, sustainable and modern energy for all", consists of 5 targets; to be achieved by 2030. Everyday life depends on reliable and affordable energy services to develop equitably and operate smoothly, as any shortage of access to energy supplies is a barrier to economic and human development. The energy system must be

well-established to support all sectors such as business, education, medicine, communications, agriculture, infrastructure, and high technology. Goal 7 therefore focuses on how to ensure individuals have access to modern, sustainable, reliable, and affordable energy. It also focuses on substantially increasing shares of renewable energy, improving energy efficiency, and encouraging investment in clean energy technology and energy infrastructure. It also focuses on promoting global cooperation to facilitate access to clean energy technology and research, improving energy efficiency, renewable energy, and cleaner and advanced fossil fuel technology.

Goal 12, "Ensures sustainable consumption and production patterns", consists of 11 targets. Economic and social progress over the last century has been accompanied by environmental degradation that endangers the systems on which future development depends on. Goal 12, therefore focuses on the efficient use of natural resources, reducing waste generation and rationalizing fossil fuels, as well as sustainable and environmentally sound management of waste and chemicals.

Goal 13, "Take urgent action to combat climate change and its impacts", consists of 5 targets, addressing human-induced climate change that threatens the Earth's future, to ensure a sustainable world for all.

Goal 14, "Conserve and sustainably use the oceans, seas and marine resources for sustainable development", consists of 10 targets, it focuses on reducing marine pollution, addressing, and reducing the impacts of ocean acidification, improving ocean health and productivity, effectively regulating harvesting, conserving coastal and marine areas, prohibiting overcapacity and overfishing, and ensuring sustainable use of marine and oceans resources to enhance marine biodiversity. Although about a million known species live in the oceans, the largest ecosystem on Earth, decades

of irresponsible utilization leading to degradation, hence Goal 14 of Plant Conservation and Sustainable use of the world's seas, oceans, and marine resources.

Goal 15, "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss", consists of 12 targets. It is concerned with how to protect and manage the Earth's resources, and focuses on ensuring the restoration, conservation, and sustainable use of inland freshwater, forests, and terrestrial ecosystems, stopping deforestation, restoring degraded forests, preserving of mountain ecosystems, restoring degraded lands and soils, combating desertification, protecting endangered species, and promoting of biodiversity.

There are also many environmental targets included in the rest of the sustainable development goals such as:

- Target 1.a "Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programs and policies to end poverty in all its Dimensions
- Target 2.3 "By 2030, double the agricultural productivity and incomes of small-scale food producers, particularly women, indigenous people, farmers, pastoralists and fishers, through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment",
- Target 2.4 "By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other

disasters. Consequently, this would progressively improve land and soil quality.

- Target 2.5 "By 2020, maintain the genetic diversity of seeds, cultivated plants, farmed, and domesticated animals and their related wild species. This would be through soundly managed and diversified seed and plant banks at the national, regional, and international levels. Also, to promote access to these seed and plant banks, in addition to fair and equitable sharing of benefits through the utilization of genetic resources and associated traditional knowledge, as internationally agreed".

- Target 3.9 "By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals, air, and water or soil pollution and contamination".

- Target 4.7 "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development through education for sustainable development and sustainable lifestyles, in addition to 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 sustainable development".

- Target 9.4 "By 2030, upgrade infrastructure and retrofit industries to make them sustainable, through increasing the use of resources efficiently and a greater adoption of clean and environmentally sound technologies as well as the industrial processes, as all countries take action in accordance with their respective capabilities".

- Target 11.5 "By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations".

- Target 11.6 " By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management".

- Target 11.a " By 2030, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels".

The Glasgow Conference (COP26, 2021) on climate change imposed on countries to achieve net zero emissions by year 2050, and to control the increase of the global temperature so that it does not exceed 1.5 degrees. His Highness the Crown Prince announced the Kingdom of Bahrain's pledge to achieve net zero emissions in 2060. The Global Methane Pledge has been signed by 103 countries, including 15 major emitters, and aims by 2030 to reduce methane emissions by 30% from 2020 levels. One of the most powerful greenhouse gases is methane, which is responsible for One-third of current global warming.

Economy is one of the pillars of sustainable development, which is differ from one country to another depending on what natural resources it possesses, in addition to social, economic, and political factors.

Bahrain is a small developing island in the Arabian Gulf. The total land area is currently about 780 km², which is considered one of the smallest countries in the world with mostly flat terrain, and Jebel Dukhan is the highest point in Bahrain with a height of 135 meters, where the only oil field is located. Bahrain has a total coastline of 946 km, the capital, Manama, is located on the main island of Bahrain, which makes up about 85% of the total area It is in an arid region with very poor resources of fresh

water, it is the most water stressed zones in the world when its population is considered. Its climate is described as high average temperatures, irregular and limited precipitation averaging about 80 mm/year, and high rates of evapotranspiration averaging 1800 mm/year. In order to meet the increasing demand for water in Bahrain and to conserve groundwater resources, the water authorities have directed their efforts towards developing non-conventional water sources, namely the expansion of desalination and the reuse of treated wastewater. Currently, the municipal water supply in Bahrain depends almost entirely on desalination, while treated wastewater complements groundwater in the agricultural sector (Kadhim & Zubari, 2020).

As Bahrain's Third National Communication (2020) mention that Over the past 30 years, Bahrain's coastline has developed greatly due to a sequence of land reclamation projects, in which approximately 111 square kilometers of reclaimed land have been added representing about 15% of its current total land area since 1980, and it is continuing till now.

The desert environment covers Bahrain, with the exception of the narrow fertile strip along the northern and northwestern coasts, where many species of birds, insects, reptiles and wild mammals live in the desert of Bahrain. Also, the most vital marine habitats in Bahrain are mangrove and coral reefs. Moreover, Bahrain has a lack of fresh water, therefore it can be considered as a water stressed country, where there is only 3 m³ of groundwater per capita compared to a global average of 6,000 m³ per capita, because of increasing population coupled with high consumption patterns. Other more pressing environmental concerns include desertification caused by lack of freshwater resources, the degradation of arable land, drought, Coastal degradation caused from oil spills and dust storms.

Agriculture represents only 0.3% of the GDP, with production mainly covering domestic consumption, which consists of vegetables, fruits, dairy products, poultry, fish, and shrimp. The low agricultural productivity is indicative of both the extremely arid climate and the limited arable land, which is only 2.1% of the land.

Bahrain produces about 42,000 barrels of oil per day and gets 50% of the revenue associated with the production of about 300,000 barrels per day in the Saudi-operated Abu Al Sa'fa oil field that lies on the maritime border between Bahrain and Saudi Arabia.

Bahrain began building the first liquefied natural gas in the Middle East in 2017 in the Hidd industrial area on the island of Muharraq, called Bahrain Liquefied Natural Gas (LNG), to receive and regasify natural terminal offshore.

Human Development Report (HDR) (2020) shows that the value of Bahrain's Human Development Index is 0.852 for the year 2019, the summary measure of long-term progress assesses the three main dimensions of human development: access to knowledge, a healthy and long life, and a decent standard of living. The Kingdom of Bahrain is ranked 42nd out of 189 countries and regions, which is very high in the human development category.

Bahrain's economy depends directly upon oil, Bahrain is a petroleum-exporting country. Oil and Gas industry is considered as a pillar of Bahrain's economy (Economic, 2013; EIA, 2011). The oil and gas industry accounts for more than 80% of all Bahrain government revenues and more than 60% of all exports (EIA, 2011). In 1932, oil was discovered in Bahrain, which is considered as the first country in the region, which achieved a major shift in economy from traditional craft activities to infrastructure development and heavy industries. It covers the exploration, refining, production, distribution, and marketing of Bahraini oil for the

local and international market such as Africa, the Middle East, the Far East, India, and Southeast Asia. Although, OAPEC (2019) published statistics reveal that fossil fuel from the current productive oil fields will be depleted soon.

Bahraini government sectors have grown to meet the demand for government services. Many industrial projects related to oil and natural gas have been implemented, such as Salman Port, which aims to enhance Bahrain's trade exchange with all parts of the world, and Aluminum Bahrain (Alba), which was established in 1968 as the first aluminum smelter company in the region. It was followed by the King Fahd Causeway and Gulf Petrochemical Industries Company (GPIC), which cited examples that highlight the continuing importance of oil to Bahrain's economy (Khayati, 2019).

Bahrain's economy is considered the most diverse among the regional Gulf countries, as the oil sector contributes 20.8% of GDP, while non-oil sectors (including the finance and banking) account for 79.2% of GDP. (www.mofne.gov.bh).

The Kingdom of Bahrain has begun to pay attention to human resource due to the industrial renaissance, as it establishes training institutes and designing programs that qualify Bahraini youth and developing their abilities to work in the industrial sector to Bahrainizing the jobs in these companies, where one of the objectives of the Bahrain Economic Vision 2030 is Bahrainization of jobs. For example, as part of the 2030 strategy, the level of "Bahrainization" in the Petrochemical Company (GPIC) reached 92% of the staff in 2022, Aluminium Bahrain BSC (Alba) achieved "Bahrainization" reached 85% in 2023, Bahrain Petroleum Company B.S.C.(Bapco) reached 68% in 2021, and Bahrain-based Gulf Aluminum Rolling Mill (Garmco) reached 80% in 2023.

After discussing the role of Education for Sustainable Development (ESD) in Agenda 21 and during the United Nations Decade of Education for Sustainable Development (UNESCO, 2005), then the United Nations Decade of Education for Sustainable Development (DESD) (2005–2014), which aims to "integrate ESD principles and practices into all aspects of teaching and learning to encourage changes in knowledge, values, and attitudes, with the vision of enabling a more sustainable and just society for all". Environmental education is an effort to raise environmental awareness and environmental conservation through formal and informal education in schools, and by promoting knowledge-based environmental care attitudes and behaviours, awareness will be formed about maintaining a sustainable environment (Mullenbach & Green, 2018)

Bahraini curricula for science and social studies contain several environmental topics such as natural resources, pollution, and environmental preservation, which indicates the importance of education to achieve sustainable development in the Kingdom of Bahrain.

The first and only national university in the Kingdom of Bahrain is The University Bahrain, which was established in 1986 and began to provide academic programs that meet the current and future needs of the labor market. Therefore, the College of Applied Studies was established in 2005, to achieve the Bahrainization of the labor market so that there is an increasing need to hire local technicians and professionals in different jobs who are able to compete successfully with the current expatriate labor. The Department of Engineering in Applied Studies offers two diplomas to industrial school students:

- Associate Diploma in Electrical Engineering
- Associate Diploma in Mechanical Engineering.

The vision of the two programs is to enhance the economic development of the Kingdom of Bahrain, by providing qualified engineering technicians with highly practical skills, supported by broad theoretical knowledge, to engage them efficiently in the industrial sectors. Their efforts are focused on educating students to obtain a qualified Professional Diploma in Engineering, to acquire enriched skills and to enhance their engineering practices to prepare them to engage in lifelong learning, which provides services to the Bahraini society by achieving university standards. (<https://offline.uob.edu.bh/>)

The United Nations launched the “Decade of Education for Sustainable Development” in 2004, which aims to integrate the principles, values, and practices of sustainable development into formal/informal education (UNESCO, 2017), because education is the path to developing the knowledge and attitudes that citizens need to establish societies sustainable (Aikins et al., 2016; Salas-Zapata et al., 2018).

Education for Sustainable Development (ESD) was developed based on the Brundtland Report (WCED, 1987), in which greater emphasis was placed on the economic and social aspects of sustainability as a result of the United Nations Decade of Education for Sustainable Development (DESD), which lasted between 2005 and 2014 (UNESCO, 2005). In contrast, Education for Sustainable Development Goals (ESDG) was followed by Education for Sustainable Development (ESDG), as education was inspired by the United Nations Sustainable Development Goals (UNESCO, 2017).

Therefore, in December 2002, ESD took a different path, as the United Nations Decade of Education for Sustainable Development was proclaimed by the United Nations General Assembly adopting resolution 57/254, and this initiative completed a series of texts (Chapter 36 of Agenda 21 , provision124.) adopted at the United Nations Conference on

Environment and Development in June 1992 in Rio de Janeiro and the World Summit on Sustainable Development in September 2002 in Johannesburg. UNESCO assigned the responsibility of leading this decade and formulating an international implementation programme. Thus, education for sustainable development has become a political project, which has been formally formulated by major national and international institutions. As such, the International Implementation Plan for the United Nations Decade of Education for Sustainable Development considers Education for Sustainable Development.

Due to the reached consensus regarding the SDGs in Agenda 2030, some large companies have begun to refer to the SDGs in their public communications to show their contribution to sustainable development (Elalfy et al., 2021; KPMG, 2020). This practice was also stimulated by the United Nations Global Compact (UNGC) that set up a joint initiative with the Global Reporting Initiative (GRI) for supporting companies to incorporate the SDGs into their planning and reporting processes (GRI, 2019). In particular, the rate at which the SDGs are used varies according to the specific industry in which the company operates (Cardoni et al., 2019).

There also appears to be a gap compared to the targets of other documents (Agenda 21), such as those related to clean water and sanitation (Goal 6), clean and affordable energy (Goal 7), industry, innovation, and infrastructure. Infrastructure (Goal 9), responsible consumption and production (Goal 12), climate change (Goal 13) and life on Earth (Goal 15).

In the context of urban transformation, there are a series of programs and initiatives created to engage European cities in efforts to improve the quality of life through sustainable economic development and a low-carbon

future, which have generally succeeded in achieving the commitment of an increasing number of cities towards the Sustainable Development Goals (Gargiulo et al., 2017).

Industrial ecology (IE) is an innovative method that bridges the gap between traditional business practices and the Sustainable Development Goals. Where, it connection between three areas: IE, sustainable development, and business strategy were mentioned as efficient use of energy and resources, climate change mitigation and adaptation, and innovation research (Sullivan et al., 2018).

Moreover, Cordova and Celone (2019) found that in the industrial situation, innovation appears as a major driver for the pursuit of sustainable development goals at every stage. Moreover, the various ways of applying innovation represent the spirit of cooperation hoped for achieving the SDGs, particularly in Goal 17. For example, it turns out that Goal 17 seems to be a sine qua non especially in a highly interconnected and globalized world. Also, another essential goal is Goal 4 of the Sustainable Development Goals, which states the need to educate generations by adopting a sustainable concept before attempting to implement it. Therefore, social sustainability is a priority over economic sustainability and a condition for coordination towards environmental sustainability goals.

This research identifies the environmental topics that should be included in the curricula in the Kingdom of Bahrain. This will be carried out through content analysis of the secondary schools' curricula to identify their contents of sustainable development goals concerning the environment; namely the SDGs 6,7,12,13,14 and15, drafting a questionnaire to measure the knowledge, attitude, and practices. Also, conducting interviews with the environmental officials in the industrial sector to identify the

companies' points of view of the topics that are needed to achieve the SDGs. Finally, the environmental awareness of the current curricula is to be enhanced by forming an environmental enrichment unit that can be taught in the secondary schools across the Kingdom of Bahrain. This research aims to promoting environmental awareness of secondary schools' students and future employees.

1.2 Research Problem

A significant number of published research integrate environmental awareness in education (Arslan & Albay, 2019). As one of the solutions to mitigate environmental problems by providing an appropriate and effective environmental education system, it aims and plans to increase awareness and conscience about environmental issues for students of all academic levels (Alagoz & Akman, 2016).

Education is a critical tool in preventing and resolving environmental problems by increasing awareness about the environment (Tuncer et al., 2005). Effective environmental education is a path to solve environmental issues (Arslan & Albay, 2019). Where learning for the environment will positively affect learner knowledge, values, and attitudes concerning the environment (Yalmanci & Gozum, 2018). Environmental education is a critical field, encouraging students to protect the environment from current and potential local/global environmental challenges (Cole, 2007).

Educational content supported by activities to raise environmental awareness can be provided to students of all ages (Ergin, 2019), and it must include this content in all education levels and extend to all fields (Alagoz & Akman, 2016; Ho, 2009).

The Higher Education Council's 2015 presentation included survey results that revealed that just 16% of employers answered that the education

system provides them with the basic skills needed in the industrial sector, while 16% found that the curriculum is in line with the needs of the private sector. Even worse, just 19% of employers answered that the education system provides students with appropriate attitudes and behaviors.

Environmental values, attitudes, and approaches related to human behavior should be adopted in the curricula, emphasizing on contemporary environmental topics which constitute a priority to the companies. Students should acquire knowledge and concepts that help maintain sustainability and the environment's resources. Environmental science is changing rapidly; so, the courses should be revised accordingly.

Companies need students with capabilities, knowledge, trends, and practices that preserve the environment and its resources and reduce emissions of pollutants and waste to help companies achieve sustainable development goals in general and environmental in particular. Secondary school curricula constantly updating according to local, regional, and global changes.

The questions are: do our students in secondary schools in Kingdom of Bahrain have the appropriate knowledge, values, and attitudes concerning the environment SDGs? Is the curriculum appropriate, effective and planned to provide awareness, conscience and information about environmental issues?

This research aims to measure knowledge values, and attitudes concerning the environment SDGs that students in secondary schools in the Kingdom of Bahrain have. It also aims to measure to what extent the secondary schools' curricula have such knowledge and concepts of environmental SDGs; what topics related to the environmental SDGs are students supposed to know before joining the industrial sectors from the industrial companies' point of view.

In addition, the current research will attempt to identify the environmental topics that should be included in the curricula, based on the needs of the companies and the knowledge, attitude, and practices of the students. It is hoped that this research would provide a significant effective environmental enrichment unit.

1.3 Research Questions

Based on the previous sections that presented the research problem, general research questions appear that need to be addressed and discussed, which can be formulated as follows:

- What SDGs topics do industrial companies expect students to know before joining them?
- To what extent do the secondary schools curricula have knowledge and concepts of environmental SDGs?
- To what extent are the students aware of environmental SDGs?
- What topics must be included in the environmental enrichment unit to raise the of environmental awareness topics ?

1.4 Research Objectives

The objectives of this research:

- To identify SDGs topics that students are expected to know before joining the industrial sectors.
- To analyze the content of the courses taught in the secondary schools in the Kingdom of Bahrain to identify their contents of the environmental SDGs.

- To measure the knowledge, attitude, and practices of graduated secondary school students enrolled in the first year of Electrical and Mechanical Engineering students in the Associate Diploma programme.
- To design an enrichment unit on environmental SDGs topics related to the industrial sector in the Kingdom of Bahrain.

1.5 Research Significance

The subject of this thesis is new in the Kingdom of Bahrain. There are not many sources about environmental education, its existence, and the need to include it in school curricula.

The importance of this research lies in:

- Providing the curriculum specialists with a database containing the environmental topics to be in the current curricula, that assist them to developing curricula.
- Providing the curriculum specialists with an overview of building an environmental enrichment curriculum.
- providing local universities with an overview of the environmental content of existing curricula, allowing them to develop their own environmental curricula.
- providing the Ministry of Education and local universities with insight into the impact of current curricula on students' environmental awareness.
- Encouraging the Ministry of Education to develop industrial specialization to suit the requirements of factory workers.
- Providing information about environmental curricula and students' environmental awareness that assist them to improving their training programs.

- Providing students with an enrichment environmental unit with interactive teaching and learning strategies to raise students' environmental awareness.

1.6 The Study's Setting

This thesis contains four main chapters in addition to references and appendices.

- Chapter 1: Introduction: concentrates on giving a background, states the research problem, which led to state the research question and research objectives, it also gives a view to the significance of the research in education and industry sector, lastly, to identify the main research terminology.
- Chapter 2: Literature Review: presents literature of three main fields: industry, education, and awareness, and is divided into 8 sections.
- Chapter 3: Methodology: which consist of 5 sections and state detail Research Paradigm, Research Methods, Research Tools, Sampling and Data Collection, Data Analysis, Quality Criteria.
- Chapter 4: result and dissuasion and recommendation: It contains three sections: Results, Discussion, and Recommendations, where the results of the research tools are extracted, summarized in tables, illustrated with graphs, and discussed to provide recommendations.

1.7 Research Terminology

Here are the definitions of terms used in this thesis.

Sustainable:

“A capacity to maintain some entity, outcome, or process over time”
(Jenkins, 2009; Rosen, 2018)

Sustainable environment:

“Maintains ecological integrity, which means keeping the entire Earth's ecosystems in balance while humans use natural resources at a rate that enables them to replenish themselves.” (UN, 2005; 2015).

Sustainable Development:

“The development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Khan et al., 2016; Moldan et al., 2012; Svensson & Wagner, 2015).

The Sustainable Development Goals (SDGs):

A set of 17 interrelated Global Goals was adopted by the United Nations in 2015 as a global call to action to end poverty and protect the environment, ensuring that all people can enjoy peace and prosperity by 2030. They are designed as a "blueprint for a better and more future Sustainability for all” (UN, 2017).

Awareness:

A heightened metacognitive focus, namely on one's inner thoughts, feelings, and behaviors. It has been conceptualized as a trait variable (Agosti et al.,2019; Fenigstein et al.,2016; Grant et al.,2002; Trapnell & Campbell,1999).

Environmental awareness:

Knowledge that helps an individual acquire the knowledge, values, and skills required to live sustainably through understanding environmental issues and the measures that must be taken to achieve good practices towards preserving the environment. (Enger & Smith, 2013; Rogayan & Nebrida ,2019).

Education for Sustainable Development (ESD):

“The process of learning how to make decisions that take into account the long-term future of the environment, the economy, and the equality of all societies.” (Kagawa, 2007; Rogayan & Nebrida, 2019).

Environmental Education:

“Developing awareness, obtaining new views, attitudes, information, and skills, and formal and informal processes leading to changed behaviors in support of an ecologically sustainable environment in its broadest sense (AFED, 2019; Samuel & Sundar, 2007).

Content analysis:

“One of several research methods for analyzing textual data, it extends beyond simple word counting, as it seeks to understanding of the phenomena under study to provide knowledge through a systematic method of text coding and classification to discover patterns and themes. (Hsieh & Shannon, 2005; Gheyle & Jacobs, 2017; Weber, 1990).

School Curricula:

The total experiences of the student that occur during the educational process (Mulnga, 2018; Wiles & Jon, 2008).

Chapter Two

Theoretical Framework and Literature Review

Previous studies related to the current research were divided into six sections: the Kingdom of Bahrain economy, industry impact on the environment, environmental awareness, education for sustainable development (ESD), curriculum analysis, and enrichment units.

2.1 Kingdom of Bahrain's economy

Bahrain Economic Vision 2030 was launched in 2008 which was prepared by the Economic Development Board, outlines the long-term development plan for Bahrain, shaped by the government and led by a pioneering private sector to transform from an economy dependent on oil wealth to a competitive and a productive global economy, an economy that develops a broad middle class of Bahrainis with good living standards through increased productivity and higher-paying jobs.

It included future economic sustainability, the implementation of the government's action plan, and the implementation of the new e-government strategy, which is a priority to control non-renewable energy consumption (www.bahrain.bh).

The Government of the Kingdom of Bahrain prepared the “First Voluntary National Review of the Kingdom of Bahrain” (2018) on the implementation of the 2030 Agenda and the SDGs and established the National Information Committee (NIC) to undertake the task of localizing, implementing, and achieving the SDGs through the government's action plan. According to this report, the approach taken in aligning Agenda 2030 with the Government's Action Plan resulted in the successful integration of around 78% of Bahrain's targets into the Government's 2015-2018 program.

To gain international recognition for its efforts for the implementation of the 2030 Agenda, the Kingdom of Bahrain launched several international

awards; for example, King Hamad Award for Youth Empowerment to Achieve Sustainable Development Goals. Prince Khalifa bin Salman Al Khalifa Award for Urban Development and Housing, and his Highness' Award for Sustainable Development. Princess Sabeeka Bint Ibrahim Al Khalifa International Award for Women Empowerment.

Bahrain pursues policies of sustainable and diversified economic growth. (Nakibullah, 2018). The share of non-oil real GDP in the real GDP is also used as a measure of diversification to reach the extent of diversification in Bahrain, where non-oil GDP shares rose from 64% at the beginning of this century to 80%. 2016, with an average annual growth rate of 6.2% during the period from 2002-2016.

Due to small size of Bahrain and its limited resources, industrial areas are located near residential areas. Moreover, many indicators showed some environmental problems that need to be controlled with urgent solutions. The effects of the global warming and Urban heat islands (UHIs) were an overwhelming phenomenon in Manama and the coastal cities of Bahrain (Elgonaimy & Javed, 2018). UHI is defined as an urban area with a higher temperature compared to its neighbors as well as a rural area. The lack of vegetation and the predominance of a textured surface are major factors behind the emergence of UHIs (Elghonaimy & Mohamed, 2019), which has led to an understanding of the impact of industries on the environment.

(Khayati, 2019) a study on the impact of oil and non-oil exports on the Bahraini economic growth of during the period 1977-2015, which shows that the positive and important economic growth of exports, as oil had the greatest impact on economic growth in Bahrain and GDP. Positive impact of oil exports on economic growth in the short and long term. Moreover, encouraging more diversification of exports and non-oil sectors will lead to positive effects on the economy.

2.2 Industry impact on the environment

The industrial sector is a main side of the economy sector and tends to have more negative impacts on sustainability due to its direct/indirect impact on the environment, as there are growing concerns about achieving the development of environmental sustainability for industry; Thus, it is important to develop strategies to enhance the implementation and performance of the sharing economy (Gilli et al., 2017; Govindan et al., 2020; Jiang et al., 2018).

Urban growth and industrial development are mostly associated with resource consumption and severe pollution (Liu, 2020), which have badly impacted quality of life and raised environmental degradation (Alvarado & Toledo, 2016; Hoefel et al., 2017). Thus, it is crucial to formulate suitable corporate reporting systems that focus on company performance rather than financial performance (Vaz et al., 2016). For example, the Coalition for Environmentally Responsible Economies (CERES) issued in 1989, a set of 10 principles, incorporating general environmental concepts into specific disclosures, with the goal of creating an information framework for evaluating company performance based on societal standards and historical context.

These principles serve as a key milestone in shaping the unified reporting ecosystem with which companies can comply, leading in 1997 to the Global Reporting Initiative (GRI), which shared a unified framework for market sustainability reporting Global with standards around corporate economics, corporate governance, and social society responsibility (CSR)(Rupley et al., 2017). As such, the GRI Standards Guidelines have been widely adopted by companies globally as a voluntary reporting reference (GRI, 2016; KPMG, 2015; PwC, 2018; Stewart et al., 2018). A cooperative initiative between the United Nations, the World Business

Council for Sustainable Development (WBCSD), and the Global Reporting Initiative (GRI) was the first effort to integrate the SDGs through non-financial indicators, which provide a set of SDGs to support businesses in designing strategies and measuring and managing their contributions to the SDGs (Pizzi 2021).

Sustainability reports are an important driver and catalyst for corporate sustainability (Lozano, 2015; Lozano et al., 2016), including social aspects and environmental (Wang, 2017), and act as a catalyst for integrating sustainable development goals into the business model (Adams, 2017), as sustainability reports help Companies understand, , communicate, measure and lead efforts towards defining sustainable development goals, clarifying internal goals and leading the transformation towards more sustainable development (GRI, 2020). In addition, sustainability reports and their disclosure tools are the main ways to communicate externally with stakeholders (Engert et al., 2016) whether to gain, maintain, or improve a company's reputation (Deegan, 2019) or to meet stakeholder requirements for greater transparency about Sustainability Issues (Lozano, 2015). Moreover, information presentation and transparency are key principles of report quality (Boiral et al., 2019). Therefore, The Corporate Sustainability Report is defined as “a powerful catalyst and strategic instrument for a company to uncover practices that contribute to the Sustainable Development Goals, help engage stakeholders, support sustainable decision-making at all levels, drive innovations, shape business strategy, achieve better performance, and create better value and bring in investments” (GR & UN, 2017; 2018).

The industry sector considers a main role in the development of the economy, which creates the need to integrate sustainability into industrial development to avoid any effects of the deterioration and sustainability of

the economy on the environment and community. (Rashid et al., 2022) is intended to examine corporate sustainability reports to help identify and prioritize the most important sustainability issues that need to improve their environmental performance and improve their future reports by analyzing the situation of sustainability sides in materiality matrices. A content analysis approach was used to analyze 11 reports during 2016 to 2020 for 3 large companies in the Bahraini industrial sector. This study concluded that across a large segment of Bahraini companies namely Bahrain Petroleum Company Bapco, Gulf Petrochemical Industries Company GPIC, and Alba Aluminum Bahrain, sustainability reports were found based on GRI guidelines.

There is a growing concern on the impact of industrial companies on public health and the natural environment as associated industries in their use, operations and activities pollute the environment. Although industrial companies are under severe pressure from government regulators, society and an emerging competitive market to maintain and create a balance between environmental, social, and economic performance. Therefore, there is an emerging demand for the application of practices that simultaneously cover the needs of the environment, economy, and society (Tekir & Akar, 2019).

Therefore, through the industrial history, many serious industrial accidents happened and led to loss of workers' lives and workplaces. Bhopal gas station disaster in 1984, two years later in 1986 the Chernobyl nuclear power plant disaster, then also two years later in 1988 the Piper Alpha disaster, and then most recently in 2010 the BP Deepwater Horizon oil spill disaster (Besnard & Hollnagel, 2012). Human error is defined as an unintentional error in the performance of a job that causes immediate damage to the system or can be a latent defect that has the potential to

threaten the merit of a technical system (Virovac et al., 2017). Also, (Myszewski, 2012) defined human error as a failure to fulfill a particular duty (or perform an undesirable activity) that would disrupt planned activities and result in property and equipment damage.

The economic perspective of accidents in the industrial sector is a vital issue, where there is a great need for concern in risky workplaces such as the oil and gas industry (Bolu, 2011). Human error during the maintenance phase can have various impacts on device safety and performance (Dhillon, 2014; Dhillon & Liu, 2006). (Myszewski, 2012) Human error is an indicator of an organization's inefficiency. (Alkhalidi et al., 2017) the primary impacts of human errors that have negative consequences on safety and the economy are the following property damage, massive loss of life, environmental damage, and disruptions to the economic condition of any firm.

There are many factors which cause human errors such as inadequate training, skills shortage, badly designed equipment, poorly written maintenance procedures and operating manuals, complexity of maintenance duties, inappropriate tools used, outdated maintenance manuals, poor maintenance procedures, inappropriate work planning, limited workplace lighting and noise levels, and stress of maintenance personnel etc (Badenhorst & Tonder, 2004; Dillon & Liu, 2006; Myszewski, 2012)

In addition, the statistics of the Bahraini Ministry of Labor and Social Development showed that human error plays a major role in the high number of work accidents in all types of industry (Al-Aradi, 2010). Human errors occur in the maintenance of mechanical systems for various reasons, therefore, to solve the problem, many industries have prompted the establishment of various initiatives.

The third national forum included representatives from higher education, industry and business for study and attempted to bridge the gap between employers' requirements and the skills of higher education graduates entering the labor market, as studies indicate that the labor market suffers from a shortage of some skills among graduates, such as critical thinking, problem-solving, communication skills and teamwork, which negatively affects the Bahraini labor market (Ala'ali 7, 2015).

Higher Education representatives described challenges of matching the skills of graduates with the requirements of the labor market. This requires teaching new skills and capabilities that commensurate with the available job opportunities. Industry representative explained that the outputs of higher education in disciplines related to the company's work need to be developed in the technical and electronic fields, in addition to skills related to electricity, pointing to the desire of the aluminum sector to develop relevant university specializations (Ala'ali 8, 2015).

The major objectives of the National Strategy for Higher Education to prepare studied with the following skills: critical thinking, problem-solving, networking skills and communication skills necessary for success (Bukamal & Mirza, 2017).

The Ernst & Young report (2015) states the major challenges when recruiting and retaining Bahraini youth are lack of work experience, professional discipline, high salary expectations and weak communication skills. More care should be paid to the level of education of workers in the industrial sector. To address these shortcomings, companies are increasingly encouraged to work alongside teachers to design school and university curricula and make them more relevant to the industry. The study suggested that the solution is to make internships compulsory for all undergraduates, as it can help bridge the gap between work and education.

Given the lack of published research on the participation of Bahraini citizens in the Bahraini labor market, (Ala'ali, 2019) explores the perspective of employers in the Bahraini private sector towards the participation of national workers, as the study was applied through a qualitative method by applying semi-structured interviews with government officials and managers of private sector. The results show that poor coordination between training and education in relation to the needs of the labor market does not make citizens the best option for employment in Bahraini companies.

“The Kingdom of Bahrain’s First Voluntary National Review” (2018) on the implementation of the 2030 Agenda and the SDG’s shows that access to education is guaranteed in the education sector, and that efforts are exerted to enhance the quality of education. Bahrain provides the best educational, health and social care for young people, as it has seriously committed itself, and bears the responsibility to educate society about the significance of improving youth people skills, educating them, promoting their sense of belonging and citizenship, and encouraging them to participate in youth activities.

2.3 Environmental Awareness

Quality environmental education can contribute to the formation of environmental awareness (Erdogan, 2011), and can be enhanced through curricular and extracurricular activities. Students' environmental awareness can be involved in developing their environmental knowledge and attitudes (Chawla & Cushing, 2007), feeling responsible, motivating them to act responsibly (Korhonen & Lappalainen, 2004), and predicting environmental education outcomes (Hungerford & Volk, 1984).

There are some sources that can help create awareness, which can be arranged as family and school field trips, which provide opportunities to absorb environmental issues, and print/visual media (Hadjichambis & Paraskeva-Hadjichamb,2020), school activities as community work projects and society projects (Bashir et al., 2022). Another solution is to introduce environmental issues to students by incorporating topics related to the environment (Yasin,2019). Furthermore, as teaching and learning strategies, can use creative activities related to reusing and recycling products such as books, papers, clothing, plastic, glass, etc. which are effective techniques of teaching environmental awareness (Ardoin et al., 2020). Besides, social media such as Instagram, Facebook, Snapchat, and Pinterest are good platforms for sharing logos, images, or ideas with the public (Greenhow & Lewin, 2016).

The main goal of environmental education is to ensure that students accept the concept of sustainable development, which needs to develop environmental awareness. Therefore, much effort needs to be done at all levels as institutional/non-institutional to provide specific environmental knowledge to current generations, to enable them to adopt a positive attitude towards natural resources and the environment and to act in favor of the environment (Stanisic,2016).

Many theoretical frameworks have been developed and implemented to provide an explanation for the gap between environmental awareness, possessing environmental knowledge and displaying pro-environmental behavior, but no undeniable explanation has been found so far. (Kollmuss & Agyeman, 2002) Develop some widely used and highly influential analytical frameworks, by analyzing factors that are found to have some negative/positive effect on pro-environmental behavior such as demographic factors. And internal factors Such as pro-environmental

knowledge, values, motivation, awareness, attitudes, control, passion, priorities, and responsibilities. Also, external factors such as economic, institutional, and socio-cultural. The finding was that environmental knowledge, attitudes, and values along with emotional involvement shape a complex known as "pro-environmental awareness".

Amran et al. (2018) measure 21st century students' attitudes toward environmental awareness in West Nusa Tenggara, the data collection was using the self-assessment and questionnaire of environmental awareness of secondary school students, the tool was modified from the teaching and assessment skills of 21st century containing 4 aspects: creative thinking, critical thinking, communication, and cooperation. According to the findings, in general, the attitude of 21st century students can be classified in the low category while the majority of the environmental awareness of the students can be classified in the appropriate category.

Environmental education is integrated into various course curricula inclusive physical sciences, life sciences, geography, social studies, moral education, and civics in the Philippines. It aims to identify the connection between environmental awareness and the practices of students at the secondary school in 2019 to benefit from it as a basic for the environmental education program, as the findings showed that the participants had a “good” level of environmental awareness, While the level of environmental practices group was "poor". a 'positive correlation' was obtained between environmental awareness and the practices of secondary school students, which means that the level of environmental awareness among secondary schools' students is closely related to the extent of their environmental practice (Punzalan, 2020).

Yesilyurt et al.(2020) aim to develop the environmental awareness of students in a public primary school during the academic year 2018-2019 in

Gungoren district of Istanbul, in which the study group consisted of second year primary students. Data collection was obtained through semi-structured interview forms, students' environmental pictures, and observation forms. The results showed that the majority of the members of the study group achieved a positive improvement in environmental awareness, as the students who received environmental education reflected environmental awareness, by drawing pictures with enthusiasm, and the interviews showed that the students gained awareness towards the environment.

Aliman et al. (2019) aims to demonstrate the impact of the earthcomm learning model in rising students' environmental awareness among secondary schools, where knowledge, attitudes, behaviors, and skills in solving environmental problems of students represent environmental awareness. The results prove that there is a significant influence of the earthcomm learning model on changes in students' knowledge, attitudes, behaviors, and environmental problem-solving skills.

The role of schools is very important for the development of environmentally conscious students. (Rogayan & Neberida, 2019) A descriptive correlational study attempts to measure awareness and practices, conducted in the Philippines on 100 public high school science students. The results concluded that there is a medium correlation between concepts and issues of environmental awareness among students and their practices to find solutions of environmental problems and their possession of a high degree of commitment, as science students are fully aware of the state of the environment, environmental concepts, and environmental issues. This research recommended the possibility of continuing the dissemination of information programs related to the state of the

environment, environmental concepts, and environmental issues by the school to maintain the high environmental awareness of the students.

The failure of the efforts that address the environmental issues through environmental education has been examined in this research, positing that environmental problems are on the rise due to shortage of intentional stewardship and responsibility, ineffective education, and lack of unique environmental education curricula. Environmental awareness alone cannot achieve respect for the environment. Therefore, environmental education can target human cognition and attitudes and then move towards vital stewardship of the environment, as this can be achieved through an intentional educational approach to environmental values that promote a sustainable attitude and respect for the environment, where the curriculum should be the representative and carrier of these values that are critical to environmental sustainability, environmental codes of conduct, recommending environmental ethics, and eco-nationalism(Omoogun et al. ,2016).

Pardo (2012) aims to establish an important substantive relationship between the environmental awareness of the students and their practice towards environmental issues at the University of the Northern Philippines, the research recommended to develop of an environmental education program by offering electives leaning towards environmental education as part of high school curricula, in particular to students under STEM because they are more exposed to similar educational competencies , which will not only maintain the level of awareness, but also raise the level of awareness, and the extent to which students practice towards the principle of sustainable development and environmental issues.

Several studies attempt to explore potential sources of failure or success initiatives that promote sustainability related knowledge, attitudes, and/or practices (KAP) and provide a research typology related to the underlying approach to sustainability perspectives. The KAP model has 3 components: knowledge, attitude, and practices, in which knowledge increases, attitudes change, and practices improve, which are subject to the interference of communicative actions. Where, Knowledge which is defined as the cognitive elements related to mental actions during information processing such as memory, perception, learning and prediction. And Attitudes refer to emotional reactions to something, which depend on values and beliefs (Bohner & Wanke, 2002), processes of socialization, direct/indirect communication (Donahue and Miller, 2006), encounters with others, and personal experiences (Keren et al., 2009). Practices are specific actions directly related to knowledge and attitude to limit the compatibility of all actions with their socialization processes, understanding, beliefs, values, and culture (Heimlich & Ardoin, 2008).

Although the importance of KAP studies, references to this type of classification are rare, with scant records of positive attitudes toward sustainability education among teachers and students (Burmeister & Eilks, 2013). Moreover, small advances in knowledge and awareness can make a more sustainable community between students who attend courses which contains sustainable development issues. (Lozano & Young, 2013).

2.4 Education for Sustainable Development (ESD)

Sustainable development requires competence, values, knowledge and, most importantly, attitudes towards the economy, environment, health, and well-being of people. Aspects of sustainable development are interrelated and influence each other, which means that any modification in any field

affects the entire development process. Education is the most effective instrument for learning about the impact of pollution and how to protect yourself from them and cultivate a positive attitude toward the environment and lead a healthy lifestyle. Environmental knowledge, application, and improved environmental awareness are necessary components of environmental protection. All social processes should incorporate environmental protection education. As a result, the school's position and significance in this environment are becoming increasingly relevant.

Agenda 21 has appeared as a plan of advancement since the Rio Conference in 1992, highlighting sustainability as the main aspect of environmental education. ESD was increasingly defined in chapter 36 as priority and an essential component of that plan. As an aspect of sustainability, education for the environment (ESD) produces environmentally literate citizens who are empowered and motivated to find a solution to the environmental issues.

According to Stapp et al. (1969) ESD aims to help students gain knowledge, build habits, and develop abilities and sentiments. That will help them become more environmentally conscious, understand how to help address these problems, and are motivated to resolve them. Environmental learning is the main component of a society's environmental awareness. The three components of environmental awareness are environmental knowledge, attitudes, and behavior. Where, they are connected to each other. The school's role is to act and guide their development.

At the end of the 20th century, it was believed that there was a direct and linear relationship between environmental knowledge and environmental behavior. This indicates that having a basic understanding of the environment is adequate to encourage beneficial environmental behavior.

As a result, the experts pushed for as much content as possible to be included in the curriculum (Kollmuss & Agyeman, 2002).

The main challenges in developing environmental education, both in professional practice and in research, are due to a fragmented worldview, a view that separates people from the complex web of relationships that make up the earth, the nature of life, and the universe (Leff, 2007). This is a narrowed perspective that, in most circumstances, simplifies and unifies our view of the world and its manifestations. Environmental issues relate not only to development issues, but also to issues of education and knowledge that go beyond environmental learning and affect how environmental issues are understood and addressed. From this perspective, it is important for teachers and/or educators to preserve direct connection with students during all levels such as primary education, secondary education, bachelor's, and higher education (Mora, 2009).

Although the United Nations assigned the decade 2005-2014 as the Decade of Education for Sustainable Development, experts in the field continue to face challenges in merging Environmental Education (EE) into academic programs. Due to the shortage of the professional development to provide an efficient environmental education, it has been hard to adapt methods and approaches seriously enough to be deserving to be implemented in the classroom (Parlo & Butler, 2007).

ESD is mostly implemented in comprehensive secondary schools in Finland through collaboration between various courses and educational projects in particular, through the gathering and processing of data and actions from other subjects as a framework for producing unforgettable event. It is conceivable to transform the deep psychological, allegorical, and mythical level of the individual's relation with nature into a deductive

resource in which factual information takes on different and profound definitions in this way (Meri-Helega, 1992).

Waltner et al. (2019) develops a valid and reliable approach to measuring sustainability competencies, by providing new data for a school's first assessment. The paper-based questionnaire includes the demographic, sociological, cognitive, behavioral, and curriculum-oriented aspects of sustainability competencies applied to 1622 students aged 9-16 years. The results showed a pathway towards sustainability competencies to explain the needs and achievements of implementing ESD within schools.

The study Sukma et al. (2020) aimed to identify teachers' views and knowledge related to integrating the environmental education into the classroom learning process of primary school students using a questionnaire containing of 15 questions and 4 additional statements related to environmental education through learning process. The results showed that most of the teachers agreed on the importance of integrating environmental education into the learning process of students, especially primary school students.

The aim of the study Garrecht (2018) was to identify expanded education offerings related to ESD and their participation in students' decision-making. The systematic search yielded 19 articles out of 365, each dealing with the three components. It is an ESD extra-curricular activities that offers an appropriate structure to enhance decision-making because of its interdisciplinary and informal structure and explores students' decision-making process in relation to ESD and extracurricular activities.

Hernandez et al. (2017) attempts to analyze and understand the concepts espoused by educators of all levels of education, about the methodological strategies designed and/or used for practice, as well as the paradigm that is

put in place in addressing environmental education (EE). Which found that "how to teach" is more important than "what to teach", which requires a new teaching approach and different learning and collaboration.

Environmental subjects are a realistic model that modern education can and should contain the interaction of different school subjects, to facilitate the acquisition of more realistic and comprehensive knowledge. The target of environmental education can only be achieved if lessons involving environmental topics contain interactive and interdisciplinary approaches, outdoor classroom activities, active learning methods, and classrooms that encourage students to analyze and explore problems, observe specific issues from multiple perspectives, discuss issues, and exchange opinions. Where all these activities aim at acquiring environmental knowledge, shaping student attitudes and behavior, and developing environmental awareness (Stanisic,2016).

Identification of methodological characteristics of elementary school lessons dealing with environmental content, implementation in 15 classes of grade 8 in three primary schools in Belgrade through observation. The observation included lessons in chemistry, biology, physics, and geography. The results showed that the teachers mostly applied the frontal teaching style and the monologic style to teach environmental content to their students. Although the environmental content requires specific teaching with active learning methods, which encourage students to explore, analyze and observe specific issues from multiple perspectives, outside activities, discuss issues and exchange opinions. Therefore, according to the results, these teaching methods are not sufficiently represented in primary schools (Stanisic,2016).

2.5 Curriculum Analysis

To implement ESD, there is a need to analyse the context of curricula. In data analysis terminology, Content analysis generally refers to the systematic coding of quantitative or qualitative data based on certain categories or topics. by commonly used examples, calculating subject frequencies through document analysis or word classification and arithmetic as a measurement tool are mostly used procedures. Also, another example of content analysis is the structured classification and coding of data acquired through interviews or observations, which are used in theoretical or applied studies (Gheyle & Jacobs, 2017). It also defined as the number of times a symbol appears within a text, which is used to understand its prevalence, based on the assumption that texts are a rich source of data with great potential for discovering valuable information about phenomena (Kondracki et al., 2002).

The method is very fruitful in educational research because it is multilateral and can be implemented in both quantitative and qualitative studies, which is an excellent method to enrich the current curricula and develop them (Graneheim, 2017; Julien, 2008). As a method of analyzing qualitative data, content analysis provides clarity, as it uses the repetition of appearance symbol in the text to understand its pervasiveness, as the type of reality is objective, measurable, and observable. (Kleinheksel et al. ,2020).

Recent studies indicate that school geography at the secondary level is often being taught throughout the world using traditional approaches (Seremet, 2016) that have required students to memorize names of countries and their capitals (Ottati, 2015) and is composed of “purely descriptive knowledge and skills” (Maude, 2014). This has resulted in the develop the low-level of thinking skills among students and is contrary to academic geography in higher education that is research-based and

promotes “the incorporation of recent approaches to teaching thinking skills into the geography classroom” (Dizon, 2021; Rawding, 2010).

Evaluation studies of secondary school geography curriculum indicated that there is a need to “retreat from the rote-memorization type” of learning and develop a new curriculum instead so that geography textbooks will feature exploratory, discovery, and expository strategies (Dizon, 2021; Yasar & Seremet, 2009), to be student-centered and constructivist, which will help develop critical and creative thinking among students (Yasar & Seremet, 2009; Yang, 2011).

Traditional social studies textbooks contain topics that depict “nature as a natural resource that must be managed sustainably” and these teaching materials put humans at the center and make them appear superior to nature (Lioro-Bidart, 2015). This human-centered approach with an emphasis on environmental awareness among students fails to provide “any concrete solution or prescription on how to address” problems such as environmental degradation (Abueg, 2007), because it considers non-humans to be “resources that are extracted, purified, exchanged and used” (Lioro-Bidart, 2015).

A qualitative study Derman & Gurbuz (2018) aimed at comparing the objectives of environmental education subjects in different countries by using content analysis to analyze the data obtained, as the results showed the low level of environmental education activities in all countries, and the categories of objectives related to the environment in education Primary schools is higher in Turkey than in other countries, where the concept of biodiversity is covered extensively in biology curricula and the concept of the ozone layer in chemistry curricula.

Carcelen et al. (2021) analyzed the policies of compulsory Spanish education, covering ages 6 to 16, by analyzing the way in which environment, learning and sustainability awareness were integrated into the curriculum through normative review, and in particular by using content analysis to identify sustainability and environmental references, whether they are included in the standards and the contents to which they relate. There are two main aspects in the international guidelines, which are environmental education and the promotion of sustainability, so educational institutions must have an effective role in achieving sustainability and environmental awareness, as government educational policies must provide the necessary tools for it. The results detect that there is no consideration for these terms. There is greater integration in the secondary curriculum where environment and sustainability are more theoretical and focused on the topics; Where practical, it is usually associated with reflection processes. Thus, the research concluded that government institutions needed to rise the presence of these terms in educational curricula by integrate them incidentally through certain skills and content, which contributes to building social awareness of the importance of these phenomena in society.

Finally, about regulations, it is considered necessary to cover environmental and sustainability terms in educational policies as competencies and not only as subject content to rise environmental awareness among students.

2.6 Environmental Enrichment units

Many previous studies present the importance of the E-enrichment unit, Alsheeya (2013) results of a study applied in Kuwait revealed that the most subjects, including environmental issues, are in science that constituted

35% and national education 24% skills of life 15%. This study pointed out that 95% of teachers supported adding an e-enriching units to the environmental nationalism to help develop a kind of awareness of the environment by students.

Yildirim & Sensoy (2018) aims to determine the effects of teaching science supported by technological applications on academic achievement levels of seventh grade students attending a public high school in Turkey within 13 weeks during 2016. The research method was used a quasi-experimental approach, in which Experimental design with a test group before and after, on 83 students, where 42 students as a control group and 41 students as an experimental group. The Academic Achievement Test was used as a preliminary test, a post-test, and a follow-up test. The same science teacher was teaching both the control and experimental groups in the science class, where the science course syllabus was given to the students in the control group without applying any experimental method, but the experimental group followed the science course syllabus with the teaching procedure using technology-rich science teaching applications. The findings indicate that there was a noteworthy increase in the achievement levels of the experimental group, and it was much higher than the achievement of the control group, so it is recommended to use technology-enhanced teaching in teaching science.

Aldosary (2017) attempted to study the effectiveness of an enrichment program for the development of geographical and cosmic knowledge and concepts among 2nd-grade Saudi secondary students in the Humanities track during the academic year 2016/2017. The study adopted a quasi-experimental method, where the study sample consisted of fifty female students in the second year who were randomly selected, and they were divided equally into two groups, an experimental and a control group. The

results showed that the enrichment program had a positively impact on students' achievement and the cosmic awareness development, with recommendation of enrich geography curriculum by supported activities to develop cosmic and geographical concepts and cosmic awareness, also to hold training courses for teachers before and during service in order to change the geography curriculum from an educational one to an enriching one.

Ugulu (2019) aims to determine the efficiency of a Recycling Education Program of gifted students', which was integrated on the ecosystem ecology subject in terms recycling knowledge, ecology conceptual understanding, and environmental attitudes. the results show there was an improvement in students' answers in the level of conceptual understanding after the applications, which means there was progress in the students' knowledge about recycling and attitudes towards the environment.

One model for designing instructions is to draw the Kemp model as an oval shape surrounded by two outer layers, where the oval is composed of the following 10 unit as shown in Figure (2):

- Instructional problems.
- Learner's characteristics.
- Task analysis
- Instructional objective
- Content sequencing
- Instructional strategies
- Message design
- Instructional delivery
- Evaluation instruments
- Support services

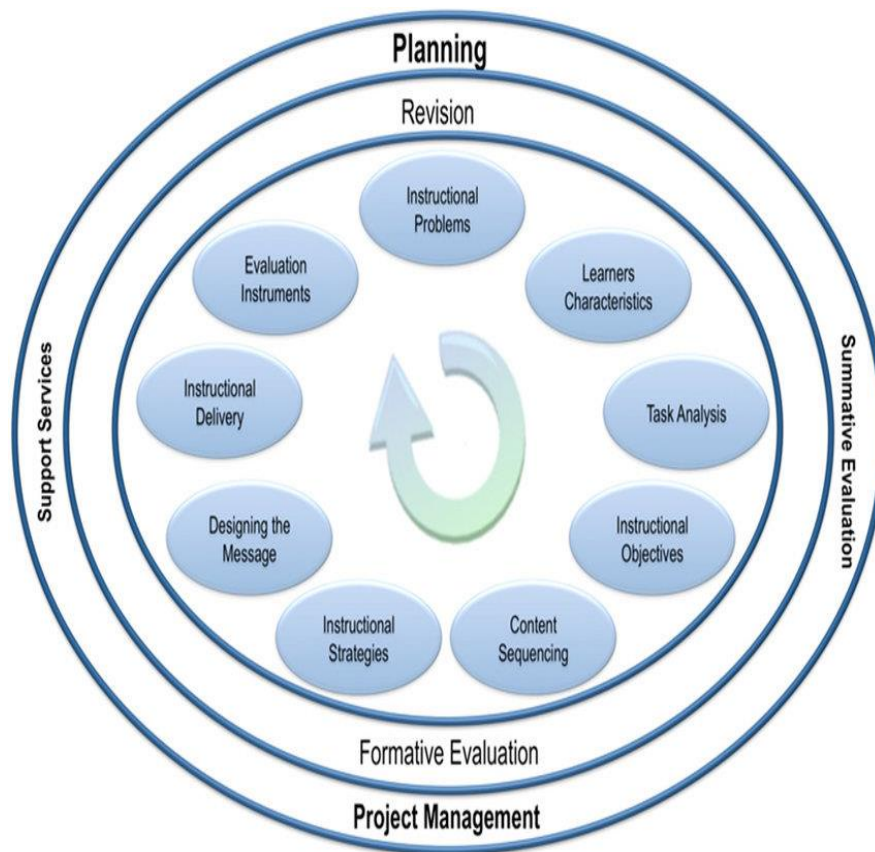


Figure (2): Kemp's Model

Also, Feedback during formative assessment and revision was represented as the outer sector. Besides, the model adapts changes in instructional elements or content through instructional development, without having to start from any original specific point, and must continue clockwise through the specified processes (Morrisun et al.,2001).

Numerous research papers describe the benefits of environmental education for students kindergarten through 12 grades on both environmental and academic aspects, so considering the basics descriptions of these programs, Ardoin et al. (2018) analyze a sample of 119 articles of the peer-reviewed literature systematically (1994-2013), with concertation on the environmental education programs outcomes of K-12 students. The result identified 121 unique outcomes, with primary positive reports in most articles in terms of environmental knowledge, attitudes, and skills.

Providing students with the ability to make informed decisions is a crucial competency for developing social and scientific issues, and extra-curricular activities in ESD that offer a suitable format to enhance the decision-making process (Garrecht, 2018). The Organization for Economic Co-operation and Development (OECD) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) recommend 21st-century education concepts for teaching science ESD by promoting some learning models and strategies for implementing ESD, such as Project-Based Learning, Experiential Learning, Values Education, Storytelling, Inquiry Learning, Appropriate Assessment, Learning Outside the Classroom, Problem-Solving for the Future, Societal Problem Solving (UNESCO, 2002).

Each learning strategy integrates personality values and critical thinking into learning, such as problem-based learning, which is a model of environmental care (Kuvac & Koc, 2018), Project-based learning style of student attitudes and behaviour (Risnani et al., 2017), and field trip models of attitude improvement and environmental behavior (Alon & Tal, 2017).

The starting points that influence the formation of feelings are the senses, such as remembering smell, color, and sensory perception before learning anything. Some essential learning happens through the senses as well, and educational activities in which students actively participate enable them to learn permanently and effectively. Several types of research explain which learning strategies are best, as follows:

1-Project-Based Learning:

It is a student-centered style of teaching depend on three fundamentals: learning is specific context, learners actively participate in the learning process, and the learner achieves goals through knowledge sharing,

understanding, and social interactions (Cocco, 2006). It's a special kind of inquiry-based learning in which the learning is contextualized by presenting problems and questions in real-world practices that lead learners into meaningful learning experiences (Al-Balushi & Al-Aamri, 2014).

Risnani et al. (2017) investigated the increasing attitudes and behavior of students in grades (6-11) regarding environmental awareness and conservation using learning based on the "One Man One Tree" project. The research concluded that the project-based learning model could raise students' knowledge, attitudes, and behavior in the environment as students realize the significant of protecting the environment and begin to actively participate in caring for the school environment, taking care of the plants around the school, and this is reflected in their desire to maintain the cleanliness of the school, and throw away garbage in the waste bins.

Dimante et al. (2016) aims to identify the potential harmful effects on the health of the ecosystems, it developed an educational task that helps students become aware of the actual quantities of household chemicals they use and keep at home by analyzing the causes and the effects and then act according to the knowledge gained. Purpose of examining how educational methods can help reduce unsustainable consumption patterns related to household chemicals in modern society, where the research method is an educational task that involves self-reviewing the consumption of domestic chemicals, systemic thinking to discover the leading causes and consequences, finding solutions, and acting. The results showed that after a month of teaching, only about a quarter of the students were found to have changed some consumption patterns of household chemicals, also showed that the students' behavior was changed six months after the task, where they were able to find suitable alternatives to reduce the environmental impact of maintaining their homes.

Mutakinati et al. (2018) aims to study students' critical thinking skills via STEM education over project-based learning. Descriptive research was implemented on 160 of first-grade Japanese middle school students during 4 semesters, where students in these lessons were divided into 9 groups in each class and using worksheets as tools to explore students' initial knowledge of how to clean wastewater and their critical thinking processes; also, students were asked to design tools for cleaning wastewater. The results showed that the average critical thinking skill among students was 2.82, as it was classified as an advanced thinker with a percentage of 41.6%, followed by a practicing thinker with a percentage of 30.6%, then a beginner thinker with a percentage of 25%, then a challenged thinker with a percentage of 2.8%. Also, it can be seen in the implementation of STEM education from the students' solutions, where some students used chemistry, biology, physics, mathematics, or combination concept to design a solution for wastewater treatment.

2- Storytelling

Digital storytelling uses digital technology to study environmental issues and find solutions to them through a meaningful context in which learners are engaged in learning deeply and significantly increase their experience with environmental issues. It is seen as a technological paradigm in education that has emerged recently. In addition to encouraging learners to think about real-life issues, participate in discussions, and propose solutions, which allows them to engage in a deeper learning process. Researches the impact of digital storytelling and compares the results to the impact of traditional presentations. The findings showed that the students in the digital storytelling group improved their understanding of the English language and increased their interest in protecting the environment, as digital storytelling, with its multimedia features such as

audio, visual, text, and interaction, explained in depth the issues of the ocean environment by providing the opportunity to reflect on the negative impact of the individual on the environment and allow students to think about possible ways to protect the environment and conserve the earth's resources (Guo, 2021).

Hadzigeorgiou & Judson (2017) aims to establish the value of storytelling as a tool for raising young children's environmental awareness by contrasting 'knowledge' and 'awareness' and transforming themes into a story. The results showed that storytelling has a role in encouraging children to be aware by feeling the significant of the natural world around them and to be involve emotionally and imaginatively in ideas and issues.

Heo (2004) aims to investigate the effectiveness of storytelling as an educational strategy to promote environmental learning about education at the elementary level. It is a means of promoting environmental ethics through indirect experience. Therefore, the strategies of this study are designed to build an online learning environment with storytelling. It has been found that it enabled the learners to build environmental awareness and understanding of the natural world through storytelling.

3- Values education

Teachers give values to children through education, so they must reflect values inside and outside schools to be role models that accurately by building ethical classroom environments and providing students with different value-related experiences formally in the classroom and informally outside the classroom using various strategies. Therefore, the significant benefits of ethical students are as they will be responsible, observant, tolerant, respectful, better understanding, good citizen,

compassionate, and non-discriminatory (Shobana & Kanakarathinam, 2017).

Yıldırım (2009) aims to identify the teachers' opinions about the values of education in primary schools by describing their experiences and ideas related to this process. The results showed that the teachers gave priority to "patriotism" among the values that should be taught to children, by trying to explain the values using other concepts such as attitude, faith, personality, virtue, aesthetics, or ethics.

Herdiansyah et al. (2016) is based on Community Engagement Grants program, which was developed through the stakeholder cooperation method via an empowerment approach, and aims to locate the Pesantren community, and related to institutions a subject, the moral and religious values into moral value of environmental awareness in the form of knowledge and value that should be developed to the best environment health. The results showed that environmental awareness could be optimized when it is shaped by integrating environmental education curricula, as the state of the ideal environment can be formed through approaches of Knowing (knowledge), being (attitudes), and doing (behavior).

4- Experiential learning

Using an active and experiential learning approach, students engage with adaptive learning and innovation components that enhance their lifelong learning skills and technical knowledge (Singh, 2017).

It is essential to be able to adapt new situations, the skills are rather important than the content knowledge, and therefore to improve both the depth and breadth of students' learning, experiential learning theory can be used in programs such as the experiential learning journey or by using a

computer simulation game in the Fundamentals of Business Modeling course (Jonathan & Laik ,2019).

Cheng et al. (2019) aims to assess the effects of the implemented approach on the learning effectiveness of primary school students an experiential learning approach supported by mobile technology was developed to facilitate experiential learning for students in an environmental science course. The result shows that this implemented approach significantly improved students' learning achievements and environmental attitudes and enhanced their problem-solving competence, and group effectiveness.

5- Future problem-solving

Environmental problem-solving refers to a person's skills to identify solutions to the differences between the expected and current environments. Sigit et al. (2020) analyzed the relationship between the environmental knowledge, the environmental awareness, and the academic ability to deal with environmental problem-solving skills. The quantitative descriptive method, using survey techniques, was conducted on 245 students in 11 classes at three Adiwiyatas high Schools in Tangerang City. The results indicated a sufficiently strong positive relationship between environmental knowledge, environmental awareness, and academic ability with environmental problem-solving skills, and thus environmental knowledge, awareness, and academic ability were higher in the score of the environmental problem-solving skill.

Main et al. (2017) examining the effect of using a future problem-solving strategy on 75 participants from a single suburban high school who were composed of 21 teams; each team has 3 to 4 members in the International Future Problem Solving Program. Students were selected to participate in either the regular FPSPI or the enhanced FPSPI, in which multiple group training activities anchored in a problem-solving technique were combined

over 9 weeks. The results show that the problem-solving performance of team members can be developed through direct instruction in problem-solving style, especially when there is an emphasis on group dynamics. Also, these results indicated a positive effect of training on problem-solving methods.

Duangrawa & Nuangchalerm (2020) aims to improve the problem-solving ability of tenth-grade students using Torrance's future problem-solving guidelines; as the results indicate an increase in the score of the ability with target group's problem-solving of the target group in each work cycle, the problem-solving ability score of all students rose to more than 70% by the end of the fourth cycle, which indicates that Torrance's future problem-solving guidelines can help develop students' problem-solving ability.

Problem-solving is an essential aspect of environmental education, so Silva (2022) aims to provide a model to assist teachers in creating educational activities that use electronic sensors and human senses as cognitive mediators in participatory environmental education based on problem-solving as a multisensory environment exploration. Human senses (including touch, heat, and smell) and electronic sensors are recognized as significant tools in real problem-based learning. The cross-case analysis of a set of case studies that were based on the assertions allowed the identification of critical components of environmental education problem-solving activities using senses and sensors: problem questions; content knowledge related to the problem; sensorial and epistemic practices; assessment of students' practices and resources, including senses, sensors, data forms, and data visualization and sharing tools. These key components informed the Ecosolvings model's structure centered on students' sensorial, epistemic, and decision-making practices. In this model, students' practices, which make use of the asserted resources, are guided

by problem questions and content knowledge, mediated by teachers, and produce learning outcomes, such as learning content knowledge, changing attitudes, and developing competencies.

Ulutas & Saglam (2016) developed a reliable and valid tool for assessing the problem-solving skills of 156 five-year-old children receiving environmental education. A guidebook, activities, a CD containing activities, and a booklet containing pictures for applying the scale were prepared by the researchers. Each of these activities was prepared in the form of questions, where the answers to these questions were formed on a three-point Likert scale. The results show a significant correlation between test and retest scores taken in the 20 days concerning the total score and subscale, indicating that the Environmental Education Problem Solving Scale is reliable and valid for five-year-old children.

6- learning outside the classroom

It is often referred to as outdoor schools, outdoor learning, wilderness education, and forest schools, which are examples of experiential learning which combine elements of the environment, adventure, missions, and wildlife-based experiences. Educators are constantly innovating better ways to broaden the definition of outdoor education to develop the practical workings and philosophy of outdoor education, where Outdoor education contains natural awareness, bio-regional education, earth education, ecological education, expedition learning, and expansion training, natural experience, and local-based teaching and education. Which can define outdoor education as an organized effort to study or learn the biotic and abiotic aspects of the environment an outside the classroom without human influences (Fang et al.,2023).

Siswoyo et al. (2020) describe the management of outdoor learning models in environmental education courses by assessing the teaching experience of environmental education courses for at least 4 years. The results obtained from the management of outdoor learning models in environmental education courses are divided into 5 phases: 1) analysis of the curriculum structure, 2) study of the needs and possibilities of the courses, 3) planning, 4) implementation, 5) evaluation. It concluded that it has positive effects when applied, and that it will be well implemented if it is accompanied by good management.

Nazir & Pedretti (2016) based on educational theory, this research aims to explore the hypothesis that environmental education is associated with increased environmental awareness rather than just limited knowledge of the environment, technical methods, and automatic action. Data were collected from a phenomenological case study of teachers of an outdoor education center in urban Canada. The results indicated that increasing environmental awareness associated with connecting people to their environment and promoting environmental care through environmental awareness also requires teachers with deep interactive experiences.

Latipah et al. (2019) aims to know the effect of utilizing the field trip method in promoting students' environmental intelligence. This study used a A pre-and post-test quasi-experimental. The results indicate that there are statistically significant differences in the experimental environmental intelligence compared to the control groups using visual media, which concluded that field trip methods could raise environmental awareness as it raises knowledge because it is directly exposed to the actual situation of local environmental issues that occur around them.

Chapter Three

Methods and Procedures

3.1 Introduction:

The purpose of this study was to examine the implementation of environmental SDG's in secondary school curricula. This chapter includes information on the methodology of this study and details of the sample selection. It describes the research tools along with the justifications for selecting those tools. It finally, describes the procedures of data collection and provides information on the statistical procedures used.

3.2 Research Methods

Research methods are the processes, techniques or strategies used in collecting data, consisting of both quantitative and qualitative.

Quantitative research methods are used to study natural phenomena in the natural sciences, which has primarily focused on using analogy to describe alternative relationships and objects (Bryman & Bell, 2007). Quantitative research is mostly context-independent which aims to obtain a large amount of data and strip it of context as well as search for statistical significance (Saunders et al., 2009).

Quantitative research focuses on objectivity as inferences from population samples and data can be measured, in particular, it is suitable if there is a potential to collect quantifiable measures of variables. It also uses formal tools and structured procedures to collect data systematically and objectively. Because the samples are generally large and representative of the population, the results obtained constitute a comprehensive and sufficiently general view of the entire population. Besides, disciplines such as statistics and mathematics are of fundamental importance in the process of analysis and generalization of the obtained results, as programs like SPSS or Minitab were used to analyze numerical data (Queiros et al., 2017).

The benefit of quantitative research approaches and methods is that they focus on quantification in data collection and analysis, where quantitative results are generalized to a subpopulation or entire population because it includes a larger randomly selected sample. But it also fails to ascertain the deeper underlying meanings and interpretations. But it cannot explain how people explain their actions, or how social reality is formed and maintained. The quantitative research model disregards the experiences and perspectives of respondents in extremely controlled settings (Rahman, 2017).

On the other hand, the qualitative research method aim to produce explanatory and in-depth information to understand the different dimensions of the problem being analyzed. Therefore, qualitative research focuses on the non-measurable aspects of reality, through the understanding and interpretation of social relations. It works with meanings, beliefs, values, attitudes, aspirations, and motives (Queiros et al.,2017).

There are advantages and disadvantages to using qualitative research methods and approaches, some of advantages are: produce a description of the experiences, opinions, and feelings of the participants in detail, incorporate a wide range of cognitive perspectives, interpretive, and research methods techniques to understand human experiences, and interpret the meanings of their actions, and understand people's voices, their meanings, and their events. However, some of disadvantages are: the small size of the sample raises the issue of generalizing to the entire research population, analyzing issues takes a long time, the results can be generalized to a larger population in a very limited way, and it may give policy-makers low credibility to the results of the qualitative approach (Rahman, 2017).

Thus, quantitative data usually includes closed answers that can be found in psychological questionnaires or tools while qualitative data tends to be open-ended with no predetermined answers (Creswell, 2014).

Mixed methods include collecting and "mixing" or combining both qualitative and quantitative data in a research study, which has become increasingly popular in recent years. Mixed methods are defined as the use of at least two qualitative or/and quantitative strategies in a one research project. It is represented when a study uses mixed or multiple strategies to test hypotheses and/or answer research questions, where the strategies are implemented sequentially or concurrently. Also, multiple approaches are undertaken for at least two research projects, each completed, to address research hypotheses or/and questions, which can use a combination of qualitative methods, quantitative methods, or both, as they can be done sequentially or concurrently. but each study project is planned and implemented to answer a specific sub-question independently (Driessnack et al., 2007).

Driessnack et al. (2007) Identify five primary purposes for using a mixed/multiple method to study the phenomenon of interest, which include:

- Triangulation is corroboration or convergence in the collection and interpretation of data about the same phenomenon.
- Complementarity provides a greater range of visions and points of view, focusing on the different aspects of the phenomenon.
- Initiation includes the deliberate analysis of new views on the phenomenon of interest.
- Development means developing a method using or combining the results of another method to study a phenomenon.
- Expansion refers to the overall expansion of the range, breadth, or scope of the study.

In this research, the Mixed and Multiple methods were used: quantitative research approaches used through applying a content analysis which was used to determine the contents of a text whereas a questionnaire was used to determine the environmental awareness of students. Furthermore, qualitative research approaches used in a form of an interview with companies to get more data about the labor market need and the abilities of the new employees.

3.3 Research Tools

The study used three research tools, content analysis, an interview, and a questionnaire. Next, some highlights on each of them.

3.3.1 The interview

An interview is an attempt to elicit opinions, information, or belief from another person or persons. It is a widely flexible method used in conservation research, allowing in-depth analysis to be carried out from a small sample size and determining the concentrate of the research on the opinions of the participants. Conducting an interview begins with defining the research question(s), continues with critical thinking about whether the interview needs to be supplemented in other ways and whether the interview is the most suitable method to use. Also, structured interviews are built on a specific set of predetermined questions, in which the same interview transcript is used for each separate interview, allowing for a close comparison between different transcripts (Young et al., 2018).

Adhabi & Anozie (2017) mention that based on the nature of the interviews, they can be categorized as follows:

- Formal interviews are conducted to higher standards, are structured, and are used more prominently in the professional world, as they are

conducted by a lead analyst, an aspect that is not emphasized in informal interviews.

- Informal interviews are part of everyday life as people experience it. They can be used in qualitative studies, but their applicability is limited based on the density of most topics that can be covered.

There are also three common types of interviews include:

- 1- Structured interviews are controlled entirely by the interviewer and, therefore, give the interviewee less space to be casual and flexible. It also contains a set of guidelines that the researcher must clearly observe, and the researcher must adhere to the sequence of questions and formulate the questions during the procedure. Besides, the nature of the questions being asked is very short, which is expected to be answered in a similar manner, with short and direct answers.
- 2- Semi-structured interviews: Mostly used in qualitative researchers, in which the outlines of topics and questions are prepared by the researcher. Although there is a set of leading questions, the subject's answer gives the researcher the flexibility to ask more refined questions than the ones formulated at the outset. Where there is no strict adherence, because its implementation depends on how the interviewee answers to the question or topics posed by the researcher. Also, it can be conducted in groups or individually, as the feature of dealing with an individual corresponds to the title “In-Depth Interview”, where the researcher can go deeper and highlight personal issues.
- 3- Unstructured interviews: These are controlled conversations that tend towards the interests of the researcher. There are different subtypes of unstructured interviews, such as the non-directive interview, where the interviewer does not have pre-planned

questions. Therefore, informal interviews include the best part of unstructured interviews.

In this research individual Semi-structured formal interviews were used, where an outline of the questions prepared and reviewed which is more structured with flexibility to pose more enhanced questions to get deep response. The interview consists of 11 questions (Appendix 1).

The aim of the questions was to identify:

(i) Industrial company's needs, the questions were formed as follows:

1. Does the company publish a report on the sustainable development goals?
2. What are the company's difficulties in achieving the environmentally sustainable development goals?
3. What proposals are necessary to develop the company and achieve sustainable development goals?
4. What are the proposals that help educate vocational education graduates about sustainable development goals?
5. What is your employment preference for students graduating from vocational education? Why? (High school diploma holder, diploma holder)

(ii) What should the new employees know? The questions were formulated as follows:

1. List the skills that vocational education graduates who join your company need to help the company achieve its sustainable development goals?
2. What majors do you think the vocational education graduate joining your company should acquire to achieve the sustainable development goals?
3. What are the most critical environmental issues that a graduate of vocational education who joins your company should know about?

(iii) How should the new employees' attitudes be towards the 17 environmental elements related to sustainable development goals concerning the environment; namely, SDGs 6,7,12,13,14,15: the main question stated:

Among the practices of the vocational education, graduate enrolled in your company towards the following environmental elements were (negative/positive):

1. Preserving water from pollution
2. Water use rationalization
3. Proper management of sanitation services
4. Industrial drainage management
5. Rationalization of electric energy
6. Use of mass transit
7. Encouraging renewable energy
8. Rationalizing fossil fuels
9. Recycling
10. Environmentally- sound management of chemicals
11. Reducing waste
12. Chemical spills
13. Preserving the marine environment
14. Preserving fish wealth
15. Attention to biological diversity
16. Preserving the wild environment
17. Attention to the agricultural environment
18. Air Quality

3.3.2 Content Analysis

Content analysis is a qualitative research technique, strategy, and its current applications display three different approaches: directed,

traditional, and summative, used to explain the meaning from the content of the text data, thus adhering to the normal form. The main differences between the approaches are codes origins, coding schemes, and the threats of trustworthiness. In the directed approach, the analysis begins with relevant research findings or theory as evidence for the primary symbols. And Coding classes are derived directly from textual data in traditional content analysis. But in summary content analysis includes counting and comparisons, where content or keywords are often followed by an explanation of the underlying context (Hsieh & Shannon, 2005).

This research used summative content analysis, which begins with identifying and measuring specific content or words in a text with the aim of understanding the contextual use of the content or words. This quantification is an attempt to explore usage, not to infer meaning. If the analysis stops at this point, it will be considered quantitative and focus on counting the frequency of certain content or words that can be manipulated with various statistical methods. If the analysis goes beyond word count to involve the analysis of the implicit content like produces descriptions or typologies or expressions from subjects reflecting how they view the social world , then the summative approach will be qualitative (Kleinheksel et al., 2020).

Summative content analysis will be used to define environmental SDG's terms in secondary curricula, where this summative content analysis exploring how secondary curricula seek to implement the environmental SDG's.

3.3.3 Questionnaire

It is defined as a group of written questions with space for answers, that can be conducted either by personal or telephone interviews with

individuals, or by postal interviews that can be sent via an online questionnaire or via email electronically for group interviews, which are used to collect information from the respondent. The information collected is related to individual beliefs, attitudes, and behavior of people (Etikan & Bala, 2017).

In research methodology, the questionnaire aims to:

- quickly solve a data collection problem, cross-sectional or clinical trials.
- help in obtaining easy or fast, effective and cheap means of getting huge information from a larger sample of people, data collection gives fast information even though the researcher is usually absent during the questionnaire.

The designer should take care not to use words like regularly or frequently. Different types of research questionnaire methods used both quantitative and qualitative data, where the questions include closed, open, and open-ended response option with contingency questions. In the close questionnaire should be nominal data categorical such as good or bad, yes, or no, etc. Where the information resulting from the qualitative data is turned into quantitative data by calculating the frequency of good or bad and yes or no. ordinal data can be used for closed questionnaire as ranked, by using a rating scale to measure the strength of an attitude or emotion such as, agree, neutral, unable to respond, disagree, etc., which is called Likert scale.

A Likert scale includes one or more statements or questions accompanied by a set of answer choices, in which a Likert item is assigned to each individual item in the questionnaire; all Likert items in the questionnaire refer to the term Likert scale as well (South et al., 2022).

There are details of the four elements of the Likert element:

- The number of choices the participant must choose from. Most Likert items offer 5 or 7 options, although even-numbered items without a "neutral" option are appropriate in certain scenarios.
- Text anchors accompany each choice of a Likert numeric response. Examples include "I'm not at all confident" to "very confident", "strongly disagree" to "strongly agree", "very poor" to "excellent", "not important" to "very important", and "not satisfied" to "satisfied" and "never". "always".
- Formulate the question that the participants are asked to answer. The wording often takes the form of a statement that participants can agree with or disagree with.
- A numerical representation in which the properties of numbers are used to describe response choices. Ascending scales (for example 1 to 5, 0 to 6) are the most common.

The questionnaire in this research includes closed questions written in Arabic and adapted to suit the participants (Appendix 2). It has also been screened and validated for content and relevance by the researcher and two external measurement and evaluation experts.

To answer the research question, it's divided to sub-questions:

- a) What is the knowledge degree of Electrical and Mechanical Engineering students?
- b) What is the attitude degree of Electrical and Mechanical Engineering students?
- c) What is the practice degree of Electrical and Mechanical Engineering students?
- d) Is there a correlation between knowledge, attitude, and practice when $p \leq 0.05$?

- e) Is there a significant difference between the students' awareness related to Specialization at the secondary when $p \leq 0.05$?
- f) Is there a significant difference between the students' awareness related to parents' educational level when $p \leq 0.05$?

For that, it was important to identify specialization secondary, parents' educational level. Besides, the questionnaire consisted of three parts, first part contains 9 statements measuring the knowledge ranging as: (1) No (2) I don't know (3) Yes, where the types of questions ask will likely vary depending on whether are collecting Nominal data often involves yes /Don't' know / no questions. The correct answer was assigned 2 points while an incorrect/unknown answer was assigned 0 points.

The second part contains 14 statements measuring the attitude, using a Likert type scale, and ranging as: (1) Totally disagree to (5) Totally agree, if the statement is positive and the opposite ranking if the statement is negative, and finally the third part measures the practices, contains 11 statements ranking as : (1) Never (2) Sometimes (3) Always, if the statement is positive and the opposite ranking if the statement is negative.

3.4 Sampling and Data Collection

For this research, data was collected in three stages, using one tool at a time:

3.4.1 Interviews

To collect the data and to identify the environmental issues that new employees must know and what should be focused on when they were at school. Because knowledge is difficult to be expressed or extracted, and mainly depends on observations, routines, and work experience. To understand such practical knowledge of the new employees in an industrial

company, we needed to investigate what environmental official's observation on the new employees can be.

Because of having many industrial companies in the Kingdom of Bahrain, in this research, the four major industrial companies that have been selected in which we have the highest rate of Bahrainization (Figure 3), which are as follows: Gulf Petrochemical Industries company (Gpic), Bahrain-based Gulf Aluminum Rolling Mill (Garmco), Aluminum Bahrain (Alba) and Bahrain Petroleum Company (Bapco).

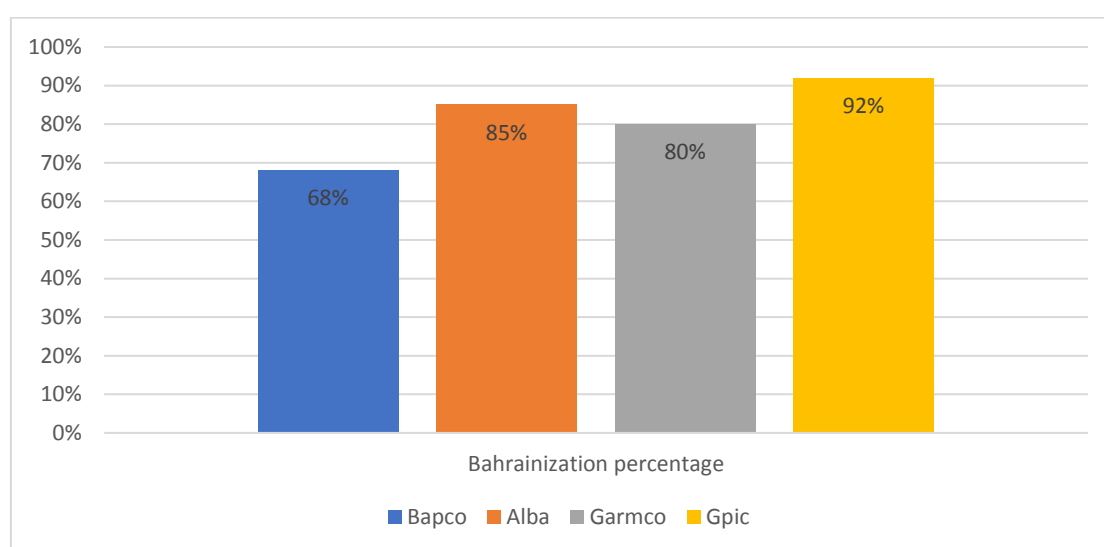


Figure 3: Rate of the Bahrainization in the four companies

In-depth, face-to-face and individual interviews were conducted with environmental officials of industrial companies in October and November 2020 (Appendix 3), the questions of the interview have been addressed to the heads of the health, where the interview period did not exceed one hour, and questions were asked, and answers were recorded in Arabic language.

3.4.2 Collecting Data for Content Analysis

The research methods were used in several ways to collect data to reflect the views as follows:

(1) Analysis of the secondary school curricula found nine courses of social studies taught in the secondary schools and 21 science courses, as illustrated in table (1), table (2), table (3), table (4) and table (5):

Table (1) General science courses in the secondary schools

Book	Environment Science	Energy
Course	sci201	Sci211
Publication year	2007	2011

Table (2) Biology courses in the secondary schools

Book	Biology 1	Biology 2	Biology 3	Biology 4	Biology 5	Geology1	Geology 2
Course	Bio102	Bio 211 /215	Bio 217	Bio222	Bio 316/ 318	Bio317	Gio 211 Gio 321
Publication year	2020	2014	2014	2003	2015	2015	2014 2011

Table (3) Chemistry courses in the secondary schools

Book	Chemistry 1	Chemistry 2	Chemistry 3	Chemistry 4	Chemistry 5
Course	chem102	chem211	chem 215/214	chem 317/315	chem318
Publication year	2014	2020	2014	2015	2015

Table (4): Physics courses in the secondary schools

Book	Physics 1	Physics 2	Physics 3	Physics 4	Physics 5	Physics 6
Course	Phys102	Phys 217/210	Phys 219/218	Phys 311/ 312	Phys /313 314	Phys324
Publication year	2020	2014	2014	2015	2015	2011

Table (5): Social Studies courses in the secondary schools

Course	AJA 102	AJA 103	AJA 203	AJA 210	AJA 211	AJA 213	AJA 214	AJA 221	AJA 312
Publication year	2020	2020	2020	2020	2020	2020	2020	2020	2020

First, the targets and indicators of the environmental SDGs were analyzed to prepare a checklist consisting of 71 terms found in the environmental SDGs (6,7,12,13,14,15), which relate to water, energy and the environment. Climate change, air, pollution, waste, land, governance, marine. Therefore, according to this checklist, a content analysis of the social studies and science courses was conducted, beginning to count those 71 terms in the checklist, as shown in the (Appendix 4).

3.4.3 Questionnaires

The high school students who graduated in 2020 were chosen to be the study population. Therefore, the sample for this research is the students who were enrolled in their first year 2020/2021 in electrical and mechanical engineering students in the Associate Diploma Program at the University of Bahrain, that's to be sure that students finish all secondary courses and examination and get the attitude and practices, as well as being the target of the industrial companies in the future.

An online questionnaire prepared with choices of language (Arabic / English) was used to measure knowledge, attitudes, and practices related to SDGs. It was sent to the college of applied studies to distribute the sample of the study of this research, where (90) responses were obtained as well as 63 responses from students who are enrolled in industrial specialization and 27 responses from those who are in the scientific track in secondary school.

All valid responses were coded, and for statistical analysis the statistical package for social sciences (SPSS) version 20 with a significant level of ($p \leq 0.05$) was used for the study.

3.5 Data Collection/ Procedures

After data collection, descriptive statistics (means, standard deviations, and tables) were performed using SPSS (version 20). This research was used, and standard deviation measures were used to analyze the numerical data obtained from the questionnaires. Frequency, mean score, standard deviation (SD), Cronbach's alpha, Pearson correlation coefficient, t-test, and one-way variance (ANOVA) were calculated. SPSS response and repeat rates were estimated for study demographic variables (secondary major, pedants' education level), and the significance level was set at $p < 0.05$.

3.5.1 The validity and reliability

The apparent validity of the questionnaire: The validity of the apparent survey was verified by two arbitrators with expertise and specialization in the fields of curricula, measurement, and evaluation (Appendix 5), to express their opinions and observations about the questionnaire's paragraphs and questions, the modification was permanent:

- 1- Two sentences were deleted because their meanings are similar other expressions.
- 2- Modify the language in some sentences to be clearer.

The final form of the questionnaire consisted of three stages.

The stability of the tool was verified by Cronbach Alpha test to detect the internal consistency of the items of the scale. But in practice, Alpha ≥ 0.55) is acceptable in research related to educational sciences.

Table (6): Reliability Statistics

Cronbach's Alpha	N of Items
.846	34

The stability coefficients included in table (6) indicate that these tools generally have a high stability coefficient, and therefore these tools are considered scientifically acceptable to achieve the purposes of the study, as it is clear from table (6) that the highest stability coefficient of the resolution axes was (0.846), while it is noted that the minimum stability value was (0.55), which indicates the possibility of the stability of the results that can be obtained from the questionnaire as a result of its application.

3.5.2 Relative Weight

To classify the answers of the sample members on the scale, the following equation was used (the largest value - the smallest value $\div$ categories), so it is $(5 - 4) \div 3 = 1.33$, then we add to the lowest value, so the ranges become according to the following table (7):

Table (7): Relative weight

Estimated	range
(1.00 - 2.33)	Low
(2.34 - 3.67)	Medium
(3.68- 5.00)	High

Chapter Four

Results, Discussion, and Recommendations

4.1 The study's Results

This chapter answers the research questions and discusses in detail the results of the methodology and the research design.

4.1.1 Interview:

To answer the first research question, What SDGs topics do industrial companies expect students to know before joining them?

Interview attempted to identify the following:

First, the industrial company's needs to achieve the SDG's by investigating three things: frequency company publishes sustainable development reports? the difficulties the company face to achieve the goals of sustainable development, and suggestions they consider necessary to develop the company and make it capable of achieving SDGs.

The researcher found that three companies published sustainable development reports (Table 8), SDG's report of Garmco were not found on their site, but Garmco have international certifications such as ISO 9001, ISO 45001, ISO 14021, ISO 27001, where ISO 14001 was in 2015 for environmental management system and ISO 22301 was in 2016 for green product certification.

Table (8): Annuls reports

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BABCO														
ALBA														
GIPC														
GARMCO														

GARMCO
has

ISO-9001, ISO 45001, ISO-14001, ISO-14021, ISO-22301, ISO-27001.

All interviewees reported similar finding that there is shortage in environmental knowledge of the new employees of vocational education graduates, so they share the same difficulties which are:

- Lack of environmental knowledge and awareness of the basics of SDG's related to the work environment.
- Society's lack of awareness of the role of companies in achieving the goals of Sustainable Development.
- Lack of new employees' awareness for the importance of submitting environmental suggestion regarding developing current systems.

In order to overcome this weakness, and to achieve SDGs, interviews suggested the following:

1. Integrating environmental awareness into secondary curricula through links to SDGs for all secondary schools, and the industrial ones.
2. Increasing the period of practical training for industrial school students.

The second part of the interviews focused on what the new employees should know, and the kind of school education required for new employees. The interviewees held similar views that educating vocational track students about the goals of sustainable development through:

- Providing environmental courses for the industrial school.
- A foundational course for security, safety, and health inside the companies.
- Conduct training agreement between companies and Ministry of Education so that the curricula should be practically related to the work at the companies.

That is to enhance the vocational track graduates' skills to know the environmental cognitive skills of the following topics: emissions (gases/liquids/solids) effects on the environment, asbestos, waste management, spills and their effects, emission reduction, climate change, reduce carbon dioxide, air quality, pollution results in the medium long

term, read the instruction and the impact of industrial companies on the environment and how to limit this impact.

In addition, interviewees identified the most important environmental issues that a graduate of vocational track should know are insulation, liquid, soil, reduction, industrial waste, ozone, aluminum industry spills (aluminum properties and interactions - components - rolling), industrial sewage management, clean environment, clean technology, and global and local environmental policies and laws of Supreme Council for the Environment.

Thirdly, the interviewees suggested developing new specialization in industrial schools to address industrial companies' needs, like:

- Introducing new majors such as renewable energy (solar).
- Integration of mecaelectronic disciplines, multi-skilled (welding, mechanics, electronics), process instrumentation, pumps, compressors (overall) and rotating equipment.

All interviewees reported similar experiences of preferring a diploma holder to secondary school degree holder, for three reasons: easy to train, more knowledgeable, and more disciplined.

The last part of the interview concerned the new employees' attitudes and behaviors. Interviewees held similar views that the vocational track graduate enrolled at work had a positive attitude towards environmental practices because the company provides training courses for all new employees before starting work. These courses includes all the necessary legal procedures for any emergency situations such as health, safety, and maintenance, danger of mixing materials, contamination/leakage/ spillage reporting, monitoring the contamination, changing the filter and industrial wastewater disposal (Appendix 6).

4.1.2 Content analysis

This section answers the second research question, which states:

To what extent do secondary schools' curricula have knowledge and concepts of environmental SDGs?

To answer this question, content analysis of all science and social studies courses in secondary schools that are related to the knowledge and concepts of the environmental SDG's is needed.

As shown in chapter 3, there were 29 different science courses (General science, Biology, Chemistry, and Physics). The result of the content analysis of science courses shows that the 71 terms (appendix 4) that related to environmental SDG's appeared 2691 times in total.

Sci 201 course has the highest environmental terms with frequency 719 which represent 26.7 % of terms in science courses, then Sci211 course with frequency 551 which represents 20.5 % of terms in science courses (Figure 4).

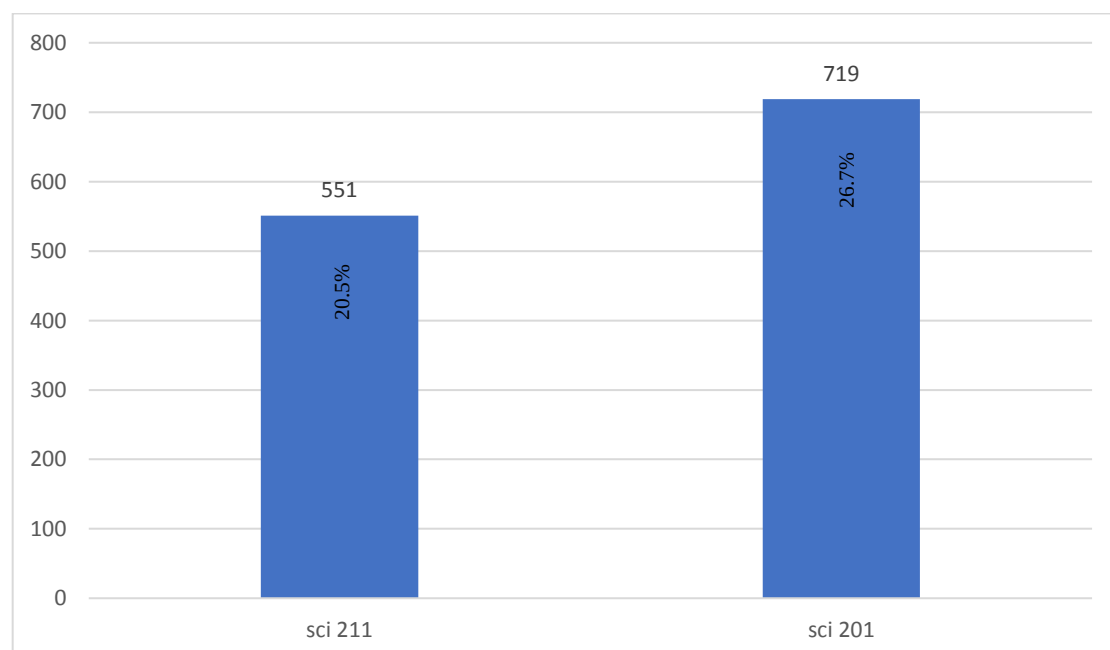


Figure (4) Frequency and percentage of total environmental terms in General science courses

Gio222 has the highest environmental terms in Biology courses with 408 repeated terms which represents 15.2% of the total terms, lastly Bio102, Bio211/215, Bio217, Bio316/318 with none of any terms related to environmental SDG's (Figure 5).

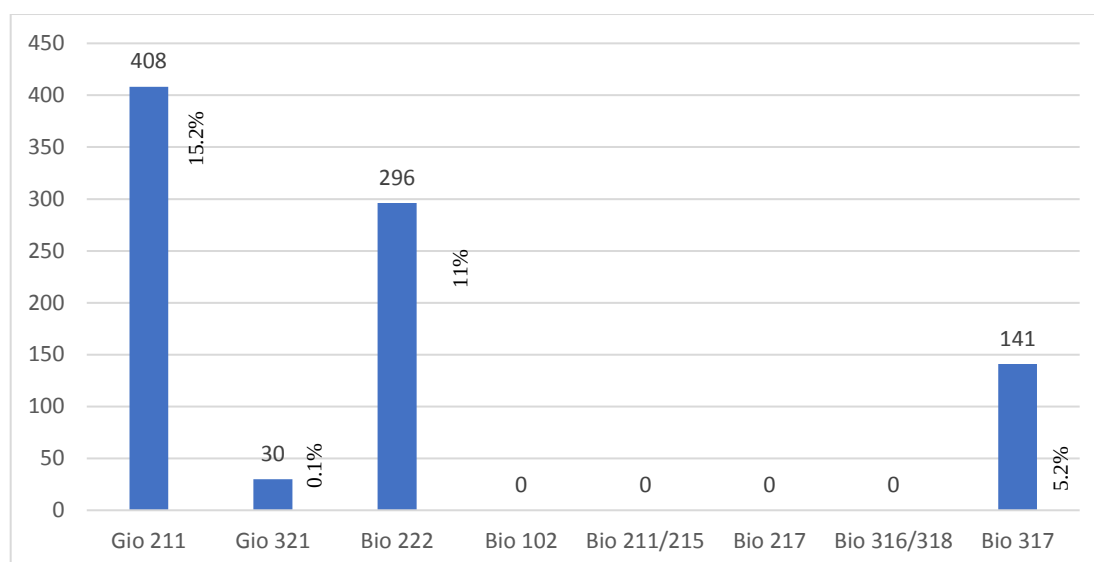


Figure (5): Frequency and percentage of total environmental terms in Biology courses

Chem214/215 courses have the highest environmental terms with frequency 16 which represents 0.6 % of terms in science courses, and the lowest is Chem211 course with frequency 1 which represents 0.004 % of terms in science courses (Figure 6).

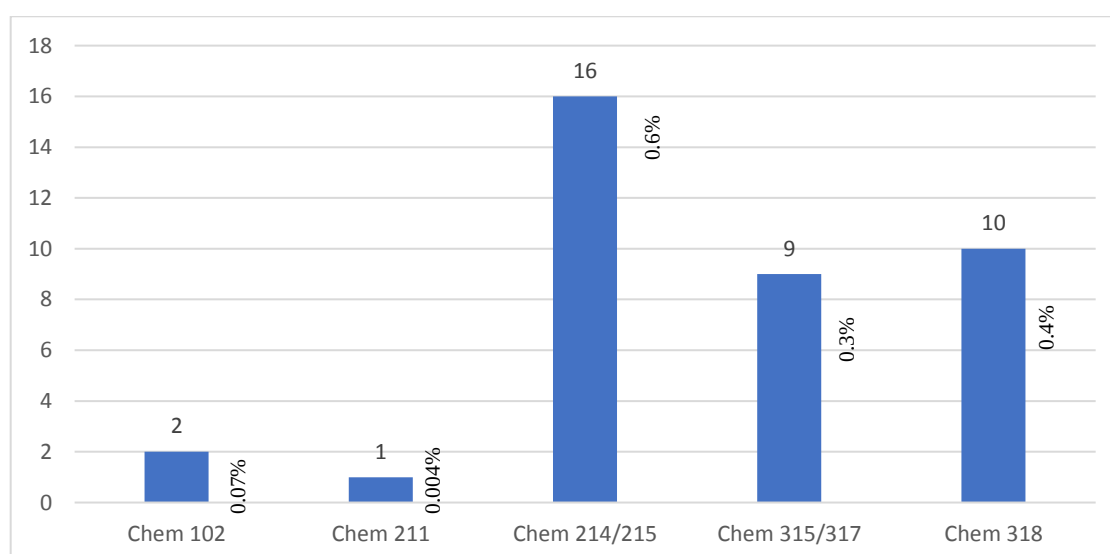


Figure (6) Frequency and percentage of total environmental terms in Chemistry courses

Phys311/312 courses have the highest environmental terms with frequency 447 which represents 16.6 % of terms in science courses, followed by Phys324 course with 41 which represents 1.5 % of terms in science courses, lastly Phys102 with none of any terms related to environmental SDG's (Figure 7).

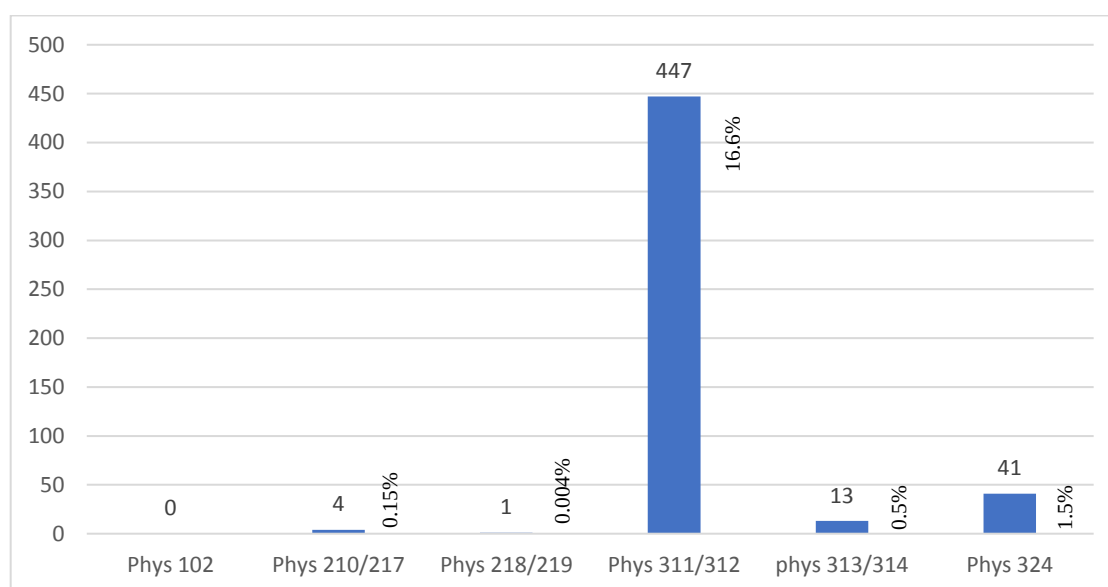


Figure (7) Frequency and percentage of total environmental terms in Physics courses

Sci 201 covers all the environmental SDG's with dissimilar frequency, while sci 211 covers only Goal 7 (Figure 8).

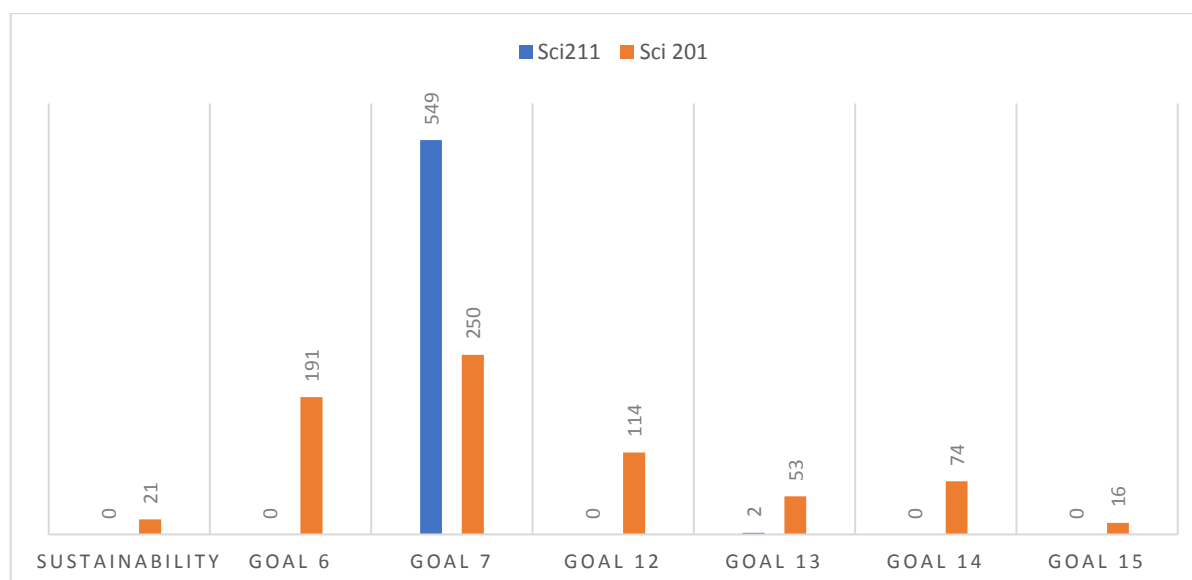


Figure (8): Frequency of environmental SDG's terms in General science courses

Figure (9) Shows that Goal 6 was covered (tackled) in four courses Gio 211, Bio222, Bio317, and Gio321 respectively. And it shows that Goal 12 was covered by two courses Gio211 and Bio222 respectively. Although, there are slight appearance of the environmental SDG's terms in the remaining courses.

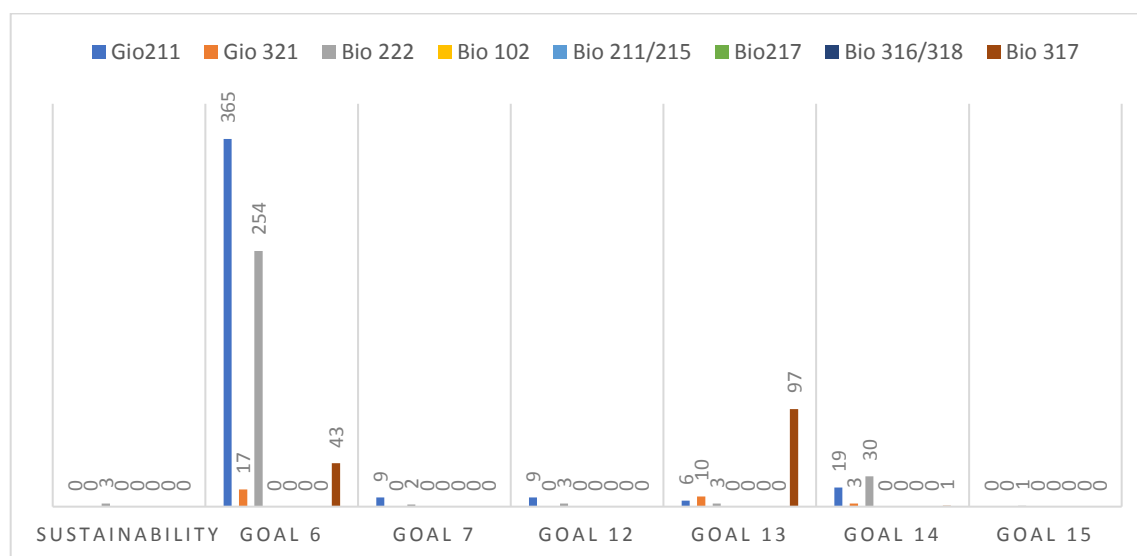


Figure (9): Frequency of environmental SDG's terms in Biology courses

Figure (10) Shows that Goal 7 was covered in two courses Chem214/215 and Chem 318 respectively. Also, Goal 12 was covered in 3 courses Chem315/317, Chem102, and Chem211 respectively. Goal 14 was covered in 3 courses Chem318, Chem315/317, and Chem102 respectively. Although, goal 6, goal 13, and goal 15 never appear in chemistry courses. Sustainability is mentioned only one time in Chem315/317 all the environmental SDG's with dissimilar frequency.

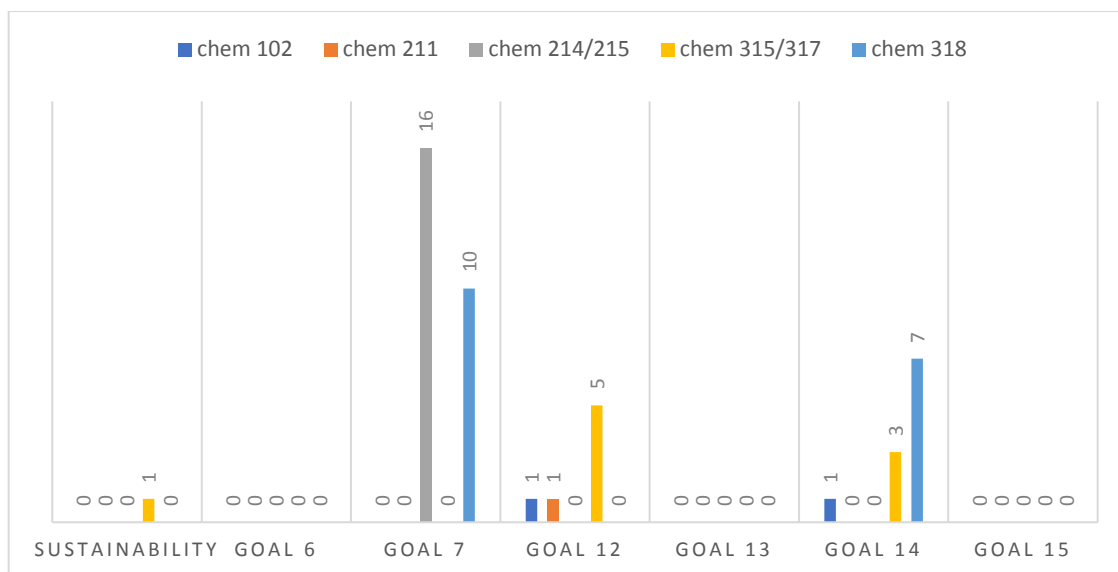


Figure (10): Frequency of environmental SDG's terms in Chemistry courses

Figure (11) shows that Goal 7 was covered in 4 courses Phys311/312, Phys324, Phys313/314 and Phys218/219 respectively. Although, goal 12 has a slight appearance of the environmental SDG's terms, but no appearances of the remaining goals.

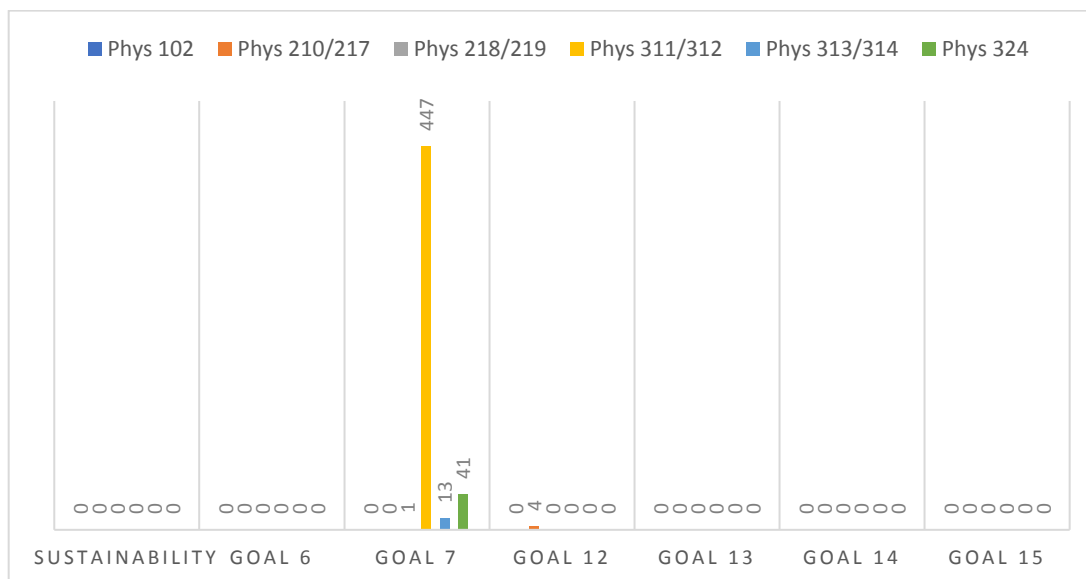


Figure (11): Frequency of environmental SDG's terms in physics courses

Table (9) shows the science courses according to the specialization in secondary school.

Table (9): Courses of science subjects taught according to specialization.

Course	Specialization	
	Science	Industrial
Bio102	✓	
Bio211	✓	
Bio215	✓	
Bio217	✓	
Bio222	✓	
Bio316	✓	
Bio318	✓	
Bio317	✓	
sci201	✓	
Sci211	✓	✓
Gio211	✓	
Gio321	✓	
chem102	✓	✓
chem211	✓	✓
chem215/214	✓	
chem317/315	✓	
chem318	✓	
Phys102	✓	
Phys 217/210	✓	
Phys 219/218	✓	✓
Phys311/ 312	✓	✓
Phys313/ 314	✓	
Phys324	✓	✓

As shown in chapter 3, there were 9 different courses in social studies syllabus issued published in 2020, 8 courses were related to knowledge and concepts of environmental SDGs, the result of the content analysis of social studies courses shows that the 71 terms that related to environmental SDG's appeared 787 times in total.

Figure (12) shows that AJA211 has the highest frequency 306 with percentage 39.2% of total terms, followed by AJA214 with frequency 201 with percentage 25.5%, then AJA221 frequency 198 with percentage 25.1% of total terms, finally, AJA203 course was the lowest percentage with 0% of terms.

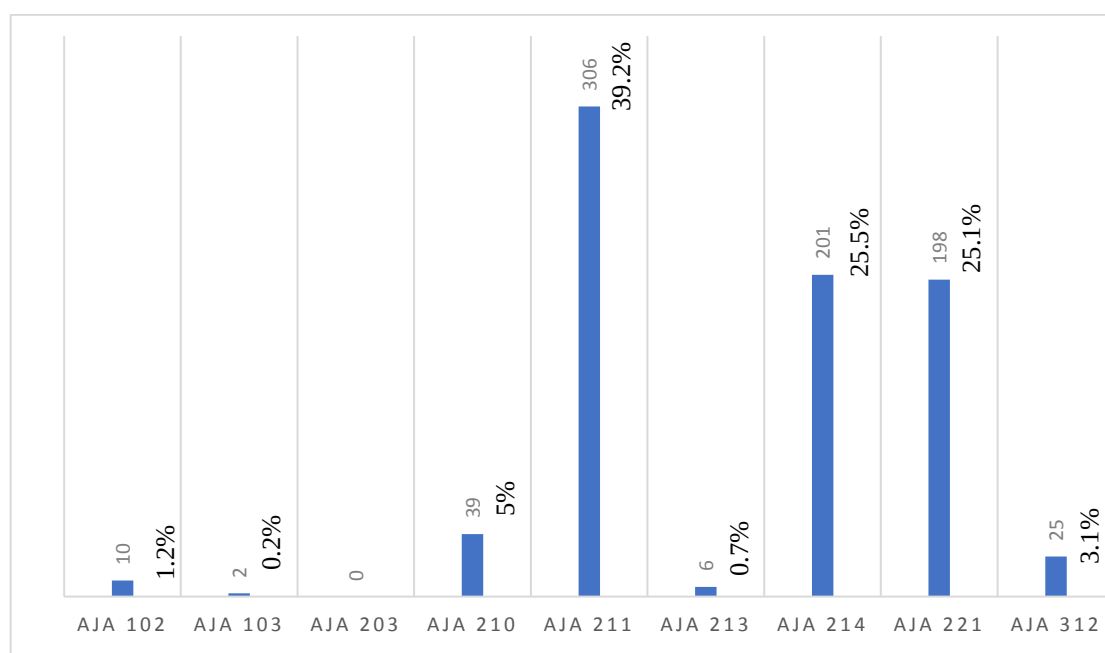


Figure (12) Frequency and percentage of total environmental terms in social study courses

Figure (11) shows that Goal 6 was covered in all courses except AJA203, where the higher represented are AJA211, AJA221, and AJA214 respectively. Also, Goal 13 was covered with AJA211 and AJA214. Although, the remaining goals have slight appearance of the environmental SDG's terms.

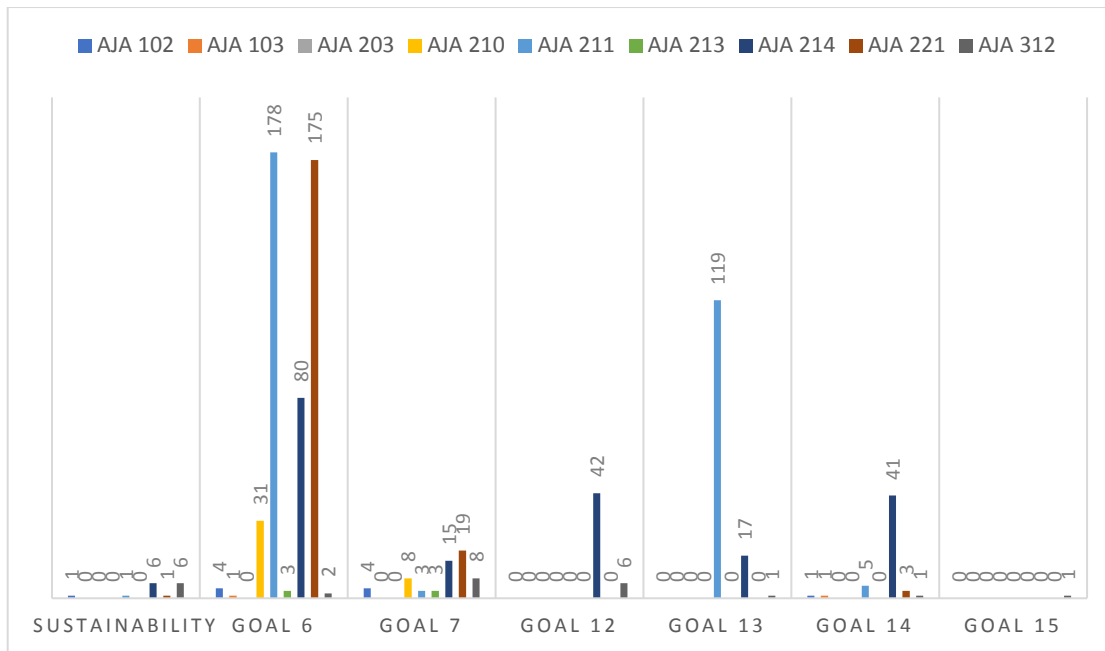


Figure (13): Frequency of environmental SDG's terms in social study courses

Table (10) shows the social study courses according to the specialization in secondary school.

Table (10): Courses of social study taught according to specialization.

Course	specialization	
	Science	Industrial
AJA102	✓	
AJA103	✓	
AJA203	✓	✓
AJA210	✓	
AJA211	✓	
AJA213	✓	
AJA214	✓	
AJA221	✓	
AJA312	✓	

4.1.3 Questionnaire:

To answer the third question of research, to what extent are the students aware of environmental SDGs?

An analysis of the responses of Electrical and Mechanical Engineering of first-year students in the Associate Diploma programme is design through a questionnaire, which measured their knowledge, attitude, and behavior towards the environmental SDG's (goals 6,7,12,13,14 and15).

The descriptive statistic of the study participants' estimates related to awareness of the environmental sustainable development goals on each axis of the scale, and on the scale as a whole by calculating the average total rating for all sentences in each axis (Table 11).

Table (11): Descriptive statistic of the study participant related to Awareness toward the environmental SDG's on each axis of the scale, and on the scale in its totality

Axis	N	Mean	Std. Deviation	Range
Average total Knowledge	90	2.56	0.362	Medium
Average total Attitude	90	4.06	0.504	High
Average total Practices	90	2.23	0.423	Low
Average total Awareness	90	3.07	0.331	Medium

Table (11) shows that descriptive statistic of the study participant, where the mean between (2.56-4.06) and standard deviation between (0.362-0.504). Where the Attitude ranked first with a mean of (4.06) and a standard deviation of (0.504) and a High degree, followed by the Knowledge in the second place, with a mean of (2.56) and a standard deviation of (0.362), with a Medium degree. While the Practices ranked last with a mean of (2.23) and a standard deviation (0.423) with a Low degree. As for the degree of Awareness toward the environmental SDG's on the items of the scale in its total form were Medium, as the mean of these estimates was (3.07) and the standard deviation was (0.331).

Table (12) shows the descriptive statistic of the study participant' estimates related to awareness of the environmental sustainable development goals on the knowledge sentences, where the mean between (2.33 - 2.80) and standard deviations between (0.362 - 0.835) with a Medium degree.

Table (12): Descriptive statistic of the study participant' estimates related to Awareness toward the environmental SDG's on the Knowledge sentences

Statement	N	Mean	Std. Deviation	Range
1. There is a relationship between environmental pollution and wasteful use of water and electrical.	90	2.46	0.781	Medium
2. There is <u>no</u> relationship between Using of some chemicals in industry and the erosion of the Ozone layer.	90	2.76	0.504	Medium
3. There is a relationship between greenhouse gas emissions and climate change	90	2.50	0.691	Medium
4. There is <u>no</u> relationship between air pollution and high temperatures.	90	2.33	0.835	Medium
5. Knowledge of national policies for preserving the environment is important.	90	2.74	0.531	Medium
6. It's important to know international agreements to preserve the environment.	90	2.59	0.669	Medium
7. It is <u>not</u> important to know the sustainable development goals.	90	2.49	0.658	Medium
8. There is a relationship between water pollution and the death of fish stocks.	90	2.80	0.502	Medium
9. Using natural gas as an alternative of oil has a role in reducing greenhouse gas emissions.	90	2.37	0.661	Medium
Total Knowledge	90	2.56	0.362	Medium

The frequency and percentage for responses of the study members related to Awareness toward the environmental SDG's on the Knowledge sentences are represent in figure (14), which shows that the majority of study members' answers is "yes" with high frequency which is more than 50 % in all sentences except in sentence "9. Using natural gas as an alternative to oil has a role in reducing greenhouse gas emissions." (Appendix 7).

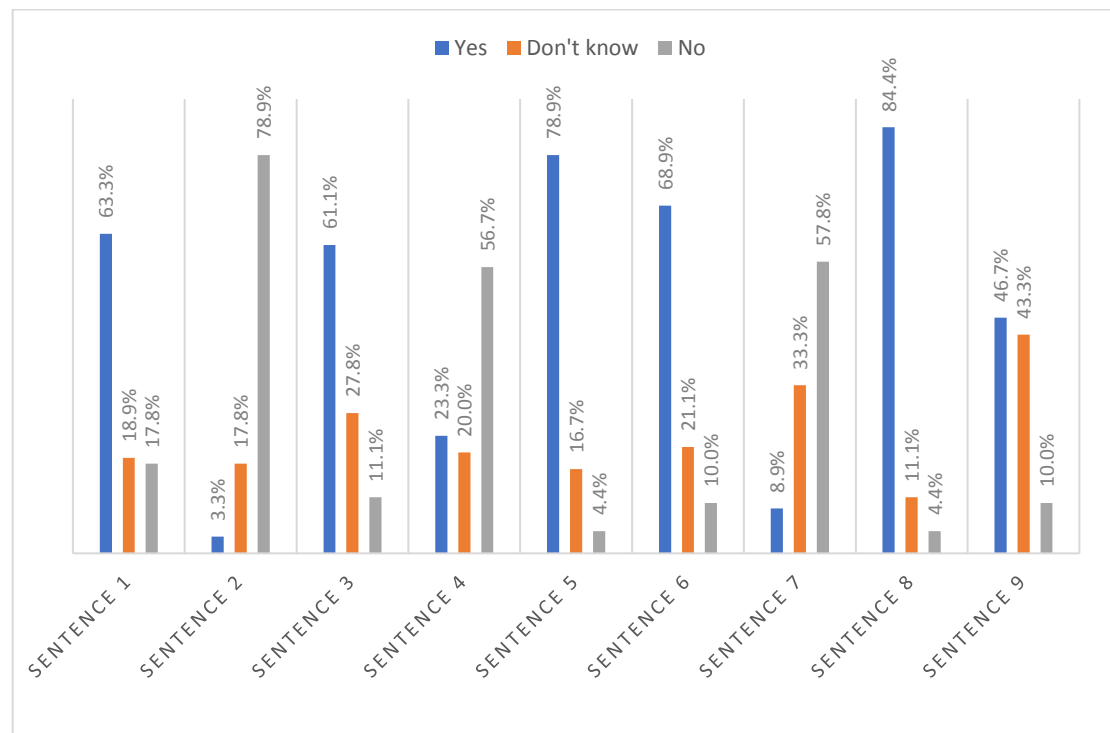


Figure (14): Frequency and percentage for responses of the study members on the of the Knowledge sentences

Table (13) shows the descriptive statistic of the study participants' estimates related to awareness of the environmental sustainable development goals on the Attitude sentences, where the mean between (3.22 - 4.68) and standard deviations between (0.504 - 1.265) with a High degree.

Table (13): Descriptive statistic of the study participants' estimates related to Awareness toward the environmental SDG's on the Attitude sentences

Sentence	N	Mean	Std. Deviation	Range
1. It is better to burial of waste than to use waste recycling technologies.	90	3.71	1.265	High
2. It is better to dump industrial waste into the seas, as the seas are able to clean themselves.	90	4.68	.776	High
3. It is better to landfill coasts to build residential cities.	90	3.78	1.149	High
4. It is better to recycle waste.	90	4.33	.848	High
5. It is better to treat wastewater to use it for cultivation and urban afforestation.	90	4.47	.796	High
6. It is better to use environmental friendly materials in industry.	90	4.49	.753	High
7. It is best to collect live plants in the camping season to use as fuel.	90	3.22	1.089	Medium
8. It is better to combat illegal, unregulated and unreported fishing in order to preserve the sustainability of marine wealth	90	4.00	1.071	High
9. It is better to reuse materials in industry to reduce industrial waste.	90	4.21	.880	High
10. It is better to use renewable energy to reduce greenhouse gas emissions.	90	4.07	.845	High
11. It is better to enact legislations to preserve the ecosystems life.	90	4.19	.873	High
12. It is better <u>not</u> to install filters for factory chimneys because the air is able to renew itself constantly.	90	4.10	1.181	High
13. It is better <u>not</u> to set strict policies on pollution rates in the Kingdom of Bahrain to keep the wheel of industrial development.	90	3.42	1.245	Medium
14. It is better to teach topics about the environment in Bahrain schools.	90	4.23	.835	High
Total Attitude	90	4.06	.504	High

Figure (15) represent the frequency and percentage for responses of the study members related to Awareness toward the environmental SDG's on the Attitude sentences, which shows that there is a high positive attitude toward the following sentences No (2) which states “It is better to dump industrial waste into the seas, as the seas are able to clean themselves”, sentences No (4) which states” It is better to recycle waste.”, sentences No (5) which states “It is better to treat wastewater to use it for cultivation and urban afforestation”, sentences No (6) which states “It is better to use environmentally friendly materials in the industry”, and sentences No (12) which states “It is better not to install filters for factory chimneys because the air is able to renew itself constantly.” (Appendix 8).

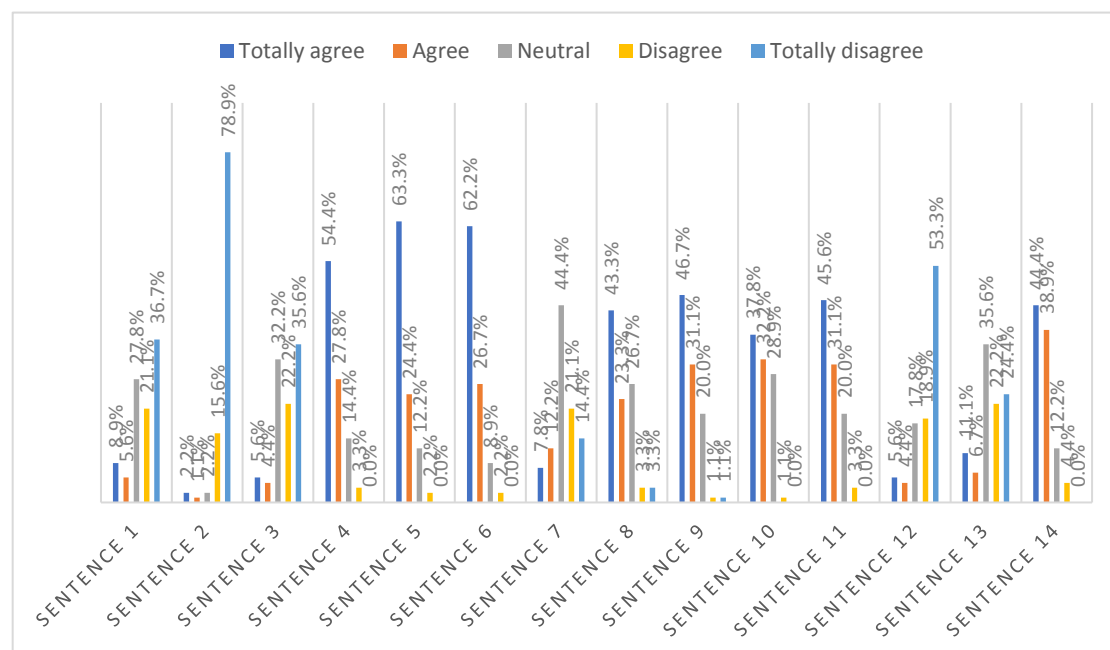


Figure (15): Frequency and percentage for responses of the study members on the of the Attitude sentences

Table (14) shows the descriptive statistic of the study participants' estimates related to awareness of the environmental sustainable development goals on the Practices sentences, where the mean between (1.90 - 2.86) and standard deviations between (0.384 - 0.753) with a Low degree.

Table (14): Descriptive statistic of the study participant s’ estimates related to Awareness toward the environmental SDG’s on the practice sentences

Sentence	N	Mean	Std. Deviation	Range
1. I <u>don’t</u> participate in a coastal clean-up campaign.	90	1.90	.688	Low
2. I keep the wild environment clean during the camping period.	90	2.86	.384	Medium
3. I <u>don’t</u> sort household waste into glass / paper / other for recycling.	90	1.96	.748	Low
4. I participate in afforestation campaigns inside / outside the school.	90	2.06	.709	Low
5. I practise agricultural activity.	90	2.14	.696	Low
6. I use plastic bags instead of environmental- friendly bags.	90	2.03	.710	Low
7. In my home, we use energy-saving lamps.	90	2.46	.673	Medium
8. In my home, we use energy-saving electrical appliances.	90	2.32	.615	Low
9. I participate in guiding others to Rationalization water management concept.	90	2.30	.726	Low
10. I participate in guiding others to Rationalization electricity management.	90	2.36	.692	Medium
11. I <u>don’t</u> participate in guiding others to improve sanitation management.	90	2.17	.753	Low
Total Practices	90	2.23	.423	Low

The frequency and percentage for responses of the study members related to Awareness toward the environmental SDG’s on the Practices sentences are shown in figure (16), which shows that there is high response for “always” to sentence No. (2) which states “I keep the wild environment clean during the camping period.”, and higher “sometime” response for the remining sentences (Appendix 9).

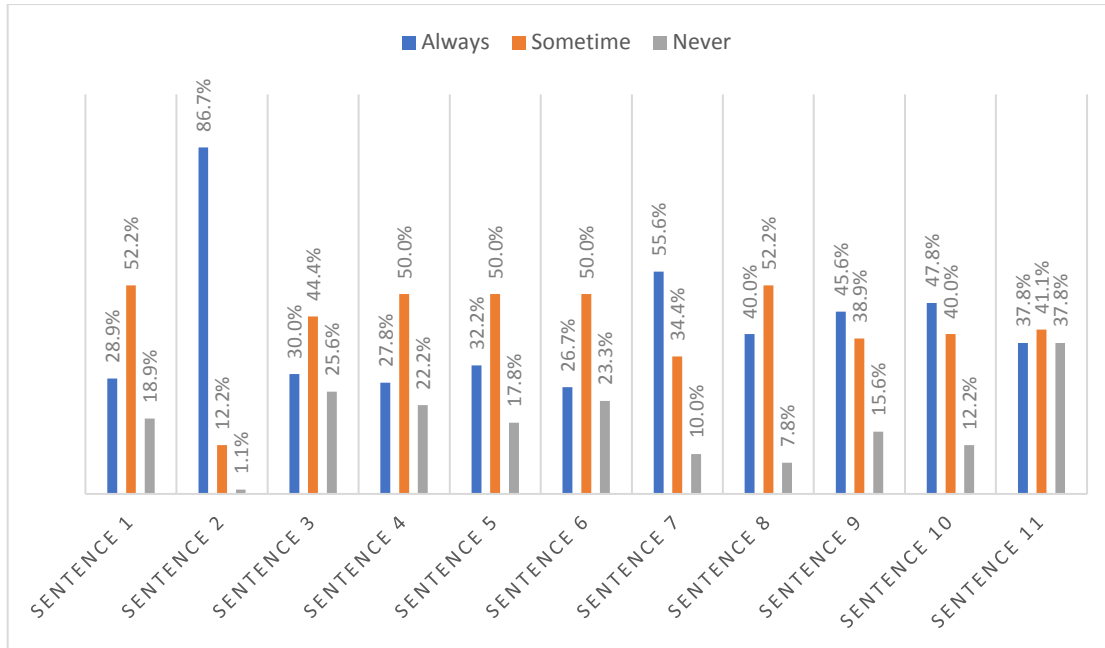


Figure (16): Percentage and percentage for responses of the study members on the of the practices sentences.

According to Table (15), which represent the Pearson Correlations between the knowledge, attitude, and practices, when ($p \leq 0.05$), Shows a significant relationship between knowledge and attitude (correlation = 0.382, p - value = 0.000), and between knowledge and practices (correlation = 0.273, p - value = 0.009), and between attitude and practices (correlation = 0.283, p - value = 0.007).

Table (15): The correlation between the Knowledge, Attitude and Practices when $p \leq 0.05$

		Total Knowledge	Total Attitude	Total Practices
Total Knowledge	Pearson Correlation	1	.382**	.273**
	Sig. (2-tailed)		.000	.009
	N	90	90	90
Total Attitude	Pearson Correlation	.382**	1	.283**
	Sig. (2-tailed)	.000		.007
	N	90	90	90
Total Practices	Pearson Correlation	.273**	.283**	1
	Sig. (2-tailed)	.009	.007	
	N	90	90	90

In order to find out whether these differences in the average estimates of the study members related to Awareness toward the environmental SDG's are statistically significant at the 0.05 level (2-tailed), an analysis was used T-test to measure the differences between the students' awareness related to Specialization at the secondary level, when $p < 0.05$. The T-test result shown no significant relationship between Specialization at the secondary whether (science or industrial) and the Awareness toward the environmental SD's (T-test = 0.382, df = 88, p - value = 0.538) (Table 16).

Table (16): The result of T-test when $p \leq 0.05$, to measure the differences between the students' awareness related to Specialization at the secondary level

	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	t	df
Equal variances assumed	.382	.538	-.281-	88
Equal variances not assumed			-.300-	53.503

In order to find out whether these differences in the average estimates of the study members related to Awareness toward the environmental SDG's on the items of the scale in its total form are statistically significant at the level of significance ($P = 0.05$), an analysis was used. One-way variance (ANOVA) to look for correlations between students' awareness related and parents' educational level when $p \leq 0.05$.

Table (17) shows that the tabulated F value ($P = 0.968$) is more than calculated F value at the significance level ($P=0.05$) for the Mother's educational variable, which means there are no statistically significant differences at the significance level in the study members' estimates related to Awareness toward the environmental SDG's according to the fathers'

educational variable, that is, the fathers' educational of the study members does not affect the accuracy of their estimates toward the environmental SDG's Awareness

Table (17): Results of One-way variance (ANOVA) when $p \leq 0.05$, to measure the differences between the students' awareness related to fathers' educational level

		Sum of Squares	df	Mean Square	F	Sig.
Total Knowledge	Between Groups	.066	5	.013	.096	.993
	Within Groups	11.596	84	.138		
	Total	11.662	89			
Total Attitude	Between Groups	.300	5	.060	.226	.950
	Within Groups	22.290	84	.265		
	Total	22.590	89			
Total Practices	Between Groups	.247	5	.049	.265	.931
	Within Groups	15.646	84	.186		
	Total	15.893	89			
Awareness	Between Groups	.105	5	.021	.183	.968
	Within Groups	9.626	84	.115		
	Total	9.731	89			

Table (18) shows that the tabulated F value ($P = 0.902$) is more than calculated F value at the significance level ($P = 0.05$) for the Mother's educational variable, which means there are no statistically significant differences at the significance level in the study members' estimates related to Awareness toward the environmental SDG's according to the mothers' educational variable, that is, the mothers' educational of the study members does not affect the accuracy of their estimates toward the environmental SDG's Awareness

Table (18): Results of One-way variance (ANOVA) when $p \leq 0.05$, to measure the differences between the students' awareness related to mothers' educational level

		Sum of Squares	df	Mean Square	F	Sig.
TOTAL Knowledge	Between Groups	.688	5	.138	1.053	.392
	Within Groups	10.975	84	.131		
	Total	11.662	89			
TOTAL Attitude	Between Groups	.578	5	.116	.441	.819
	Within Groups	22.012	84	.262		
	Total	22.590	89			
TOTAL Practices	Between Groups	.438	5	.088	.476	.793
	Within Groups	15.455	84	.184		
	Total	15.893	89			
TOTAL Awareness	Between Groups	.180	5	.036	.316	.902
	Within Groups	9.551	84	.114		
	Total	9.731	89			

4.1.4 Environmental enrichment unit:

The results of the previous questions showed the necessity of having an enrichment unit related to environmental sustainable development goals to raise the level of awareness. Although textbooks are rich in environmental knowledge but not directly linked to the Sustainable Development Goals, teaching methods focus on retaining knowledge, not on acquiring environmental attitudes and practices; There are no differences in environmental awareness between industrial school students and scientific school students.

Environmental education (EE) must shed light on the complexity of the interrelationships between environmental systems and human culture such as: What is the goal of environmental education? What is the role of students' environmental behavior in addressing environmental problems? Should the environmental curriculum include ethics and values along with environmental concepts and skills? What is the appropriate role for

teachers to develop environmental education curricula? When do children begin to understand environmental issues? How to slow environmental damage? What technology can be used? (Fang et al,2023). It becomes clear that there is a need to design an environmental enrichment unit rich with knowledge, teaching and learning strategy, and interactive activities that cover environmental SDGs topics equally to raise the environmental awareness of the students, and it is designed as worksheets in addition to the student's project.

It includes the following environmental topics:

1-sustainable development goals (general)

- Pillars of sustainable development goals
- Environmental SDG's
- Economic SDG's
- Social SDG's

2- Water (Goal 6)

- Water Resources in the Arabian Gulf
- Water desalination
- wasting water
- Water Pollution
- water resource management

3-Energy (Goal 7)

- Energy sources in the Arabian Gulf
- Energy and renewable sources
- Energy from waste
- Nuclear Energy
- International Policies to Promote Energy Efficiency

4- Waste management (Goal 12)

- Solid waste
- Liquid waste
- Hazardous waste
- Waste management procedures

5- Air pollution (Goal 12)

- Air pollutants
- Acid rain
- Ozone Layer
- Air pollution control measures

6- Climate change (Goal 13)

- Climate change
- Global Warming
- Climate Change Actions

7- Biodiversity (Goal 14)

- Overexploitation of natural resources
- Extinction
- Natural Reserves

8- Land degradation and desertification (Goal 15)

- Desert creep
- Afforestation
- Measures to reduce land degradation.
- Wild and marine life in the Kingdom of Bahrain

9- Economy and Industry in the Kingdom of Bahrain (General)

- Natural Resources
- Oil companies
- Industrial companies
- Environmental projects of Industrial companies

10- Project: Our Green School

- Cooperation Environmental Project
- Solutions and suggestions to preserve the environment.
- Environmental laws and regulations

4.2 Discussion of Results

The preliminary results of this research highlighted some interesting aspects.

The results from the interviews show the totally held similar views that between all environmental officials in the industrial companies on:

1- Educate vocational track students about the goals of sustainable development through providing environmental courses for the industrial secondary school, foundational courses for security, safety, and health inside the companies, conduct training agreement between companies and schools so that the curricula should be practically related to the work at the companies.

2- Enhance the vocational track graduates' skills to know the environmental cognitive skills such as: effects of the emissions (gases/liquids/solids) on the environment, asbestos, spills and their effects, emission reduction, climate change, reduce carbon dioxide, air quality, insulation, liquid, soil, asbestos, reduction, industrial waste, climate change, ozone, spills aluminum industry (aluminum properties and interactions - components -

rolling), waste management (solid / liquid), industrial sewage management, clean environment, clean technology, pollution results in the medium long term, read the instruction and the impact of industrial companies on the environment and limiting it, and global and local environmental policies as well as the laws of Supreme Council for the Environment.

It reported similar finding that the vocational track graduates, enrolled at work, had a positive attitude to these practices for one reason: the company provides training courses to all new employees before they start working, where companies provide for them training with all the environmental topics as well as all the necessary legal procedures for any emergency situations like health, safety, maintenance, danger of mixing materials – leakage/ spillage reporting, monitoring pollution; which concludes that there is a shortage in the previous knowledge and skills of the new employees, that they needed before joining any company.

The environmental officials in the industrial companies suggest developing vocational education curricula through providing foundational courses for the security, the safety and the health inside the companies, and more courses on environmental effects. There is also a need for new specializations such as: integration of mecaelectronic and multi-skilled (welding, mechanics, electronics) to suit the changes of the labor market.

All companies held similar views that prefer the diploma holders as a new employee than the secondary holder, for the skills, knowledge, and discipline they have what they have.

Concerning the content analysis that shows the frequency of environmental terms in secondary courses taught in public schools generally in the Kingdom of Bahrain.

There are 21 sciences book cover 29 courses divided to General science, Biology, Chemistry, and Physics. The content analysis shows that General

science courses have the most environmental terms, for example Sci 201 course has the highest environmental terms with frequency 719 which represent 26.7 % of terms in science courses. It covers many topics such as Ecosystem, Biomes, Energy Recourses, Resources in the Biosphere, Pollution, Wastes, Acid Rain, Ozone, Greenhouse, and managing human impact, where sci201 covers all the environmental SDG's with dissimilar frequency. Despite the fact that, the publication year of Sci201 course was 2007, but it shows the effort of Curricula Directory in the Ministry of Education on that time to compose a course that covers topics related to environment.

Also, Sci211 course with frequency 551 which represents 20.5 % of terms in science courses, which focuses on energy. Followed by Gio222 with 408 which represents 15.2 % of terms in science courses, lastly Bio102, Bio211/215, Bio 217, Bio 316/318 with none of any terms related to environmental SDG's.

Then followed by biology courses, with Gio 211 , Bio 222 courses which represent 408, 296 respectively, which represent 15.2%, 11% respectively of terms in science courses, where both of them cover Goal 6.

With lowest frequency in chemistry and physics courses, where the environmental terms in chemistry and physics courses mentioned as enrichment questions or enrichment paragraphs and didn't link to sustainability or SDG's, for example of physics courses, Phys311/312 courses has the highest environmental terms with frequency 447 which represent 16.6% of terms in science courses, where it covers electricity as energy where it covers electricity as energy without any link (reference) to SDG's. Also, Phys324 course with 41 which represents 1.5 % of terms in science courses, in which there is a chapter that covers thermal energy without any link to sustainability or SDG's. As example of chemistry

courses Chem 214/215 has the highest frequency of chemistry courses with 16 repeated terms which represent 0.6% of terms in science courses which cover Goal 7.

It shows that few of SDG's are covered in many courses like Goal 6 was covered (tackled) in 5 courses Gio211, Bio222, Sci201, Bio317, and Gio321 respectively. Also, Goal 12 was covered by 4 courses Sci211, Sci201, Gio211 and Bio222 respectively. On other hand, there are slight appearance of the environmental SDG's terms in the remaining courses. Therefore, there are other topics which need to be given much focus in the science courses like: pollution, waste, air, marine, land, biodiversity, and government regulation in equal proportions.

There are 9 different courses in social studies syllabus issued in 2020, 8 courses are related to knowledge and concepts of environmental SDGs, where AJA211 has the highest frequency 306 which represent 39.2% of total terms, which covers many topics like atmosphere, heat exchange, climate, water recourse, and ozone. Followed by AJA214 with frequency 201 which represent 25.5%, that covers many contemporary issues topics like pollution, global warming, and sustainability development. Then followed by, AJA221 with frequency 198 which represent 25.1% of total terms, that covers many topics like climate, water recourse, energy recourse, and sustainability development. Also, the frequency shows that 7 of social study courses cover Goal 6, where the remaining goals have slight appearance of the environmental SDG's terms.

To some extent the students are aware of environmental SDGs, the descriptive statistic of the study participants related to Awareness toward the environmental SDG's, which shows the Attitude ranked first with a mean of (4.06) and a standard deviation of (0.504) and a High degree, followed by the Knowledge in the second place, with a mean of (2.56) and

a standard deviation of (0.362), with a Medium degree. While the Practices ranked last with a mean of (2.23) and a standard deviation (0.423) with a Low degree. Therefore, the degree of Awareness of study sample toward the environmental SDG's on total were Medium, with the mean was (3.07) and the standard deviation was (0.331).

This shows that Electrical and Mechanical Engineering students have a High degree of Attitude toward environment, with Medium Knowledge and Low Practices. The results shows that students have Medium Knowledge on the following topics: pollution, ozone, climate change, energy, gas emission, and environment police and regulations. Also, they have High Attitude on these topics: recycling, waste, marine, gas emission, whereas Medium Attitude on the energy and pollution topics. Finally, it also shows that they have Medium Practices on land topics, and Low practices on the following topics: energy, waste, recycling, clean campaign inside/outside school.

The result of Pearson correlation between knowledge, attitude, and practice showed a significant relationship between knowledge, attitude, and practice. Which means, that there is a relation between knowledge, related to building attitude which influences practices. Therefore, we recommend increasing the activities related to raising the learners' awareness, where this finding is consistent with Awareness studies and research (Aliman et al.,2019; Amran et al., 2018; Kollmuss & Agyeman,2002; Punzalan, 2020; Rogayan & Neberida,2019).

The T-test result which measures the differences between the students' awareness related to Specialization at the secondary level, when $p \leq 0.05$, showed no significant relationship between Specialization at the secondary whether (science or industrial) and the Awareness toward the environmental SDG's (T-test =0.382, df = 88, p-value= 0.538). Although,

the number of courses differs according to the specialization, this did not affect the students' knowledge, attitudes, and practices. The science track includes 37 courses (29 science courses and 8 social studies courses) while the vocational track students include only 7 courses (6 science courses and one social study courses).

The result of One-way variance (ANOVA) to measure the differences between the students' awareness related to parents' educational level when $p \leq 0.05$. The result showed no statistically significant differences at the significance level ($P = 0.968$) of the study members' estimates related to Awareness toward the environmental SDG's on the items of the scale in its total form according to the fathers' educational variable, And no statistically significant differences at the significance level ($P = 0.902$) in the study members' estimates of the study members related to Awareness toward the environmental SDG's on the items of the scale in its total form according to the mother educational variable, that is the parents' education level does not affect students' Awareness toward the environmental SDG's.

Finally, the results indicated that the amount of environmental knowledge focuses on the knowledge itself and not on developing environmental attitude and practices. Many research studies (Al-Dosari, 2017; Al-Shia, 2013; Ogulu, 2019; Yildirim and Sensoy, 2018) use an environmental enrichment unit to raise environmental awareness. The need to design environmental programs designed in the form of worksheets based on teaching methods such as project-based learning, problem solving, video, digital stories, out-of-classroom learning, corporate field trips, and environmental clean-up campaigns was emphasized.

4.3 Study's Recommendations

There is a knowledge gap between the knowledge that students get from the environmental curricula and companies' needs. While the curricula are the basis of knowledge that the new employees get and acquiring the skills that necessary for the labor market. This research recommends developing the vocational education curricula to bridge the gap between education and companies' needs.

Suggestions to solve this shortage of knowledge and to achieve SDG's include setting up a design enrichment unit to integrate environmental awareness into secondary curricula through linking secondary curricula to SDGs for all secondary schools and especially the industrial ones. Suggestion of the environmental officials in the industrial company to increasing the period of practical training for the students at the industrial school in the companies , and developing a new specialization in industrial schools to cope with industrial company's needs, like introducing some new majors such as: renewable energy (solar), Integration of mecaelectronics disciplines, multi-skilled (welding, mechanics, electronics), process instrumentation, pumps, compressors (overall) rotating equipment.

Also, this research recommends that:

- 1- Start teaching the science course sci 201 for industrial school students.
- 2- Reconstruct both science courses Science course sci201 titled “Environmental Sciences” and Sci 211 titled “Energy” which are directly related to the environment, and should be developed by linking environmental terminology to sustainable development goals and issues and thus be useful to students over the next ten years and.

3- It is important to emphasis on teaching environmental concepts to increase awareness of the students through field visits, extra-curricular activities such as visits to industrial companies and learning about their support for environmental projects within their facilities. This will enrich the students awareness and attitudes towards the environmental since it will increase their knowledge and sustainability.

4- Cooperate with industrial companies to preparing environmental approaches that suit their needs and job requirements.

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Appendices

University of Bahrain

College of Science

PhD Program in Environment and Sustainable Development

Dear student ...

I would like to inform you that the interview questions you have for the PhD thesis are entitled:

" Towards the implementation of the environmental SDGs within the Secondary Schools in Kingdom of Bahrain"

One of the requirements for obtaining a PhD in Environment and Sustainable Development.

The interview questions are designed to get to know your view of vocational education graduate workers joining your work towards the environment and its resources. So, please kindly answer the questions frankly, noting that your answers are confidential and will only be used for scientific research purposes.

Thank you and I appreciate you for your kind cooperation.

Researcher / Esmahan Mohamed Al-Jawder

Interview questions for the head of the Health, Security and Environment Unit in industrial enterprises

Name of the Company's:	Interview location:
Employee Name:	Interview duration:

Q1: How many workers of vocational education graduates are working for you?

Q2: What is the percentage (%) of workers of vocational education working for you out of the total number of workers?

Q3: Does the company publish a report on the sustainable development goals? (Please tick $\sqrt{}$)

NO ☐

YES ☐

Q4: What are the difficulties that the company faces in achieving the sustainable development goals?

Q5: What proposals do you consider necessary to develop the company and make it capable of achieving sustainable development goals?

Q6: What are suggestions to help in advising vocational education graduates to achieve the sustainable development goals?

Q7: Name skills that vocational education graduates joining your work need to achieve the sustainable development goals?

Q8: What majors do you think the vocational education graduates who should be able to achieve the sustainable development goals?

Q9: What are the most important environmental issues that a graduate of vocational education who joins your work should know about?

1. -----
2. -----
3. -----
4. -----
5. -----
6. -----

Q10: Practices of the vocational education graduate enrolled in your work towards the following environmental elements are as follows:

Environmental elements	positive	don't know	negative
1- Preserving water from pollution			
2- Water use rationalization			
3- Proper management of sanitation services			
4- Industrial drainage management			
5- Rationalization of electric energy			
6- Use of mass transit			
7- Encouraging renewable energy			
8- Rationalize fossil fuels			
9- Recycling			
10- Environmental sound management of chemicals			
11- Reducing waste			
12- Chemical spills			
13- Preserving the marine environment			
14- Preserving fish wealth			
15- Attention to biological diversity			
16- Preserving the wild environment			
17- Attention to the agricultural environment			

Are there any other practices?

Q11: What is your employment preference for students graduating from vocational education? Give reasons?

High school diploma holder

☐

Diploma holder

☐

جامعة البحرين

كلية العلوم

برنامج الدكتوراه في البيئة والتنمية المستدامة

أخي الفاضل ...

السلام عليكم ورحمة الله وبركاته ،،، وبعد

أود إحاطتكم علماً أن أسئلة المقابلة التي بين أيديكم هي من أجل أطروحة الدكتوراه بعنوان:

" نحو تطبيق أهداف التنمية المستدامة البيئية في المدارس الصناعية بمملكة البحرين "

" Towards the Implementation of the Environmental SDGs on the Secondary

Schools in Kingdom of Bahrain"

وهي من متطلبات الحصول على درجة الدكتوراه في البيئة والتنمية المستدامة.

وصُممت أسئلة المقابلة للتعرف على وجهة نظركم تجاه العمال خريجي التعليم الصناعي

الملتحقين بالعمل لديكم نحو البيئة ومواردها، لذا يرجى التكرم بالإجابة على الأسئلة بكل

صراحة، علماً بأن إجاباتكم سرية ولن تستخدم إلا لأغراض البحث العلمي.

شاكراً ومقدراً لكم حسن تعاونكم.

الباحثة/ اسمهان محمد الجودر

أسئلة مقابلة رئيس وحدة الصحة والأمن والبيئة في المؤسسات الصناعية

أسم الشركة:	مكان المقابلة:
أسم الموظف:	الفترة القائمة للمقابلة:

س1: ما عدد العمال خريجي التعليم الصناعي العاملين لديكم؟

س2: ما نسبة العمال خريجي التعليم الصناعي العاملين لديكم من مجمل العاملين؟

س3: هل تصدر الشركة تقريراً بأهداف التنمية المستدامة؟

لا ☐

نعم ☐

س4: ما الصعوبات التي تواجه الشركة في تحقيق أهداف التنمية المستدامة؟

س5: ما المقترحات التي تراها ضرورية لتطوير الشركة وجعلها قادرة على تحقيق أهداف التنمية المستدامة؟

س6: ما المقترحات التي تساعد في توعية خريجي التعليم الصناعي بأهداف التنمية المستدامة؟

س7: ما المهارات التي يجب أن يتقنها خريجي التعليم الصناعي الملتحق بالعمل لديكم لتحقيق أهداف التنمية المستدامة؟

س8: حدد التخصصات التي ترى أن يكون خريج التعليم الصناعي الملتحق بالعمل لديكم متمكناً منها لتحقيق أهداف التنمية المستدامة؟

س9: ما أهم الموضوعات البيئية التي يجب أن يلم بها خريج التعليم الصناعي الملتحق بالعمل لديكم؟

- 1-
- 2-
- 3-
- 4-
- 5-
- 6-

س10: يبن ممارسات خريج التعليم الصناعي الملتحق بالعمل لديكم نحو العناصر البيئية التالية:

العناصر البيئية	إيجابية	لا أعلم	سلبية
1- الحفاظ على المياه من التلوث			
2- ترشيد استخدام المياه			
3- الإدارة السليمة لخدمات الصرف الصحي			
4- إدارة الصرف الصناعي			
5- ترشيد الطاقة الكهربائية			
6- استخدام النقل الجماعي			
7- تشجيع الطاقة المتجددة			
8- ترشيد الوقود الأحفوري			
9- إعادة التدوير			
10- الإدارة السليمة بينيا للمواد الكيميائية			
11- تقليل المخلفات / النفايات			
12- الانسكابات الكيميائية			
13- الحفاظ على البيئة البحرية			
14- الحفاظ على الثروة السمكية			
15- الاهتمام بالتنوع الحيائي			
16- الحفاظ على البيئة البرية			
17- الاهتمام بالبيئة الزراعية			

هل توجد ممارسات أخرى

.....

.....

س11: ما أفضلية التوظيف لديكم للطلبة خريجي التعليم الصناعي؟ ولماذا؟

حامل الشهادة الثانوية العامة ☐ حامل شهادة الدبلوم ☐

.....

University of Bahrain
Science Department
Ph.D. of Environmental Sustainable Development

Dear student...

This questionnaire for the Ph.D. thesis is entitled:

**"Towards the Implementation of the Environmental
Sustainable Development Goals within the Secondary
Schools in the Kingdom of Bahrain "**

**One of the requirements for obtaining a PhD in Environment
and Sustainable Development.**

**The researcher designed the questionnaire in order to know
your viewpoint towards the environment and its resources. So
please kindly answer honestly, knowing that your answers
will be only used for scientific research purposes, and we do
not require your name.**

**Thank you and I appreciate your kind cooperation and
response.**

Researcher / Esmahan Mohamed Al-Jawder

A questionnaire to measure the knowledge / attitudes / practices of mechanical and electrical engineering diploma students on environmental issues in the sustainable development goals.

First: Student data:

University Specialization		Specialization at the secondary level	Industrial ☐ science ☐
The company you want to work for			
The parent's educational level	father	Uneducated ☐	primary ☐
		secondary ☐	university ☐
	mother	Uneducated ☐	primary ☐
		secondary ☐	university ☐

Second: The fields of the resolution

Mark (☐) in front of the square that suits you:

Domain	sentence	Yes	Don't know	No
Knowledge	1. There is a relationship between environmental pollution and wasteful use of water and electrical.			
	2. There is <u>no</u> relationship between Using of some chemicals in industry and the erosion of the Ozone layer.			
	3. There is a relationship between greenhouse gas emissions and climate change			
	4. There is <u>no</u> relationship between air pollution and high temperatures.			
	5. Knowledge of national policies for preserving the environment is important.			
	6. It's important to know international agreements to preserve the environment.			
	7. It is <u>not</u> important to know the sustainable development goals.			
	8. There is a relationship between water pollution and the death of fish stocks.			
	9. Using natural gas as an alternative of oil has a role in reducing greenhouse gas emissions			

Domain	Sentence	Totally agree	agree	neutral	disagree	Totally disagree
Attitude	1. It is better to burial of waste than to use waste recycling technologies.					
	2. It is better to dump industrial waste into the seas, as the seas are able to clean themselves.					
	3. It is better to landfill coasts to build residential cities.					
	4. It is better to recycle waste.					
	5. It is better to treat wastewater to use it for cultivation and urban afforestation.					
	6. It is better to use environmental friendly materials in industry.					
	7. It is best to collect live plants in the camping season to use as fuel.					
	8. It is better to combat illegal, unregulated and unreported fishing in order to preserve the sustainability of marine wealth					
	9. It is better to reuse materials in industry to reduce industrial waste.					
	10. It is better to use renewable energy to reduce greenhouse gas emissions.					
	11. It is better to enact legislations to preserve the ecosystems life.					
	12. It is better <u>not</u> to install filters for factory chimneys because the air is able to renew itself constantly.					
	13. It is better <u>not</u> to set strict policies on pollution rates in the Kingdom of Bahrain to keep the wheel of industrial development.					
	14. It is better to teach topics about the environment in Bahrain schools.					

Domain	sentence	always	sometime	never
practices	1. I <u>don't</u> participate in a coastal clean-up campaign.			
	2. I keep the wild environment clean during the camping period.			
	3. I <u>don't</u> sort household waste into glass / paper / other for recycling.			
	4. I participate in afforestation campaigns inside / outside the school.			
	5. I practise agricultural activity.			
	6. I use plastic bags instead of environmental- friendly bags.			
	7. In my home, we use energy-saving lamps.			
	8. In my home, we use energy-saving electrical appliances.			
	9. I participate in guiding others to rationalization water management concept.			
	10. I participate in guiding others to rationalization electricity management.			
	11. I <u>don't</u> participate in guiding others to improve sanitation management.			

جامعة البحرين

كلية العلوم

برنامج الدكتوراه في البيئة والتنمية المستدامة

عزيزي الطالب ...

السلام عليكم ورحمة الله وبركاته ،،، وبعد

أود إحاطتكم علماً أن استبانة التي بين أيديكم من أجل أطروحة الدكتوراه بعنوان:

" نحو تطبيق أهداف التنمية المستدامة البيئية في المدارس الصناعية بمملكة البحرين "

**" Towards the Implementation of the Environmental SDGs within the
Secondary Schools in The Kingdom of Bahrain "**

وهي من متطلبات الحصول على درجة الدكتوراه في البيئة والتنمية المستدامة.

وصممت الباحثة الاستبانة بهدف التعرف على وجهة نظركم اتجاه البيئة ومواردها. لذا يرجى

التكرم بالإجابة بكل صراحة، علماً بأن إجابتكم ولن تستخدم إلا لأغراض البحث العلمي ولا

تتطلب ذكر اسمكم الكريم.

شاكرًا ومقدرةً حسن تعاونكم وتجاوبكم.

الباحثة/ اسمهان محمد الجودر

استبانة لقياس معرفة/ اتجاهات/ ممارسات طلبة دبلوم الهندسة
الميكانيكية والكهربائية لمواضيع البيئية في أهداف التنمية المستدامة

أولاً: بيانات الطالب:

التخصص الجامعي	التخصص في المرحلة الثانوية	☐ علمي ☐ صناعي
الشركة التي ترغب في العمل لديها		
المستوى التعليمي للوالد	☐ غير متعلم ☐ ابتدائي ☐ إعدادي ☐ ثانوي ☐ جامعي ☐ دراسات عليا	
المستوى التعليمي للوالدة	☐ غير متعلم ☐ ابتدائي ☐ إعدادي ☐ ثانوي ☐ جامعي ☐ دراسات عليا	

ثانياً: مجالات الاستبانة

ضع علامة (√) أمام المربع الذي يناسبك:

المجال	العبارة	نعم	لا أعلم	لا
البيئة	1. توجد علاقة بين التلوث البيئي والإسراف في استخدام كل من المياه والكهرباء.	3	2	1
	2. لا توجد علاقة بين استخدام بعض المواد الكيميائية في الصناعة واستنزاف طبقة الأوزون.	1	2	3
	3. توجد علاقة بين انبعاثات الغازات الدفيئة وتغير المناخ.	3	2	1
	4. لا توجد علاقة بين تلوث الهواء وارتفاع درجات الحرارة.	1	2	3
	5. توجد أهمية لمعرفة السياسات الوطنية للمحافظة على البيئة.	3	2	1
	6. توجد أهمية لمعرفة الاتفاقيات الدولية للمحافظة على البيئة.	3	2	1
	7. لا توجد أهمية لمعرفة أهداف التنمية المستدامة.	1	2	3
	8. توجد علاقة بين تلوث المياه ونفوق الثروة السمكية.	3	2	1
	9. استخدام الغاز الطبيعي بديلاً عن النفط له دور في تقليل انبعاثات الغازات الدفيئة.	3	2	1

المجال	العبارة	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
البيئة الطبيعية	1. من الأفضل دفن المخلفات بدلاً من استخدام تقنيات تدوير المخلفات.	1	2	3	4	5
	2. من الأفضل رمي المخلفات الصناعية في البحار والبحار قادرة على تنظيف نفسها.	1	2	3	4	5
	3. من الأفضل ردم السواحل لبناء مدن سكنية.	1	2	3	4	5
	4. من الأفضل تدوير المخلفات.	5	4	3	2	1
	5. من الأفضل معالجة مياه الصرف الصحي لاستخدامه في الاستزراع وتشجير المدن.	5	4	3	2	1
	6. من الأفضل استخدام مواد صديقة للبيئة في الصناعة.	5	4	3	2	1
	7. من الأفضل جمع النباتات الحية في موسم التخميم لاستخدامها كوقود.	1	2	3	4	5
	8. من الأفضل وقف الصيد البحري الجائر للمحافظة على استدامة الثروة البحرية.	5	4	3	2	1
	9. من الأفضل إعادة استخدام المواد في الصناعة لتقليل من المخلفات الصناعية.	5	4	3	2	1
	10. من الأفضل استخدام الطاقة المتجددة لتقليل من انبعاثات الغازات الدفينة.	5	4	3	2	1
	11. من الأفضل سن التشريعات للمحافظة على الحياة في النظم البيئية.	5	4	3	2	1
	12. من الأفضل عدم تركيب مرشحات لمداخن المصانع لأن الهواء قادر على تجديد نفسه باستمرار.	1	2	3	4	5
	13. من الأفضل عدم وضع قيود صارمة على معدلات التلوث في مملكة البحرين لإبقاء عجلة التطور الصناعي.	1	2	3	4	5
	14. من الأفضل تدريس مواضيع عن البيئة في مدارس البحرين.	5	4	3	2	1

المجال	العبارة	دائمًا	أحيانًا	أبدًا
الممارسات	1. لا أشارك في حملة تنظيف السواحل.	1	2	3
	2. أحافظ على نظافة البيئة البرية في فترة التخميم.	3	2	1
	3. لا أفرز المخلفات المنزلية إلى زجاج / أوراق / أخرى لإعادة تدويرها.	1	2	3
	4. شاركت في حملات التشجير داخل / خارج المدرسة.	3	2	1
	5. أمارس نشاط زراعي.	3	2	1
	6. أستخدم الأكياس البلاستيكية بدلاً من الأكياس صديقة للبيئة.	1	2	3
	7. نستخدم في منزلي مصابيح موفرة للطاقة.	3	2	1
	8. نستخدم في منزلي أجهزة كهربائية موفرة للطاقة.	3	2	1
	9. أشارك في توعية الآخرين على ترشيد استخدام المياه.	3	2	1
	10. أشارك في توعية الآخرين على ترشيد الطاقة الكهربائية.	3	2	1
	11. لا أشارك في توعية الآخرين على تحسين إدارة الصرف الصحي.	1	2	3

Interviewee's Information

Company name	Interviewee's name	Job title	Date of the interview
Gulf Aluminum Rolling Mill Company	Dr. Adel Dager	Safety, Security, Health, and Environment Manager	28/10/2020
Bahrain Petroleum Company	Mr. Ebrahim Mohamed Hussain	Action Manager Health, safety, and Environment Department	9/11/2020
Gulf Petrochemical Industries Company	Mr. Jamal Alshawoosh	Safety, Security, Health, and Environment Manager	16/11/2020
Aluminum Bahrain Company	Mr. Nezar Hamed Ali	Manager Safety and Health	17/11/2020

Sustainability terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc 103	Soc203	Soc 210	Soc 211	Soc 213	Soc 214	Soc 221	Soc 312
Term									
1- Sustainable Development Goals	0	0	0	0	0	0	0	0	0
2- Sustainability / Sustainability of development	0	0	0	0	1	0	0	0	5
3- Environmental awareness	0	0	0	0	0	0	0	0	0
4- Environmental policies, legislation, and laws	1	0	0	0	0	0	6	1	1

Name of the book	الطاقة	الاحياء 5	الجيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيولوجيا 1	الأحياء 1	الاحياء 2	الأحياء 3	الاحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Courses	Sci 211	Bio 317	321 Gio	Sci 201	Bio 222	Gio 211	Bio 102	Bio /211 215	Bio 217	Bio /316 318
Term										
1- Sustainable Development Goals	0	0	0	0	0	0	0	0	0	0
2- Sustainability / Sustainability of development	0	0	0	4	0	0	0	0	0	0
3- Environmental awareness	0	0	0	1	0	0	0	0	0	0
4- Environmental policies, legislation, and laws	0	0	0	16	3	0	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses	chem 102	chem 211	chem 215/214	chem 317/315	chem 318
Term					
1- Sustainable Development Goals	0	0	0	0	0
2- Sustainability / Sustainability of development	0	0	0	0	0
3- Environmental awareness	0	0	0	1	0
4- Environmental policies, legislation, and laws	0	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses	Phys 102	Phys 217/210	Phys 219/ 218	Phys 311/ 312	Phys /313 314	Phys 324
Term						
1- Sustainable Development Goals	0	0	0	0	0	0
2- Sustainability / Sustainability of development	0	0	0	0	0	0
3- Environmental awareness	0	0	0	0	0	0
4- Environmental policies, legislation, and laws	0	0	0	0	0	0

Goal 6 terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc 103	Soc203	Soc 210	Soc 211	Soc213	Soc 214	Soc 221	Soc 312
Term									
1- Water	3	1	0	28	168	3	64	142	0
2- Water use efficiency	0	0	0	0	0	0	0	0	0
3- Water quality	0	0	0	0	0	0	1	0	0
4- Improving water quality	0	0	0	0	0	0	0	0	0
5- Water Scarcity	0	0	0	0	2	0	0	0	0
6- Water shortage	0	0	0	0	0	0	0	0	0
7- Water stress	0	0	0	0	0	0	0	0	0
8- Recycle water	0	0	0	1	0	0	4	0	0
9- Domestic wastewater	0	0	0	2	0	0	4	0	0
10- Industrial wastewater	0	0	0	0	0	0	0	0	0
11- Reducing the proportion of untreated domestic wastewater	0	0	0	0	0	0	0	0	0
12- Dumping waste	0	0	0	0	0	0	3	0	1
13- Release waste	0	0	0	0	0	0	4	0	0
14- Dumping hazardous chemical waste	0	0	0	0	0	0	0	0	1
15- Release of hazardous chemical waste	0	0	0	0	0	0	0	0	0
16- The environmentally sound management of wastes	0	0	0	0	0	0	0	0	0
17- Water resources management	0	0	0	0	0	0	0	1	0
18- Protect water ecosystems	0	0	0	0	0	0	0	0	0
19- Restore ecosystem	0	0	0	0	0	0	0	0	0
20- Protect aquifers	0	0	0	0	1	0	0	0	0
21- Aquifers	1	0	0	0	7	0	0	32	0

Name of the book	الطاقة	الاحياء 5	الجيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيولوجيا 1	الاحياء 1	الاحياء 2	الأحياء 3	الاحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Courses	Sci 211	Bio 317	Gio321	Sci 201	Bio 222	Gio 211	Bio102	Bio /211 215	Bio 217	Bio /316 318
Term										
1- Water	0	43	17	163	235	267	0	0	0	0
2- Water use efficiency	0	0	0	0	0	0	0	0	0	0
3- Water quality	0	0	0	0	0	1	0	0	0	0
4- Improving water quality	0	0	0	0	0	0	0	0	0	0
5- Water Scarcity	0	0	0	1	0	0	0	0	0	0
6- Water shortage	0	0	0	2	0	0	0	0	0	0
7- Water stress	0	0	0	0	0	0	0	0	0	0
8- Recycle water	0	0	0	0	0	0	0	0	0	0
9- Domestic wastewater	0	0	0	4	11	0	0	0	0	0
10- Industrial wastewater	0	0	0	0	0	0	0	0	0	0
11- Reducing the proportion of untreated domestic wastewater	0	0	0	0	0	5	0	0	0	0
12- Dumping waste	0	0	0	0	1	0	0	0	0	0
13- Release waste	0	0	0	0	0	0	0	0	0	0
14- Dumping hazardous chemical waste	0	0	0	0	0	0	0	0	0	0
15- Release of hazardous chemical waste	0	0	0	12	5	4	0	0	0	0
16- The environmentally sound management of wastes	0	0	0	0	0	0	0	0	0	0
17- Water resources management	0	0	0	0	0	1	0	0	0	0
18- Protect water ecosystems	0	0	0	0	0	0	0	0	0	0
19- Restore ecosystem	0	0	0	0	0	0	0	0	0	0
20- Protect aquifers	0	0	0	0	0	0	0	0	0	0
21- Aquifers	0	0	0	9	2	87	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses	chem 102	chem 211	chem 215/214	chem 317/315	chem 318
Term					
1- Water	0	0	0	0	0
2- Water use efficiency	0	0	0	0	0
3- Water quality	0	0	0	0	0
4- Improving water quality	0	0	0	0	0
5- Water Scarcity	0	0	0	0	0
6- Water shortage	0	0	0	0	0
7- Water stress	0	0	0	0	0
8- Recycle water	0	0	0	0	0
9- Domestic wastewater	0	0	0	0	0
10- Industrial wastewater	0	0	0	0	0
11- Reducing the proportion of untreated domestic wastewater	0	0	0	0	0
12- Dumping waste	0	0	0	0	0
13- Release waste	0	0	0	0	0
14- Dumping hazardous chemical waste	0	0	0	0	0
15- Release of hazardous chemical waste	0	0	0	0	0
16- The environmentally sound management of wastes	0	0	0	0	0
17- Water resources management	0	0	0	0	0
18- Protect water ecosystems	0	0	0	0	0
19- Restore ecosystem	0	0	0	0	0
20- Protect aquifers	0	0	0	0	0
21- Aquifers	0	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses	Phys 102	Phys 217/210	Phys 218 219/	Phys 311/ 312	Phys /313 431	Phys 324
Term						
1- Water	0	0	0	0	0	0
2- Water use efficiency	0	0	0	0	0	0
3- Water quality	0	0	0	0	0	0
4- Improving water quality	0	0	0	0	0	0
5- Water Scarcity	0	0	0	0	0	0
6- Water shortage	0	0	0	0	0	0
7- Water stress	0	0	0	0	0	0
8- Recycle water	0	0	0	0	0	0
9- Domestic wastewater	0	0	0	0	0	0
10- Industrial wastewater	0	0	0	0	0	0
11- Reducing the proportion of untreated domestic wastewater	0	0	0	0	0	0
12- Dumping waste	0	0	0	0	0	0
13- Release waste	0	0	0	0	0	0
14- Dumping hazardous chemical waste	0	0	0	0	0	0
15- Release of hazardous chemical waste	0	0	0	0	0	0
16- The environmentally sound management of wastes	0	0	0	0	0	0
17- Water resources management	0	0	0	0	0	0
18- Protect water ecosystems	0	0	0	0	0	0
19- Restore ecosystem	0	0	0	0	0	0
20- Protect aquifers	0	0	0	0	0	0
21- Aquifers	0	0	0	0	0	0

Goal 7 terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc 103	Soc203	Soc 210	Soc 211	Soc 213	Soc 214	Soc 221	Soc 312
Term									
1- Fuels	2	0	0	0	0	3	0	2	0
2- energy	0	0	0	7	0	0	10	17	6
3- Solar energy	0	0	0	1	3	0	0	0	1
4- Renewable energy	2	0	0	0	0	0	3	0	1
5- Energy efficiency	0	0	0	0	0	0	0	0	0
6 Advanced and cleaner fossil-fuel technology	0	0	0	0	0	0	0	0	0
7- Fossil fuels	0	0	0	0	0	0	2	0	0
8- modern and Sustainable energy services	0	0	0	0	0	0	0	0	0

Name of the book	الطاقة	الاحياء 5	جيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيولوجيا 1	الاحياء 1	الاحياء 2	الأحياء 3	الأحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Courses	Sci 211	Bio 317	Gio 321	Sci 201	Bio 222	Gio 211	Bio 102	Bio /211 215	Bio 217	Bio /316 318
Term										
1- Fuels	1	0	0	48	1	2	0	0	0	0
2- energy	545	0	0	160	0	6	0	0	0	0
3- Solar energy	1	0	0	34	1	0	0	0	0	0
4- Renewable energy	1	0	0	2	0	1	0	0	0	0
5- Energy efficiency	1	0	0	1	0	0	0	0	0	0
6 Advanced and cleaner fossil-fuel technology	0	0	0	0	0	0	0	0	0	0
7- Fossil fuels	0	0	0	5	0	0	0	0	0	0
8- modern and Sustainable energy services	0	0	0	0	0	0	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses	chem 102	chem 211	chem 215/214	chem 317/315	chem 318
Term					
1- Fuels	0	0	12	0	0
2- energy	0	0	0	3	7
3- Solar energy	0	0	0	0	1
4- Renewable energy	0	0	2	0	2
5- Energy efficiency	0	0	0	0	0
6 Advanced and cleaner fossil-fuel technology	0	0	2	0	0
7- Fossil fuels	0	0	0	0	0
8- modern and Sustainable energy services	0	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses	Phys 102	Phys 217/210	Phys 219/ 218	Phys 311/ 312	Phys 431 /313	Phys 324
Term						
1- Fuels	0	0	0	0	0	0
2- energy	0	0	0	444	10	40
3- Solar energy	0	0	1	3	2	1
4- Renewable energy	0	0	0	0	0	0
5- Energy efficiency	0	0	0	0	0	0
6 Advanced and cleaner fossil-fuel technology	0	0	0	0	0	0
7- Fossil fuels	0	0	0	0	0	0
8- modern and Sustainable energy services	0	0	0	0	1	0

Goal 12 terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc 103	Soc203	Soc 210	Soc 211	Soc 213	Soc 214	Soc 221	Soc 312
Term									
1- Rate of land consumption	0	0	0	0	0	0	0	0	0
2- minimize waste impact on environment	0	0	0	0	0	0	0	0	1
3- Using resources Efficiently	0	0	0	0	0	0	0	0	0
4- Air quality	0	0	0	0	0	0	1	0	1
5- Air pollution	0	0	0	0	0	0	0	0	0
6- Air pollution emission	0	0	0	0	0	0	0	0	0
7- Air quality standard	0	0	0	0	0	0	0	0	0
8- Waste management	0	0	0	0	0	0	0	0	0
9- Waste	0	0	0	0	0	0	40	0	4
10- Environmentally sound management of chemicals	0	0	0	0	0	0	0	0	0
11- Reduce waste generation	0	0	0	0	0	0	0	0	0
12- Hazardous industrial waste	0	0	0	0	0	0	0	0	0
13- Medical waste	0	0	0	0	0	0	1	0	0

Name of the book	الطاقة	الاحياء 5	جيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيولوجيا 1	الأحياء 1	الاحياء 2	الأحياء 3	الاحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Course	Sci 211	Bio 317	Gio 321	Sci 201	Bio 222	Gio 211	Bio 102	Bio /211 215	Bio 217	Bio /316 318
Term										
1- Rate of land consumption	0	0	0	1	0	0	0	0	0	0
2- minimize waste impact on environment	0	0	0	0	1	0	0	0	0	0
3- Using resources Efficiently	0	0	0	0	0	0	0	0	0	0
4- Air quality	0	0	0	1	0	1	0	0	0	0
5- Air pollution	0	0	0	22	0	0	0	0	0	0
6- Air pollution emission	0	0	0	0	0	0	0	0	0	0
7- Air quality standard	0	0	0	0	0	0	0	0	0	0
8- Waste management	0	0	0	0	0	0	0	0	0	0
9- Waste	0	0	0	89	2	8	0	0	0	0
10- Environmentally sound management of chemicals	0	0	0	0	0	0	0	0	0	0
11- Reduce waste generation	0	0	0	1	0	0	0	0	0	0
12- Hazardous industrial waste	0	0	0	0	0	0	0	0	0	0
13- Medical waste	0	0	0	0	0	0	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses	chem 102	chem 211	chem 215/214	chem 317/315	chem 318
Term					
1- Rate of land consumption	0	0	0	0	0
2- minimize waste impact on environment	0	0	0	0	0
3- Using resources Efficiently	0	0	0	0	0
4- Air quality	0	0	0	0	0
5- Air pollution	0	0	0	0	0
6- Air pollution emission	1	0	0	0	0
7- Air quality standard	0	0	0	0	0
8- Waste management	0	1	0	1	0
9- Waste	0	0	0	4	0
10- Environmentally sound management of chemicals	0	0	0	0	0
11- Reduce waste generation	0	0	0	0	0
12- Hazardous industrial waste	0	0	0	0	0
13- Medical waste	0	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses	Phys 102	Phys 217/210	Phys 219/ 218	Phys 311/ 312	Phys 431 /313	Phys 324
Term						
1- Rate of land consumption	0	0	0	0	0	0
2- minimize waste impact on environment	0	0	0	0	0	0
3- Using resources Efficiently	0	0	0	0	0	0
4- Air quality	0	0	0	0	0	0
5- Air pollution	0	0	0	0	0	0
6- Air pollution emission	0	0	0	0	0	0
7- Air quality standard	0	0	0	0	0	0
8- Waste management	0	0	0	0	0	0
9- Waste	0	0	0	0	0	0
10- Environmentally sound management of chemicals	0	0	0	0	0	0
11- Reduce waste generation	0	0	0	0	0	0
12- Hazardous industrial waste	0	4	0	0	0	0
13- Medical waste	0	0	0	0	0	0

Goal 13 terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc 103	Soc203	Soc 210	Soc 211	Soc 213	Soc 214	Soc 221	Soc 312
Term									
1- Global Warming	0	0	0	0	1	0	10	0	0
2- Air	0	0	0	0	118	0	4	0	0
3- Climate change	0	0	0	0	0	0	1	0	1
4- Reduce climate change	0	0	0	0	0	0	0	0	0
5- Greenhouse gas emissions	0	0	0	0	0	0	2	0	0

Name of the book	الطاقة	الاحياء 5	الجيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيوولوجيا 1	الاحياء 1	الاحياء 2	الأحياء 3	الأحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Courses	Sci 211	Bio 317	Gio321	Sci 201	Sci 222	Gio 211	Bio 102	Bio /211 215	Bio 217	Bio /316 318
Term										
1- Global Warming	0	0	0	11	1	0	0	0	0	0
2- Air	2	97	10	41	1	6	0	0	0	0
3- Climate change	0	0	0	1	1	0	0	0	0	0
4- Reduce climate change	0	0	0	0	0	0	0	0	0	0
5- Greenhouse gas emissions	0	0	0	0	0	0	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses			chem	chem	
Term	102 chem	211 chem	215/214	317/315	318 chem
1- Global Warming	0	0	0	0	0
2- Air	0	0	0	0	0
3- Climate change	0	0	0	0	0
4- Reduce climate change	0	0	0	0	0
5- Greenhouse gas emissions	2	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses		Phys 217/210	Phys218 219/	Phys 311/ 312	Phys/313 314	
Term	Phys102					Phys324
1- Global Warming	0	0	0	0	0	0
2- Air	0	0	0	0	0	0
3- Climate change	0	0	0	0	0	0
4- Reduce climate change	0	0	0	0	0	0
5- Greenhouse gas emissions	0	0	0	0	0	0

Goal 14 terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc103	Soc203	Soc 210	Soc 211	Soc213	Soc 214	Soc 221	Soc 312
Term									
1. pollution	1	1	0	0	5	0	41	1	0
2. water resources	0	0	0	0	0	0	0	2	0
3. marine pollution	0	0	0	0	0	0	0	0	1
4. prevent marine pollution	0	0	0	0	0	0	0	0	0
5. reduce marine pollution	0	0	0	0	0	0	0	0	0
6. floating plastic debris density	0	0	0	0	0	0	0	0	0
7. sustainably manage marine and coastal ecosystems	0	0	0	0	0	0	0	0	0
8. Minimize ocean acidification	0	0	0	0	0	0	0	0	0
9. protect marine and coastal ecosystems	0	0	0	0	0	0	0	0	0
10. improve ocean health	0	0	0	0	0	0	0	0	0
11. Enhance the conservation and sustainable use of oceans and their resources	0	0	0	0	0	0	0	0	0

Name of the book	الطاقة 5	الاحياء 2	الجيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيولوجيا 1	الأحياء 1	الاحياء 2	الأحياء 3	الاحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Courses	Sci 211	Bio 317	Gio321	Sci 201	Bio 222	Gio 211	Bio 102	Bio /211 215	Bio 217	Bio /316 318
Term										
1. pollution	0	1	2	73	21	13	0	0	0	0
2. water resources	0	0	0	0	0	6	0	0	0	0
3. marine pollution	0	0	1	0	5	0	0	0	0	0
4. prevent marine pollution	0	0	0	0	0	0	0	0	0	0
5. reduce marine pollution	0	0	0	1	1	0	0	0	0	0
6. floating plastic debris density	0	0	0	0	0	0	0	0	0	0
7. sustainably manage marine and coastal ecosystems	0	0	0	0	0	0	0	0	0	0
8. Minimize ocean acidification	0	0	0	0	0	0	0	0	0	0
9. protect marine and coastal ecosystems	0	0	0	0	3	0	0	0	0	0
10. improve ocean health	0	0	0	0	0	0	0	0	0	0
11. Enhance the conservation and sustainable use of oceans and their resources	0	0	0	0	0	0	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses	chem 102	chem211	chem215/214	chem317/315	chem 318
Term					
1. pollution	1	0	0	0	0
2. water resources	0	0	0	0	0
3. marine pollution	0	0	0	0	0
4. prevent marine pollution	0	0	0	0	0
5. reduce marine pollution	0	0	0	0	0
6. floating plastic debris density	0	0	0	0	0
7. sustainably manage marine and coastal ecosystems	0	0	0	0	0
8. Minimize ocean acidification	0	0	0	0	0
9. protect marine and coastal ecosystems	0	0	0	0	0
10. Improve Ocean health	0	0	0	0	0
11. Enhance the conservation and sustainable use of oceans and their resources	0	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses	Phys 102	Phys 217/210	Phys 218/219	Phys 311/312	Phys 313 /314	Phys 324
Term						
1. pollution	0	0	0	0	0	0
2. water resources	0	0	0	0	0	0
3. marine pollution	0	0	0	0	0	0
4. prevent marine pollution	0	0	0	0	0	0
5. reduce marine pollution	0	0	0	0	0	0
6. floating plastic debris density	0	0	0	0	0	0
7. sustainably manage marine and coastal ecosystems	0	0	0	0	0	0
8. Minimize ocean acidification	0	0	0	0	0	0
9. protect marine and coastal ecosystems	0	0	0	0	0	0
10. improve ocean health	0	0	0	0	0	0
11. Enhance the conservation and sustainable use of oceans and their resources	0	0	0	0	0	0

Goal 15 terms in secondary curricula

Name of the book	الجغرافيا الاقتصادية	تاريخ العالم الحديث والمعاصر	تاريخ البحرين الحديث والمعاصر	جغرافية الوطن العربي	الجغرافية الطبيعية	تاريخ العرب الحديث والمعاصر	قضايا ومشكلات معاصرة	جغرافيا الخليج العربي	الجغرافيا السكانية
Edition	2020	2020	2020	2020	2020	2020	2020	2020	2020
Courses	Soc 102	Soc 103	Soc203	Soc 210	Soc 211	Soc 213	Soc 214	Soc 221	Soc 312
Term									
1- Conservation sustainable use of ecosystems	0	0	0	0	0	0	0	0	1
2- Ecosystems degradation	0	0	0	0	0	0	0	0	0
3- Ensure the conservation terrestrial ecosystems	0	0	0	0	0	0	0	0	0
4- Ensure the conservation inland freshwater ecosystems	0	0	0	0	0	0	0	0	0
5- Ensure the restoration and sustainable use of terrestrial ecosystems and their services	0	0	0	0	0	0	0	0	0
6- Ensure the restoration and sustainable use of inland freshwater ecosystems and their services	0	0	0	0	0	0	0	0	0
7- Biodiversity	0	0	0	0	0	0	0	0	0
8- Ensure the biodiversity	0	0	0	0	0	0	0	0	0
9- The loss of biodiversity	0	0	0	0	0	0	0	0	0

Name of the book	الطاقة	الاحياء 5	الجيولوجيا 2	علوم البيئة	أساسيات علوم البحار	جيولوجيا 1	الاحياء 1	الاحياء 2	الاحياء 3	الاحياء 4
Edition	2011	2015	2011	2007	2003	2014	2020	2014	2014	2015
Courses	Sci 211	Bio 317	321 Gio	Sci 201	Sci 222	Gio 211	Bio 102	Bio /211 215	Bio 217	Bio /316 318
Term										
1- Conservation sustainable use of ecosystems	0	0	0	0	1	0	0	0	0	0
2- Ecosystems degradation	0	0	0	1	0	0	0	0	0	0
3- Ensure the conservation terrestrial ecosystems	0	0	0	0	0	0	0	0	0	0
4- Ensure the conservation inland freshwater ecosystems	0	0	0	0	0	0	0	0	0	0
5- Ensure the restoration and sustainable use of terrestrial ecosystems and their services	0	0	0	0	0	0	0	0	0	0
6- Ensure the restoration and sustainable use of inland freshwater ecosystems and their services	0	0	0	0	0	0	0	0	0	0
7- Biodiversity	0	0	0	14	0	0	0	0	0	0
8- Ensure the biodiversity	0	0	0	0	0	0	0	0	0	0
9- The loss of biodiversity	0	0	0	1	0	0	0	0	0	0

Name of the book	الكيمياء 1	الكيمياء 2	الكيمياء 3	الكيمياء 4	الكيمياء 5
Edition	2014	2020	2014	2015	2015
Courses	chem 102	chem211	chem 215/214	chem 317/315	chem318
Term					
1- Conservation sustainable use of ecosystems	0	0	0	0	0
2- Ecosystems degradation	0	0	0	0	0
3- Ensure the conservation terrestrial ecosystems	0	0	0	0	0
4- Ensure the conservation inland freshwater ecosystems	0	0	0	0	0
5- Ensure the restoration and sustainable use of terrestrial ecosystems and their services	0	0	0	0	0
6- Ensure the restoration and sustainable use of inland freshwater ecosystems and their services	0	0	0	0	0
7- Biodiversity	0	0	0	0	0
8- Ensure the biodiversity	0	0	0	0	0
9- The loss of biodiversity	0	0	0	0	0

Name of the book	الفيزياء 1	الفيزياء 2	الفيزياء 3	الفيزياء 4	الفيزياء 5	الفيزياء 6
Edition	2020	2014	2014	2015	2015	2011
Courses	Phys 102	Phys 217/210	Phys 219/218	Phys 311/ 312	Phys /313 314	Phys324
Term						
1- Conservation sustainable use of ecosystems	0	0	0	0	0	0
2- Ecosystems degradation	0	0	0	0	0	0
3- Ensure the conservation terrestrial ecosystems	0	0	0	0	0	0
4- Ensure the conservation inland freshwater ecosystems	0	0	0	0	0	0
5- Ensure the restoration and sustainable use of terrestrial ecosystems and their services	0	0	0	0	0	0
6- Ensure the restoration and sustainable use of inland freshwater ecosystems and their services	0	0	0	0	0	0
7- Biodiversity	0	0	0	0	0	0
8- Ensure the biodiversity	0	0	0	0	0	0
9- The loss of biodiversity	0	0	0	0	0	0

Arbitrators

- 1- DR. Khalid Salah Albaz (Education college -Ain shams University).
- 2- DR. Abdulhakim Ali Al-Mhidat (Arab open university).

Interviews responses

questions	Bapco	Alba	Garmco	Gpic
Bahrainization %	80%	83.5%	85%	90%
Does the company publish a report on the sustainable development goals?	yes	yes	no iso	yes
What are the difficulties that the company faces in achieving the sustainable development goals?	environmental knowledge	-Society's lack of awareness of the role of companies in achieving sustainable development goals. -Students' lack of awareness of the importance of submitting environmental suggestion with regard to developing current systems.	environmental awareness	Lack of knowledge of the basics of sustainable development goals related to the work environment
What suggestion do you consider necessary to develop the company and make it capable of achieving sustainable development goals?	Development of environmental curricula for industrial school	Developing secondary curricula and linking them to the environment	Integrating environmental awareness into secondary curricula	Increasing the period of practical training for students at the industrial school. Providing practical training for students at the secondary school.
What is the suggestion that help in educating vocational education graduates about the sustainable development goals?	Providing environmental courses for the industrial school	Teaching Environmental Effects (gases/liquids/solids) emissions	Providing foundational courses for security, safety and health within factories A training agreement between companies and schools so that the curricula are practically related to the work of companies	Development of vocational education curricula Ensure to apply the safety rules in industrial workshops
What are the skills that vocational	Emissions	Knowing: emissions	Safety and security skills	Safety and security skills

education graduates joining your work with to achieve the sustainable development goals?	Spills Asbestos environmental Cognitive skills Safety and Security	Effects on the environment Spills and their effects Emission reduction Climate change Reduce carbon dioxide. air quality Pollution results in the medium long term	discipline concentration on health Read the instruction	Environmental knowledge The impact of industrial companies on the environment and how to limit this impact
What majors do you think the vocational education graduate who is joining with you should be able to achieve the sustainable development goals?	soil air Waste management	Teaching environmental sciences for all tracks Develop a new specialization in the name of renewable energy (solar)	Integration of mecaelectronic disciplines Multi-skilled (welding, mechanics, electronics)	welding Electricity Precision devices pumps compressors (overall) Rotating equipment
What are the most important environmental issues that a graduate of vocational education who joins your work should know about?	Insulation Liquid Soil Asbestos Reduction industrial waste emissions and gases	environmental policies Climate change emissions ozone Spills	Aluminum industry (aluminum properties and interactions components rolling) Environmentally sound management of chemicals pollution Industrial reactions for each industry clean environment clean technology environmental awareness industrial sewage management	Waste Management (Solid / Liquid) Emissions and their impact on the environment Global and local environmental policies and laws (Supreme Council for the Environment)
What is your employment preference for students graduating from vocational education? Why?	diploma holder Ease to train more knowledge more discipline	diploma holder Ease to train more knowledge	diploma holder Ease to train Previous knowledge more discipline	diploma holder Ease to train Previous knowledge

Frequency and percentage for answers of the study members on the Knowledge sentences

Sentence	Yes	Don't Know	No
1. There is a relationship between environmental pollution and wasteful use of water and electrical.	57	17	16
	63.3%	18.9%	17.8%
2. There is <u>no</u> relationship between Using of some chemicals in industry and the erosion of the Ozone layer.	3	16	71
	3.3%	17.8%	78.9%
3. There is a relationship between greenhouse gas emissions and climate change.	55	25	10
	61.1%	27.8%	11.1%
4. There is <u>no</u> relationship between air pollution and high temperatures.	21	18	51
	23.3%	20%	56.7%
5. Knowledge of national policies for preserving the environment is important.	71	15	4
	78.9%	16.7%	4.4%
6. It's important to know international agreements to preserve the environment.	62	19	9
	68.9%	21.1%	10%
7. It is <u>not</u> important to know the sustainable development goals.	8	30	52
	8.9%	33.3%	57.8%
8. There is a relationship between water pollution and the death of fish stocks.	76	10	4
	84.4%	11.1%	4.4%
9. Using natural gas as an alternative of oil has a role in reducing greenhouse gas emissions.	42	39	9
	46.7%	43.3%	10 %

**Frequency and percentage for answers of the study members on the of the
Attitude sentences**

Sentence	Totally agree	Agree	Neutral	Disagree	Totally disagree
1. It is better to burial of waste than to use waste recycling technologies	8	5	25	19	33
	8.9%	5.6%	27.8%	21.1%	36.7%
2. It is better to dump industrial waste into the seas, as the seas are able to clean themselves.	2	1	2	14	71
	2.2%	1.1%	2.2%	15.6%	78.9%
3. It is better to landfill the coasts to build residential cities.	5	4	29	20	32
	5.6%	4.4%	32.2%	22.2%	35.6%
4. It is better to recycle waste	49	25	13	3	0
	54.4%	27.8%	14.4%	3.3%	0%
5. It is better to treat wastewater to use it for cultivation and urban afforestation.	57	22	11	2	0
	63.3%	24.4%	12.2%	2.2%	0%
6. It is better to use environmentally friendly materials in the industry	56	24	8	2	0
	62.2%	26.7%	8.9%	2.2%	0%
7. It is best to collect live plants in the camping season to use as fuel	7	11	40	19	13
	7.8%	12.2%	44.4%	21.1%	14.4%
8- It is better to combat illegal, unregulated and unreported fishing in order to preserve the sustainability of marine wealth.	39	21	24	3	3
	43.3%	23.3%	26.7%	3.3%	3.3%
9- It is better to reuse materials in the industry to reduce industrial waste	42	28	18	1	1
	46.7%	31.1%	20 %	1.1%	1.1%
10- It is better to use renewable energy to reduce greenhouse gas emissions.	34	29	26	1	0
	37.8%	32.2%	28.9%	1.1%	0%
	41	28	18	3	0

Sentence	Totally agree	Agree	Neutral	Disagree	Totally disagree
11- It is better to enact legislation to preserve the ecosystems life.	45.6%	31.1%	20%	3.3%	0%
12- It is better <u>not</u> to install filters for factory chimneys because the air is able to renew itself constantly	5	4	16	17	48
	5.6%	4.4%	17.8%	18.9%	53.3%
13- It is better <u>not</u> to set strict policies on pollution rates in the Kingdom of Bahrain to keep the wheel of industrial development.	10	6	32	20	22
	11.1%	6.7%	35.6%	22.2%	24.4%
14- It is better to teach topics about the environment in Bahrain schools.	40	35	11	4	0
	44.4%	38.9%	12.2%	4.4%	0%

**Frequency and percentage for answers of the study members on the of the
practice sentences**

Sentence	Always	Sometime	Never
1. I <u>don't</u> participate in a coastal clean-up campaign.	26	47	17
	28.9%	52.2%	18.9%
2. I keep the wild environment clean during the camping period	78	11	1
	86.7%	12.2%	1.1%
3. I <u>don't</u> sort household waste into glass / paper / other for recycling.	27	40	23
	30%	44.4%	25.6%
4. I participated in afforestation campaigns inside / outside the school	25	45	20
	27.8%	50%	22.2%
5. I practice agricultural activity	29	45	16
	32.2%	50%	17.8%
6. I use environmentally friendly bags instead of plastic bags	24	45	21
	26.7%	50%	23.3%
7. In my home, we use energy-saving lamps	50	31	9
	55.6%	34.4%	10%
8. In my home, we use energy-saving electrical appliances	36	47	7
	40%	52.2%	7.8%
9. I participate in educating others on rationalization water management	41	35	14
	45.6%	38.9%	15.6%
10. I participate in educating others on rationalization electricity management	43	36	11
	47.8%	40%	12.2%
11. I <u>don't</u> participate in guiding others to improve sanitation management.	19	37	34
	21.1%	41.1%	37.8%

الملخص

التعليم هو الطريق لتطوير المعارف والمواقف والممارسات التي يحتاجها الافراد لبناء مجتمعات مستدامة، لذلك اهتمت أهداف التنمية المستدامة بالتعليم وخصوصًا بالمناهج الدراسية، حيث تكرر المؤشر ذاته في كلا الهدفين 12 و13 وهو "مدى تعميم التعليم من أجل التنمية المستدامة في المناهج الدراسية". لذا يهدف هذا البحث إلى ادماج أهداف التنمية المستدامة البيئية في المدارس الثانوية بمملكة البحرين.

استخدمت الدراسة ثلاثة أساليب لجمع البيانات الأولية وهي: إجراء مقابلات مع مسؤولي البيئة في الشركات الصناعية، تحليل محتوى مقررات العلوم والدراسات الاجتماعية، وتطبيق استبانة لقياس الوعي البيئي على طلاب السنة الأولى 2021/2020 في تخصص الهندسة الكهربائية والميكانيكية في الدبلوم المشارك بجامعة البحرين كعينة بحث لخريجي المدارس الثانوية. وقد تم تحليل البيانات باستخدام تحليل المحتوى واستخدام حزمة SPSS للحسابات الاحصائية.

وفقًا لنتائج البحث، أظهر تحليل المحتوى أن كل من المقررات علم 201 وعلم 211 وأجا 211 وأجا 214 تحتوي على أعلى نسبة من المصطلحات البيئية المرتبطة بأهداف التنمية المستدامة، كما تبين وجود ارتباط بين المعرفة والمواقف والممارسات، بينما لا يوجد أي تأثير لمستوى تعليم الوالدين أو تخصص الطالب في المدرسة الثانوية سواء (علمي أو صناعي) على الوعي البيئي للطلبة. كما تشير النتائج إلى أن المعرفة البيئية الحالية تتركز في مستوى المعرفة دون أن تتطور إلى مواقف والممارسات بيئية. مما يؤكد الحاجة إلى تصميم برامج بيئية إثرائية على صورة أوراق عمل تركز على أساليب التعليم والتعلم التفاعلية مثل التعلم القائم على المشاريع، وحل المشكلات، والفيديو، والقصص الرقمية، والتعلم خارج الفصل الدراسي، ورحلات الميدانية إلى الشركات وحملات تنظيف البيئة.

الكلمات المفتاحية: البيئة، التنمية المستدامة، الوعي البيئي، المدارس الثانوية، البحرين.

جامعة البحرين

كلية العلوم

برنامج البيئة والتنمية

المستدامة



نحو إدماج أهداف التنمية المستدامة البيئية في المدارس الثانوية بمملكة البحرين

مخطط بحث لإستكمال متطلبات الحصول على درجة دكتوراه
الفلسفة في البيئة والتنمية المستدامة

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نوفمبر 2023