

The Role of Saudi Universities in Spreading the Culture of Green Education in Light of the “Green Saudi Initiative”

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Abstract: In this paper, we analyze the role of Saudi universities in promoting green education culture and identified obstacles and ways to overcome them. A questionnaire was used to gather data from 383 students from various universities. Results showed that green education culture in Saudi universities was rated as average, while obstacles were rated high. Ways to overcome these obstacles were also rated high. Gender, university, and academic level did not significantly affect the results. Recommendations included offering specialized courses on environmental culture, employing student activities focused on environmental issues, and implementing a renewable energy management project in Saudi universities.

Keywords: green education - Saudi universities - Green Saudi Initiative.

1 Introduction

The strength of nations is no longer measured by their natural resources, but by the human minds they possess, capable of engineering knowledge and producing creative solutions to problems, thus achieving a high level of national intellectual income that contributes to the progress of countries in all fields. Therefore, the development of the educational system in our current era has become a continuous necessity, in order to prepare a generation proficient in thinking skills, capable of continuous self-learning, leading to achieving sustainable development, which is achieved through green education.

In the context of caring for the ecosystem, avoiding industrial pollutants, and rationalizing the increasing energy consumption, the symbolism and slogan of green or eco-friendliness emerged, such as green buildings, green transportation, green agriculture, green hydrogen, green education, and other terms. The economies of advanced countries have already begun to adopt technologies, applications, behaviors, and tools aimed at preserving the environment and contributing to reducing the burden on education ministries materially and temporally, reaching the learner. Recently, the term "greening of curricula" and "greening of education" have emerged as future projects aimed at green education (Abdulatif et al., 2021: p. 83).

Protecting the environment has become a priority for countries, communities, and individuals alike, due to its direct and indirect impact on our lives. The environment with all its elements and components of water, air, plants, animals, inanimate objects, and others affects human life, health, livelihood, and quality of life. Any defects that occur in it can lead to many problems and disasters that may extend for decades and sometimes centuries (Al-Jiyar, 2019: p. 85).

Therefore, the Kingdom of Saudi Arabia has worked towards green education as a means of achieving sustainable development, and the university as a societal institution is not required to remain idle or isolated from the community but is required to contribute to its societal duty by participating with the government in achieving its developmental policies and education and economic orientations. Additionally, Saudi universities should be directed to benefit from international universities and their experiences in this regard to achieve the requirements of green education (Mahmoud, 2018: p. 9).

Hence, it can be said that green education has become a necessity in the field of contemporary higher education. The current era is characterized by multiple challenges related to the environment and sustainable development. Hence, young people must be prepared so that they can adapt to a world surrounded by these challenges. Hence the importance of the role of Saudi universities in spreading the culture of green education among their students.

The study Problem:

In light of the contemporary world's shift towards achieving sustainable development and integrating green thinking in various fields, the spread of green culture has become an urgent need in modern societies. Therefore, the role of educational institutions, especially universities, in promoting green education culture is of great importance. Some recent studies have emphasized the need to activate the role of educational institutions in promoting green education culture. For example, as indicated by a study by Abdelhamid (2022), concerned educational institutions must launch national programs towards the transition to green education based on a specific timeline. This is in addition to the necessity of coordinating with ministries

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and entities concerned with sustainable development, supporting non-governmental organizations and companies in experimenting with green education.

Another study by Al-Qudra (2022) emphasized the importance of supporting green education and linking it to achieving sustainable development goals. The results of the study showed that green educational institutions are an educational tool for achieving sustainable development, and therefore, they are an urgent environmental and global educational necessity to confront environmental challenges. The study also stressed the importance of integrating green culture into educational curricula. These results are in line with a study by Suleiman (2021), which emphasizes the need to develop future visions for planning to enhance digital green education skills for students.

It is important not to overlook the challenges that may surround the promotion of green education in educational institutions. As indicated by a study by Attallah (2021), these challenges include the lack of necessary material and human resources to enable educational institutions to carry out activities and practices that promote green education culture, as well as the weak motivation of lecturers to engage in such activities, especially if they are not related to the content of educational curricula.

Through the previous discussion, the research problem that the study seeks to address emerges. Despite the important role of educational institutions in promoting a culture of green education, achieving this goal is still surrounded by various material and human challenges. The current study aims to address this gap by focusing on the role of universities in spreading the culture of green education, with a focus on the Saudi context represented by Saudi universities and the requirements for achieving the goals of the Green Saudi Initiative. By addressing this topic, it is possible to shed light in a more comprehensive way on the role of universities in spreading this culture, the obstacles surrounding that, and the possible and appropriate way to deal with these obstacles.

Study questions:

- What is the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative?
- What are the obstacles to Saudi university students' awareness of obstacles to promoting a culture of green education in light of the Green Saudi Initiative?
- What are the ways to overcome the obstacles to promoting a culture of green education in Saudi universities in the light of the Green Saudi Initiative?
- Are there statistically significant differences at the significance level (0.05) between the mean estimates of the sample members due to the study variables (gender, university, academic level)?

Study Objectives:

The current study aimed to achieve several objectives, including the following:

- Identify the current role of Saudi universities in promoting a culture of green education among their students in light of the Green Saudi Initiative.
- Shed light on the perceptions of Saudi university students regarding the obstacles to promoting a culture of green education in light of the Green Saudi Initiative.
- Determine the significance of differences, at a significance level of ($\alpha \leq 0.05$), from the perspective of students towards the reality of promoting a culture of green education according to variables (gender, university, academic level).
- Identify mechanisms to activate the role of Saudi universities in promoting a culture of green education among their students in light of the Green Saudi Initiative.

Importance of the Study:

The importance of the current study is highlighted in the following:

It coincides with the Kingdom's commitment to addressing environmental issues and sustainable development, which emphasizes the support of efforts aimed at maintaining global energy security and protecting the environment for future generations in the Kingdom.

It aligns with the strategic projects of the state: the Green Saudi Initiative, the Middle East Green Initiative - Saudi Arabia's Vision 2030, and the essential contributions that the Kingdom can make to protect the environment and address the challenges of climate change, which contributes to the development of a green economy and building a more sustainable future.

The importance of developing new "educational policies" that make green education a way to improve the quality of life and protect the environment for future generations in the Kingdom, and to be comprehensive to the university's vision and mission.

The essential role that the university can play in collaborating with bodies and institutions to promote climate action and engage stakeholders in the public and private sectors to achieve climate goals, which helps increase the awareness of Saudi university students about the concept of green education and develop their abilities to protect the environment, transform the energy sector, and innovative sustainability programs for building a green future.

Attempting to provide mechanisms that contribute to addressing environmental issues and sustainable development, which benefits university decision-makers in developing strategies and identifying requirements for employing green education in the university environment.

Scope of the Study:

The current study is limited in its objective aspect to studying the role of Saudi universities in promoting a culture of green education in light of Saudi Vision 2030 and the Green Saudi Initiative, and its implications for achieving sustainable development. It is also limited in its human and spatial scope to Saudi university students, where each of Tabuk University, Jazan University, King Abdulaziz University, King Faisal University, and Prince Sattam bin Abdulaziz University was selected, including both males and females, during the first semester of the academic year 1444 AH.

Study Terminology:

Green Education:

Green Education is a modern term that refers to a new type of education that serves the environmental field. It is also referred to as greening, greening education, and it is a modern education that keeps up with development to achieve full benefit from the educational process and to produce distinctive outputs according to environmentally friendly standards that seek sustainable development that preserves the environment and guides the use of technologies and applications in an environmentally and economically sound manner (Halib, 2018: p. 38). In this study, the culture of green education is defined operationally as all the efforts made by universities to achieve sustainable development, keep up with technological development, and efficiently utilize it in all elements of the educational process to produce distinctive outputs according to environmentally friendly standards. Thus, it develops two aspects: the aspect related to environmental programs of buildings, energy, landscaping, and services, and the other aspect focuses on the educational process with technologies, applications, strategies, and practices related to the concept of green education.

Green Saudi Initiative:

The Green Saudi Initiative 2030 is an ambitious Saudi national initiative launched in 2021, aimed at improving the quality of life and protecting future generations. The initiative aims to increase the Kingdom's reliance on clean energy, expand green cover, reduce carbon emissions, protect the environment, and combat climate change, all in line with the Vision 2030 plan.

Green Education:

Green Education is a developmental process characterized by continuity and primarily focused on future roles in light of new developments. It serves as a starting point for educational reform and addresses effective education, methods, procedures, and tools that should be employed in different educational situations based on theoretical knowledge and scientific research to preserve the green environment (Sulaiman, 2021: p. 2978).

Green education culture can be described operationally as a transformative process that equips teachers, students, and faculty members with new knowledge and thinking methods to achieve economic prosperity and responsible citizenship while maintaining the safety of the life systems on which human life depends.

The Theoretical Framework of the Study:

Individuals' awareness of environmental needs, their understanding of the environment's components and relationships, as well as their awareness of environmental issues and ways of dealing with them, are fundamental needs for achieving environmental awareness. This awareness is achieved through natural life experiences and educational practices. Interest in the environment has increased due to the growing environmental problems and issues that have prompted the need to develop environmental awareness among individuals and groups, so that they can acquire responsibility, knowledge, and awareness towards their environments, in their quest for gains and needs and control of resources, tend to engage in many activities that are harmful to the environment, whether intentionally or unintentionally. Therefore, it was necessary to find solutions to this problem, which is worsening day by day, and hence the importance of green education.

Green education adopts green energy, which is the product of renewable energy, and aims to conserve energy sources and their uses, conserve water consumption and management safely, create what is known as green jobs, green production, and green growth, in order to achieve balance and harmony between education, environment, and society, hoping to alleviate the severity of environmental, economic, and social crises and achieve development that meets the needs of the present without infringing on the rights of future generations to live in a safe and better life (Al-Jayar, 2019: p. 88).

Green education is not limited to a particular specialty, but there are many specialties that should be taken care of, employed, and integrated to contribute to the efforts aimed at applying this concept. These specialties include humanities such as education, and others related to natural sciences such as engineering, as well as information technology, and all of them integrate to apply and achieve this concept in the real world (Mohammed, 2017: p. 44).

Based on what has been discussed, it is clear that green education is a method or approach to education that focuses on addressing environmental challenges and achieving sustainable development. Green education involves encouraging the green transformation in various aspects of life, with the aim of ensuring sustainability and development for current and future generations.

Benefits of green education:

Green education leads to improving human well-being and reducing social disparities in the long term. It also helps to reduce the risks of future generations being exposed to the degradation of environmental systems. The shift towards green education can be seen as a fundamental means to achieve sustainable development and progress. Economic development becomes more efficient in resource use, and less reliant on the depletion of natural resources, while pollution is reduced. Thus, green education becomes a valuable tool in addressing many global problems such as poverty, environmental issues, climate change, and biodiversity loss (Mohammed, 2017: p. 35-36).

Through the implementation of green education, many opportunities are provided to enable teachers, students, and faculty members to apply the concept of sustainability in a practical manner. Green education involves raising students' awareness about energy conservation, water conservation, solid waste management, and environmental preservation practices (Geng et al., 2013, 6).

From what has been discussed, it is clear that green education has many positive impacts on university students and society as a whole. Green education represents a means of spreading awareness in the community about environmental issues and sustainability. In light of the contemporary world's environmental and developmental challenges, generating those positive effects has become an urgent necessity rather than just a positive or desirable outcome.

Objectives of green education:

Given the close relationship between education and society and its active role in addressing its problems in all economic, social, and environmental fields, educational systems and institutions in some countries have adopted new environmentally friendly terms, mechanisms, and models, including green education. This is in hopes of reducing risks and threats and improving the quality of human life (Al-Jayar, 2019: p. 86).

One of the main objectives of green education is to regularly organize educational programs at universities in order to build and enhance public awareness of environmental sustainability concepts (Parvez & Agrawal, 2019, 83). Green education aims to promote education and culture while taking into account environmental changes, social and cultural dimensions, and adopting all creative, innovative alternative ideas and initiatives to eliminate traditional outdated ideas that have no benefit and achieve sustainability by constantly directing thinking towards fighting poverty and eliminating it, by providing green and decent living opportunities for members of society (Al-Haiti, 2022: p. 123).

From the above, it can be said that green education aims to spread awareness in the community about behaviors and practices related to environmental conservation. Green education adopts a long-term perspective, aiming to bring about a transformation in society to become environmentally friendly in all aspects of life. Therefore, green education aims to achieve sustainability for natural environments and ensure that future generations are not deprived of opportunities to achieve development and sustainability.

The role of Saudi universities in promoting green education:

To promote green education among students, universities must apply the concept of sustainability in education. By employing a mix of formal and informal teaching methods in this regard, universities can inspire students to become responsible individuals and expand their social responsibility in order to achieve sustainability (Zhao & Zou, 2015, 496).

Saudi universities have given great importance to protecting the environment, natural resources, and reducing pressure on them, as environmental protection has become a protection for life on earth, in order to ensure the right of future generations to those resources, to reap the benefits of sustainable development, and to maintain the health of individuals. Universities make a

lot of efforts to protect the environment by clarifying the negative effects of factory waste and pollution, and therefore have turned to integrating green education into their curricula. Green education is one of the mechanisms of sustainable development and a means of preserving the environment (Al-Ameri & Al-Owaidi, 2022: p. 293).

As Saudi universities strive to improve the education process by linking their academic outputs of human resources with the needs and requirements of society and the job market, there may be graduates in fields that are no longer in demand or needed by the job market, while other fields are in demand but may suffer from a shortage of qualified and skilled individuals. This requires good planning to enhance green education skills in universities and spread this culture widely (Mahmoud, 2018, 226).

From this, it can be said that Saudi universities have sought to promote a culture of green education by introducing changes in their organizational and educational practices. Saudi universities have updated their policies and strategies to align with the requirements of achieving this goal. With the Saudi universities' pursuit of achieving the ambitious Vision 2030 goals, it is expected that they will exert more efforts in the coming years to contribute to spreading the culture of green education.

The researcher believes that the culture of green education represents an important means through which sustainability can be achieved and enhanced in society. It begins by promoting awareness among students about green education and its importance in addressing environmental challenges, and it ends by achieving sustainability in society. Figure 1 illustrates the relationship between green education and achieving sustainability.

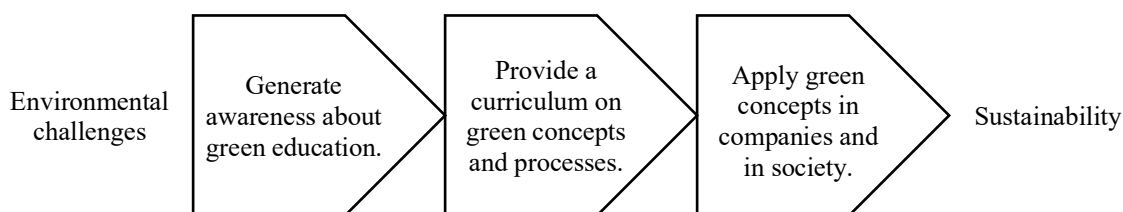


Fig. 1: The role of green education in achieving sustainability in society.

Source: (Aithal & Rao, 2016, 796).

Therefore, it can be said that universities can achieve many outputs to support green jobs in society. Universities can prepare their graduates to fill types of jobs and specializations that were not as important in the recent past as they are today. Universities have increasingly realized the importance of green education as a component of achieving sustainable development in societies. This has driven universities to equip their students with the appropriate skills and competencies to adapt to the professional and job requirements in an era characterized by a green transformation in various fields and specializations. Therefore, it is important for universities to continue updating their educational and organizational policies to be able to provide outputs that are compatible with the needs of green jobs in contemporary job markets.

Barriers to spreading the culture of green education:

Several conferences have pointed out a shortage of skills among university students, especially in the field of renewable energy. Therefore, universities need to develop their university education programs in the field of green education. Reports from the International Labour Organization have also highlighted a lack of focus on developing green skills in formal education. This calls for directing university programs towards green education to improve the specifications of graduates to meet the requirements of this type of education, which aims to achieve sustainable development (Jamaluddin, 2015, 678).

The most important barriers to implementing green education within Saudi universities are (Al-Mohammadi et al., 2015, 347):

1. Green education methods and approaches require a greater effort and time commitment from faculty members, which can affect their productivity and scientific activity.
2. The large number of students in each class causes a shortage of faculty members to follow up on green education activities assigned to students as part of their curriculum.
3. Faculty members' lack of green education skills negatively impacts their assessment practices.
4. Some faculty members are loyal to traditional teaching methods and resist changing them, refusing to replace them with advanced modern methods.
5. Fear of student complaints and their struggles with modern activities can cause faculty members to be lenient in their teaching practices.

In addition to these barriers, green education faces many other challenges, such as weak enforcement of environmental laws and regulations and a lack of necessary modern skills and experiences to implement green education. Additionally,

there is a shortage of financial resources to invest in the transition from traditional education to green education, along with a lack of suitable modern technology for transitioning to green education practices (Mahmoud, 2018, 9).

Therefore, it can be said that the barriers to spreading a culture of green education largely stem from the novelty of green concepts. Therefore, incorporating green education concepts and practices into universities may require significant changes in organizational and teaching culture across different levels.

Ways to overcome the challenges of spreading a culture of green education include:

One of the most important requirements for overcoming the challenges of spreading a culture of green education is to apply the concept of the green university. This concept is based on the idea of using sustainability in education, and by implementing this concept, the university should apply formal and informal methods for green education. The university should also prepare students to become responsible citizens and expand its social responsibility to achieve and activate the concept of sustainability. The concept of the green university focuses on several aspects, such as green curricula, green training, and green learning environments (Shahriari et al., 2020, 339).

The challenges of promoting green education culture can be overcome by involving students in environmental activities such as forming an environmental club, encouraging them to participate in planning and celebrating Earth Day, having them visit the gardens within the university, contributing to the evaluation of energy usage in their universities, or advocating for energy and water efficiency in their schools, homes, and communities in general. In addition, directing research institutions such as the College of Education and various educational research centers towards conducting further research that ensures the analysis of the content of study curricula to determine what environmental values should be included (Abdullatif et al., 2021: p. 104).

Furthermore, ways to overcome the challenges of spreading a culture of green education include (Sulaiman, 2021, 3004):

- 1 Using strategies to link environmental awareness, building skills, and responsible performance, to make informed, effective, and responsible decisions based on scientific foundations to build students' skills that enable them to keep up with market demands.
- 2 Preserving the environment and its resources and raising awareness of environmental issues through creating qualified individuals to work and raising their productivity towards environmental issues to achieve sustainability in all sectors of society, and transferring knowledge related to the environment by promoting environmentally friendly behaviors that help them develop their relationship with the environment.
- 3 Using new technological innovations, methods, and modern educational techniques that rely on the Internet of information and knowledge, which enable the student to use personal devices without the need for computer labs and virtual labs to deliver educational content to students during the learning process.
- 4 Providing an academic infrastructure that is friendly to the environment, aimed at sustainable environmental and economic development, and achieving green digital citizenship.

Based on what has been discussed, it can be said that addressing the many challenges surrounding the spread of a culture of green education primarily depends on involving various stakeholders and entities concerned with achieving sustainability goals and preserving the environment. These stakeholders include university employees, students, as well as any external organizations or entities that can contribute to supporting the role of universities in spreading green education.

Previous studies:

Previous studies have aimed to identify the role of Saudi universities in developing environmental awareness among their students and to explore the relationship between the actual role of universities in developing environmental awareness among students and their level of awareness of sustainable development. The study by Alotaibi (2022) had a sample of 384 individuals and used a descriptive methodology, relying on a questionnaire as a research tool. The study found that the actual role of Saudi universities in developing environmental awareness among students was high, with university administration playing the leading role, followed by faculty members, while student activities came in third place, and university courses in fourth place. The study also found no statistically significant differences between the responses of the study sample based on gender or university.

The study by Alsayed (2021) aimed to identify and examine the opinions of Saudi university leaders on the most important responsibilities that Saudi universities should undertake to achieve environmental sustainability and to uncover the current status of their practice of these responsibilities. The study had a sample of 181 university leaders and used a descriptive survey methodology, relying on a questionnaire as a research tool. The study found that Saudi universities practice their responsibilities towards environmental sustainability to a moderate degree that tends towards weakness. The study also found no statistically significant differences between the responses of the study sample based on the variables of leadership

position or academic degree.

The study by Al-Sheti (2020) aimed to identify the role of Saudi universities in aligning higher education with the requirements of sustainable development in accordance with the Vision 2030, from the perspective of administrative leaders at Qassim University. The study had a sample of 80 administrative leaders at Qassim University in Saudi Arabia, and used a descriptive-analytical methodology, relying on a questionnaire as a research tool. The study found that the sample agreed to a moderate degree on the items related to the role that Saudi universities can play in aligning their educational outputs with the requirements of sustainable development. Additionally, there were statistically significant differences in the responses of the administrative leaders in Qassim University based on gender in the axis of scientific consultations, scientific projects, and scientific research quality.

The study by Zhao and Zou (2015) examined the green university initiatives in China using Tsinghua University as a case study. The study had a sample of Tsinghua University in China, and used a case study methodology, relying on observation, analysis of archival records, annual reports, and statistical information related to Tsinghua University as research tools. The study found that Tsinghua University used the principle of the "green university" and dimensions of "green education, green research, and green campus" to formulate its green initiatives. The study also found that the green university initiative faced several challenges such as ignoring social justice, scattered coordination efforts, and lack of effective communication and evaluation mechanisms. The green university initiative at Tsinghua University led to the promotion of green university initiatives at the national level and increased awareness of sustainability among faculty, students, and staff.

The study by Sadati (2014) aimed to examine and evaluate the level of environmental awareness among university students, their understanding and knowledge of the environment around them, and the extent of the application of green education in the university. The study had a sample of 150 students at Eastern Mediterranean University in Northern Cyprus, and used a quantitative methodology based on a questionnaire as a research tool. The study found that the level of environmental awareness and environmental knowledge among students was low, and the university was committed to implementing the green education agenda to a low degree. Additionally, there were no differences in the levels of environmental awareness and environmental knowledge among students based on gender.

Methodological procedures of the study:

The study followed a descriptive-analytical methodology that is suitable for the nature and objectives of the study. The procedures included designing a questionnaire to survey the opinions of Saudi university students about the role of Saudi universities in promoting green education in light of the Green Saudi Initiative.

Study population and sample:

The current study community includes all students from Taibah University, Jazan University, King Abdulaziz University, King Faisal University, and Prince Sattam bin Abdulaziz University for the academic year (1444 AH). The study sample consisted of (383) male and female students from various academic levels to represent the study community.

The frequencies and percentages of the research sample were calculated according to gender, university, and academic level.

1. Distribution of respondents by gender:

Table 1: shows the distribution of the sample individuals by gender.

N	Gender	Frequency	percentage
1	Male	164	42.8%
2	Female	219	57.2%
Total		383	100.0%

It is clear from Table (1) that (42.8%) of the respondents are males, while (57.2%) of the respondents are females.

2. Distribution of respondents by university:

Table 2: Distribution of respondents according to the university.

N	University	Frequency	Percentage
1	Tabouk university	48	12.5%
2	Jizan University	69	18.0%
3	King Abdulaziz University	116	30.3%
4	King Faisal University	84	21.9%
5	Prince Sattam University	66	17.2%
Total		383	100.0%

Table (2) shows that (12.5%) of the respondents belong to Tabuk University, while (18.0%) of the respondents belong to Jizan University, while (30.3%) of the respondents belong to King Abdulaziz University, while (21.9%) of the respondents belong to King Abdulaziz University. %) of the respondents belong to King Faisal University, while (17.2%) of the respondents belong to Prince Sattam University.

3. Distribution of respondents according to the educational level:

Table 3: Distribution of respondents according to the educational level.

N	Academic level	Frequency	Percentage
1	Bachelor's	215	56.1%
2	Master's	115	30.0%
3	Ph.D.	53	13.8%
Total		383	100.0%

Table (3) shows that (56.1%) of the respondents are studying at the bachelor's level, while (30.0%) of the respondents are affiliated with studying at the master's level, while (13.8%) of the respondents are affiliated with studying at the doctoral level.

Study tool:

After reviewing the educational literature and previous studies related to the subject of the research, the researcher built and developed a questionnaire with the aim of identifying the role of Saudi universities in spreading the culture of green education in the light of the "Green Saudi Initiative".

Validity of the study tool:

1) Sincerity of Internal Consistency:

a) The validity of internal consistency

The sincerity of the internal consistency was calculated according to the responses of the respondents of the survey sample, n = (30), by calculating the Pearson correlation coefficient between the scores of each statement and the total degree of the axis to which the statement belongs from the questionnaire axes, as its results are shown in Table No. (4) following:

Table 4: Pearson correlation coefficients between the scores of each statement and the total score of the axis to which the statement belongs from the questionnaire axes

The first axis: the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative					
Paragraph number	Correlation coefficient	Paragraph number	Correlation coefficient	Paragraph number	Correlation coefficient
1	.594**	6	.770**	11	.712**
2	.586**	7	.617**	12	.670**
3	.582**	8	.688**	13	.565**
4	.631**	9	.723**	14	.799**
5	.793**	10	.794**	15	.685**
The second axis: Obstacles to spreading the culture of green education in Saudi universities					
1	.712**	5	.754**	9	.718**
2	.696**	6	.721**	10	.764**
3	.726**	7	.669**		
4	.728**	8	.738**		
The third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities					
1	.716**	5	.802**	9	.609**
2	.801**	6	.726**	10	.791**
3	.787**	7	.802**		
4	.575**	8	.737**		

** Statistically significant at the significance level (0.01)

* Statistically significant at the significance level (0.05)

It is clear from the previous table (4) that the correlation coefficients of the expressions with the total degree of the axis to which the phrase belongs from the axes of the questionnaire were all statistically significant at the level of significance

(0.01), and all the values of the correlation coefficients were high values, as they ranged in the first axis: the reality of green education culture in Saudi universities in light of the Green Saudi Initiative between (.565**-.799**); While the correlation coefficients ranged in the second axis: obstacles to spreading the culture of green education in Saudi universities between (.669**-.764**); In the third axis, ways to overcome obstacles to spreading the culture of green education in Saudi universities ranged between (.609** - .802**), which indicates the availability of a high degree of validity of the internal consistency of the axes and expressions of the questionnaire.

b) The general structural validity of the questionnaire axes:

The constructive validity of the questionnaire axes was verified by finding correlation coefficients between the total score for each axis and the total score of the questionnaire, and its results are shown in the following table:

Table 5: Correlation coefficients between the total score for each axis and the total score for the questionnaire

N	Axis	Correlation coefficient
1	The first axis: the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative	.985**
2	The second axis: Obstacles to spreading the culture of green education in Saudi universities	.905**
3	The third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities	.890**

** Statistically significant at the significance level (0.01)

* Statistically significant at the significance level (0.05)

It is clear from the previous table (5) that the values of the correlation coefficients for the axes of the questionnaire with the total score of the questionnaire came with high values, as they ranged between (.890**-.985**), and they were all statistically significant at the level of significance (0.01); Which indicates the availability of a high degree of constructive validity for the axes of the questionnaire.

2) The stability of the resolution

Table 6: Cronbach's alpha stability coefficients for the axes of the resolution

N	Dimension	Number of paragraphs	Cronbach's alpha coefficient
1	The first axis: the reality of the culture of green education in Saudi universities in light of the Green Saudi Initiative	15	.925
2	The second axis: Obstacles to spreading the culture of green education in Saudi universities	10	.966
3	The third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities	10	.971
Total		35	.958

It is clear from the previous table (6) that the values of the stability coefficients for the resolution axes came with high values, as the values of the stability coefficients for the resolution axes ranged between (.925-.971), and the value of the total stability coefficient for the resolution axes was (.958); These values of stability coefficients indicate the validity of the questionnaire for application and the reliability and reliability of its results.

Presentation and discussion of the first question: "What is the reality of the culture of green education in Saudi universities in light of the Green Saudi Initiative"?

To answer this question, the arithmetic mean and standard deviation were calculated for each of the dimensions of the first axis (the reality of green education culture in Saudi universities in light of the Green Saudi Initiative), and then arranged these dimensions in descending order based on the arithmetic mean, as shown in the following table No. (7):

Table 7: The reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative

N	Dimension	Arithmetic mean	Standard Deviation	Rank	Response Rate
1	The first dimension: Building students' abilities and skills according to the principles of green education	3.41	.819	1	Medium
2	The second dimension: scientific research and creativity according to the principles of green education	3.32	.908	2	Medium

3	The third dimension: serving the local community according to the principles of green education	3.16	.875	3	Medium
The total score for the first axis, "The reality of green education culture in Saudi universities in the light of the Green Saudi Initiative		3.30	.756	--	Medium

Table (7) indicates that "the reality of green education culture in Saudi universities in light of the Green Saudi Initiative" received a moderate score, with an overall mean of the first axis (3.30) and a standard deviation of (.756). The standard deviations of the dimensions of the first axis ranged from (.819-.908), which are low values, indicating the homogeneity of the sample individuals' opinions on the dimensions of the first axis.

The first dimension, "building students' capacities and skills based on green education principles," ranked first with an arithmetic mean of (3.41) and a standard deviation of (.819). The second dimension, "scientific research and innovation based on green education principles," ranked second with an arithmetic mean of (3.32) and a standard deviation of (.908). The third dimension, "serving the local community based on green education principles," ranked third with an arithmetic mean of (3.16) and a standard deviation of (.875).

The researcher believes that the moderate response to "the reality of green education culture in Saudi universities in light of the Green Saudi Initiative" may be attributed to the universities' focus on the academic process and developing the educational process to achieve benefits for the job markets in various fields after graduating university students, which does not make the universities' interest in green education culture essential compared to the educational process itself.

This result is consistent with the findings of Mr. (2021), who concluded that Saudi universities practice their environmental sustainability responsibilities to a moderate extent, leaning towards weakness.

However, this result differs from the findings of Al-Otaibi's study (2022), which indicated that the reality of Saudi universities' role in developing students' environmental awareness is high.

To answer the second question, "What are the obstacles to promoting green education culture in Saudi universities?" the arithmetic means and standard deviations were calculated for each item of the second axis, "Obstacles to promoting green education culture in Saudi universities," and those items were ranked in descending order based on the arithmetic mean, as shown in Table (8) below.

Table 8: Frequencies, percentages, arithmetic averages, and standard deviations of the respondents' responses about obstacles to spreading the culture of green education in Saudi universities

The phrase		Response Rate					Arithmetic mean	Standard Deviation	Rank	Response Rate	
			Very low	low	Medium	high					Very high
8	Scarcity of a training unit within universities to facilitate green education activities for students	m	0.0	18	56	180	129	4.10	.815	1	high
		%	0.0	4.7	14.6	47.0	33.7				
5	Lack of interest of university administrations in documenting cooperation agreements with civil society organizations to spread the culture of green education	m	0.0	22	61	157	143	4.10	.869	2	high
		%	0.0	5.7	15.9	41.0	37.3				
4	The scarcity of conviction of the benefits of green education by the competent authorities, and therefore the lack of support for the implementation of its activities	m	5	22	61	153	142	4.06	.936	3	high
		%	1.3	5.7	15.9	39.9	37.1				
10	Resistance to change by some universities	m	5	18	83	143	134	4.00	.935	4	high
		%	1.3	4.7	21.7	37.3	35.0				
3	Lack of spread of green education culture among Saudi university students	m	0.0	19	86	171	107	3.96	.838	5	high
		%	0.0	5.0	22.5	44.6	27.9				
6	The scarcity of educational and social media participation in spreading the culture of green education	m	0.0	25	120	118	120	3.87	.934	6	high
		%	0.0	6.5	31.3	30.8	31.3				

1	Scarcity of interest in using modern technology in the applications of green education activities	m	8	27	100	156	92	3.78	.961	7	high
		%	2.1	7.0	26.1	40.7	24.0				
7	Scarcity of training strategies that can keep pace with the educational environment in green education in universities and achieve its goals	m	13	28	110	145	87	3.69	1.010	8	high
		%	3.4	7.3	28.7	37.9	22.7				
2	Scarcity of financial allocations necessary to implement green education activities in universities	m	4	46	85	185	63	3.67	.925	9	high
		%	1.0	12.0	22.2	48.3	16.4				
9	Lack of trained cadres that help university students implement green education activities	m	33	79	79	138	54	3.26	1.187	10	Medium
		%	8.6	20.6	20.6	36.0	14.1				
The total arithmetic mean for the second axis, "Obstacles to spreading the culture of green education in Saudi universities"								3.84	.578	---	high

From Table (8), it is evident that the obstacles to promoting green education culture in Saudi universities received a high score from the study sample individuals, with an overall mean of the third axis (3.84) and a standard deviation of (.578). The standard deviations of the third axis statements ranged from (.815-1.010).

The first-ranked statement was (8) "The scarcity of a training unit within universities to facilitate green education activities for students," with an arithmetic mean of (4.10) and a standard deviation of (.815). The second-ranked statement was (5) "The lack of interest of university administrations in documenting cooperation agreements with civil society institutions to promote green education culture," with an arithmetic mean of (4.10) and a standard deviation of (.869). The last-ranked statement was (9) "The shortage of trained personnel who assist university students in implementing green education activities," with an arithmetic mean of (3.26) and a standard deviation of (1.187). The remaining statements of the third axis received a high response.

The researcher believes that the high score obtained by the obstacles to promoting green education culture in Saudi universities may be attributed to the lack of focus on embedding green education principles within university curricula and the failure to communicate with media institutions that play a role in promoting green education culture in educational and community environments.

This result is consistent with the findings of Zhao and Zou's study (2015), which concluded that the green university initiative faces several challenges, such as ignoring social justice, scattered coordination efforts, and a lack of effective communication and evaluation mechanisms.

To answer the third question, "What are the ways to overcome the obstacles to promoting green education culture in Saudi universities?" the arithmetic means and standard deviations of each statement of the third axis, "Ways to overcome the obstacles to promoting green education culture in Saudi universities," were calculated, and those statements were ranked in descending order based on the arithmetic mean, as shown in Table (9) below.

Table 9: Frequencies, percentages, arithmetic averages, and standard deviations of the respondents' responses on ways to overcome obstacles to spreading the culture of green education in Saudi universities

The phrase		Response Rate					Arithmetic mean	Standard Deviation	Rank	Response Rate	
		Very low	low	Medium	high	Very high					
3	The need to establish a green education research unit in universities to conduct more research in this context and benefit from it	m	0.0	13	15	139	216	4.46	.729	1	Very high
		%	0.0	3.4	3.9	36.3	56.4				

7	Presentation of a project for renewable energy management in Saudi universities	m	0.0	0.0	41	160	182	4.37	.669	2	Very high
		%	0.0	0.0	10.7	41.8	47.5				
10	Publishing pamphlets and advertisements about the Green Saudi Initiative in universities	m	4	8	25	151	195	4.37	.785	3	Very high
		%	1.0	2.1	6.5	39.4	50.9				
8	The participation of civil society organizations to implement external student activities with the aim of greening the desert spaces	m	0.0	9	37	151	186	4.34	.749	4	Very high
		%	0.0	2.3	9.7	39.4	48.6				
1	The need to hold many activities related to spreading the culture of sustainable development in universities	m	0.0	5	38	175	165	4.31	.700	5	Very high
		%	0.0	1.3	9.9	45.7	43.1				
6	Establishing periodic projects to cultivate all unused areas in universities	m	12	5	45	160	161	4.18	.917	6	high
		%	3.1	1.3	11.7	41.8	42.0				
2	The need to benefit from successful international experiences in the field of green education	m	0.0	26	32	179	146	4.16	.844	7	high
		%	0.0	6.8	8.4	46.7	38.1				
5	The need to employ student activities and direct them towards environmental issues	m	11	28	84	171	89	3.78	.978	8	high
		%	2.9	7.3	21.9	44.6	23.2				
9	Spreading the culture of ecotourism among students in Saudi universities	m	5	35	97	160	86	3.75	.949	9	high
		%	1.3	9.1	25.3	41.8	22.5				
4	The need for curricula to address topics aimed at raising awareness of the importance of preserving the environment	m	65	68	97	100	53	3.02	1.294	10	high
		%	17.0	17.8	25.3	26.1	13.8				
The total arithmetic mean for the third axis, "Ways to overcome obstacles to spreading the culture of green education in Saudi universities"								4.07	.476	---	high

Table (9) shows that the means of overcoming the obstacles to promoting green education culture in Saudi universities received a (high) degree of response from the study sample individuals, with an overall mean of the third axis (4.07) and a standard deviation of (.476). The standard deviations of the third axis statements ranged from (.669-1.294).

The first-ranked statement was (3) "The necessity of establishing a green education research unit in universities to conduct more research in this context and benefit from it," with an arithmetic mean of (4.46) and a standard deviation of (.729). The second-ranked statement was (7) "Submitting a project for renewable energy management in Saudi universities," with an arithmetic mean of (4.37) and a standard deviation of (.669). The last-ranked statement was (4) "The necessity of including courses that aim to increase awareness of the importance of environmental conservation" with an arithmetic mean of (3.02) and a standard deviation of (1.294). The remaining statements of the third axis received a very high and high response.

The researcher believes that the high response obtained by the means of overcoming the obstacles to promoting green education culture in Saudi universities may be attributed to the many obstacles that prevent university management from embedding and promoting green education culture. Most of the study sample individuals perceived these obstacles, such as not employing student activities and directing them towards environmental issues, and not establishing a green education research unit in universities. This increased their response to the means of overcoming the obstacles to promoting green education culture in Saudi universities.

This result is consistent with the findings of Sadati's study (2014), which recommended the necessity of environmental

awareness and knowledge among students, and the commitment of universities to implementing the green education agenda.

Presentation and discussion of the study hypotheses: Are there statistically significant differences (at the level of 0.05) between the opinions of the research sample about the questionnaire axes according to the study variables (gender - university - academic level)?

First: Are there statistically significant differences (at the level of 0.05) between the opinions of the research sample about the questionnaire axes and the total score according to the study variable (type)?

In order to detect the presence of differences between the answers of the sample members to the questionnaire axes and the total score according to the variable (type), the researcher applied the "Independent Samples Test" test to clarify the significance of the differences in the answers of the study sample according to the gender variable, as shown in the following table No. (10)

Table 10: the results of the independent samples t-test for differences in study sample individuals' responses to the questionnaire items and the total score according to gender differences.

Axis	Gender	n	Arithmetic mean	standard deviation	degrees of freedom	"t" value	significance	level of significance
The first axis: the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative	male	164	3.3646	.84355	381	1.404	.161	no statistically significant differences at > 0.05
	female	219	3.2551	.68255				
The second axis: Obstacles to spreading the culture of green education in Saudi universities	male	164	3.8579	.48751	381	.289	.773	no statistically significant differences at > 0.05
	female	219	3.8406	.63891				
The third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities	male	164	3.9915	.44230	381	2.961	.303	no statistically significant differences at > 0.05
	female	219	4.1356	.49206				
Total degree	male	164	3.6847	.42539	381	.249	.803	no statistically significant differences at > 0.05
	female	219	3.6740	.40765				

Based on the results presented in Table (10), the following can be concluded:

1. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the first axis: the reality of green education culture in Saudi universities in light of the Green Saudi Initiative, according to gender differences.
2. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the second axis: obstacles to promoting green education culture in Saudi universities, according to gender differences.
3. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the third axis: means of overcoming the obstacles to promoting green education culture in Saudi universities, according to gender differences.
4. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the questionnaire items as a whole, according to gender differences.

The researcher believes that this result may be due to the fact that both male and female students in the sample have a similar level of knowledge about the reality and obstacles to implementing and promoting green education culture in the

universities under study, which brought their responses closer together despite gender differences. This result is consistent with the findings of Sadati's study (2014), which found no differences between male and female students in their levels of environmental awareness and knowledge.

Secondly, the researcher examined whether there were statistically significant differences (at a significance level of 0.05) in the study sample individuals' opinions on the questionnaire items according to the variable of university. To answer this question, a one-way ANOVA test was conducted to determine the significance of differences in the study sample individuals' responses to the questionnaire items and the total score according to the variable of university, and the results are presented in Table (11).

Table 11: Results of the "One Way Anova" of the differences in the answers of the study sample on the questionnaire axes and the total score according to the difference in the university variable

Axis		Total of squares	Number of freedom degree	medium square	Statistics Tool (P)	Level of significance
The first axis: the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative	between groups	1.993	4	.498	.869	.482
	within groups	216.680	378	.573	---	
	total	218.673	382	---	---	
The second axis: Obstacles to spreading the culture of green education in Saudi universities	between groups	2.310	4	.578	1.740	.140
	within groups	125.446	378	.332	---	
	total	127.756	382	---	---	
The third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities	between groups	1.159	4	.290	1.282	.276
	within groups	85.460	378	.226	---	
	total	86.619	382	---	---	
Total degree	between groups	1.280	4	.320	1.877	.114
	within groups	64.454	378	.171	---	
	total	65.734	382	---	---	

Based on the results presented in Table (11), the following can be concluded:

1. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the first axis: the reality of green education culture in Saudi universities in light of the Green Saudi Initiative, according to the variable of university.
2. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the second axis: obstacles to promoting green education culture in Saudi universities, according to the variable of university.
3. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the third axis: means of overcoming the obstacles to promoting green education culture in Saudi universities, according to the variable of university.
4. There were no statistically significant differences at a significance level of 0.05 in the study sample individuals' opinions on the questionnaire items as a whole, according to the variable of university.

The researcher believes that this result may be due to the similarity in administrative methods and orientations across Saudi universities in general when it comes to promoting green education culture among their staff and students. The universities' focus on the educational process and graduating a generation capable of facing the job market may be more important to them than the environmental and green education aspect.

This result is consistent with the findings of Alotaibi's study (2022), which found no statistically significant differences in the study sample individuals' responses to the two axes "the reality of the universities' role in developing environmental awareness" and "the level of students' awareness of sustainable development" according to the variable of university.

Second: Are there statistically significant differences (at the level of 0.05) between the opinions of the research sample about the questionnaire axes according to the variable (the academic level)?

To answer this question, "One Way Anova" was tested to clarify the significance of the differences in the answers of the study sample according to the variable of the study (the academic level).

Table 12: Results of the "One Way Anova" of the differences in the answers of the study sample on the questionnaire axes and the total score according to the difference in the academic level variable

Axis		Total of squares	Number of freedom degree	medium square	Statistics Tool (P)	Level of significance
The first axis: the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative	between groups	.224	2	.112	.195	.823
	within groups	218.449	380	.575	---	
	total	218.673	382	---	---	
The second axis: Obstacles to spreading the culture of green education in Saudi universities	between groups	2.993	2	1.496	4.557	.011
	within groups	124.764	380	.328	---	
	total	127.756	382	---	---	
The third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities	between groups	1.865	2	.933	4.181	.016
	within groups	84.754	380	.223	---	
	total	86.619	382	---	---	
Total degree	between groups	.623	2	.312	1.818	.164
	within groups	65.111	380	.171	---	
	total	65.734	382	---	---	

This is evident from the results shown in Table (12).

1. There are no statistically significant differences at the level of significance (0.05) in the opinions of the research sample members on the first axis: the reality of green education culture in Saudi universities in the light of the Green Saudi Initiative according to the academic level variable.
2. There are no statistically significant differences at the level of significance (0.05) in the opinions of the research sample members about the second axis: obstacles to spreading the culture of green education in Saudi universities according to the academic level variable.
3. There are no statistically significant differences at the significance level (0.05) in the opinions of the research sample members on the third axis: ways to overcome obstacles to spreading the culture of green education in Saudi universities according to the academic level variable.
4. There are no statistically significant differences at the significance level (0.05) in the opinions of the research sample members about the questionnaire axes as a whole according to the academic level variable.

This result, from the researcher's point of view, may be attributed to the closeness that most of the sample students, whether at the bachelor's, master's or doctoral level, exchange opinions and experiences with each other regarding their awareness and understanding of the importance of the culture of green education and its dissemination in the student circles, which brought their answers closer to the axes of the questionnaire and its total degree.

Results summary:

- That "the reality of the culture of green education in Saudi universities in the light of the Green Saudi Initiative" was (medium) from the point of view of the study sample.
- The first dimension came in the first order: building students' capacities and skills according to the principles of green education, with an arithmetic average of (3.41), and a standard deviation of (.819), followed by the second dimension in the second order: scientific research and creativity in accordance with the principles of green education, with an arithmetic mean of (3.32).), and a standard deviation of (.908), followed by the third dimension: local community service according to the principles of green education, with an arithmetic mean of (.16), and a standard deviation of (.875).
- The obstacles to spreading the culture of green education in Saudi universities came to a (high) degree from the point of view of the study sample.
- The ways to overcome the obstacles to spreading the culture of green education in Saudi universities came with a (high) degree from the point of view of the study sample.
- There are no statistically significant differences at the significance level (0.05) in the opinions of the research sample

members about the questionnaire axes as a whole according to the type variable.

- There are no statistically significant differences at the level of significance (0.05) in the opinions of the members of the research sample about the axes of the questionnaire as a whole according to the university variable.
- There are no statistically significant differences at the significance level (0.05) in the opinions of the research sample members about the questionnaire as a whole according to the academic level variable.

Study recommendations:

- The need to present a project for renewable energy management in Saudi universities.
- The necessity of investing in the state's direction in its institutions towards achieving the goals of sustainable development through green education in Saudi universities.
- The need to prepare university courses specialized in environmental culture.
- The need to pay attention to participating in the celebration of environmental events that are held annually, and to invest students' skills in writing reports and research to direct them towards issues related to their environment.
- The need to establish a green education research unit in universities to conduct more research in this context and benefit from it
- The need to employ student activities and direct them towards environmental issues.
- The need for Saudi universities to seek to enhance their effective role in developing environmental awareness among their students.
- The need for the participation of civil society organizations to carry out external student activities with the aim of greening the desert spaces.

Conflict of interest

The authors declare that there is no conflict regarding the publication of this paper.

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