

## Article

# Analyzing Sustainability Awareness among Higher Education Faculty Members: A Case Study in Saudi Arabia

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**Abstract:** *Purpose:* The purpose of this study is to examine the understanding of sustainability of the faculty members in higher education in Saudi Arabia. One of the main objectives is to explore how they implement sustainability in the courses offered in one of the major non-profit private universities in Riyadh. *Findings:* A survey was conducted among the faculty members to investigate their awareness on this topic. Survey results were compared between the different departments to understand how the faculty members can contribute to sustainable education if they increase their knowledge through training and workshops related to the topic. The comparative analysis allows us to define the guidelines to build a strong institution that presents itself as a leader and change-driver in the Gulf region. The survey was done among the limited number of faculty members in the benchmark university, searching for answers about sustainability using the top-down methodology. The survey fulfilled the original aim of developing an evidence base of faculty members existing expertise, experience and interest in sustainability. The survey is also an important step to embed sustainability into the benchmark university. It also provides an opportunity to reflect and put forward suggestions on what it means to have sustainability as a core value and strategic priority. *Originality/value:* According to the Saudi Vision 2030, developed following the UN requirements, the Saudi Government expects companies to be more responsible towards society and sustainable economy. Increasing the understanding and learning of sustainability among faculty members is beneficial to young people to build their professional careers in a sustainable environment, considering the environmental, social, and economic implications. In this context, the role of faculty members is crucial to strengthen the awareness and knowledge about sustainability in higher education among the new generation. The work identified opportunities to engage all staff on what it means to have sustainability as a core value and strategic priority.

**Keywords:** sustainability; higher education; education for sustainable development; sustainable societies; sustainable development; Saudi Arabia

## 1. Introduction

Awareness of environmental problems and changes grew in the second half of twentieth century [1]. Besides environmental changes, human society has been changing in a dynamic way as a result of advancements in communication technology and globalization. The social structure and economic conditions of today's world have caused an increase in global inequality and polarization in society. Understanding the integration of environmental, social, and economic aspects for human and natural systems has become highly necessary [2].

Sustainability is a dynamic condition requiring the interconnections of ecological, economic, and social systems. Sustainable development was defined as ‘meets the needs of the present without compromising the ability of future generations to meet their own needs’ by the Brundt Commission in 1987 [3]. Education for sustainable development is a dynamic concept that utilizes all aspects of public awareness, education, and training to create or enhance the understanding of the linkages among the issues of sustainable development and to develop the knowledge, skills, perspectives, and values that will empower people of all ages to assume responsibility for creating and enjoying a sustainable future.

Modifying society patterns of behavior in sustainability awareness starts by educating the young generation. Clavijo [4] mentioned that today’s teaching and learning strategies are more complex and dynamic. Consequently, each profession needs to develop its own teaching and learning approaches. Hedden et al. [5] showed that teaching engineers to adopt a sustainable attitude means empowering them to face sustainability challenges in the real world. As a result of the lack of inclusion of sustainability subjects in study plans, graduates need more motivation and support to improve their sustainability awareness and to contribute sustainability in their professional lives [6].

Region-specific socio-economic, technical, and environmental conditions are crucial factors in the consideration of the opportunities and challenges of higher education as a change agent for sustainability [7]. Saudi Vision 2030 aims to improve the future social, economic, and environmental possibilities for society in a sustainable way. One of the main goals of Saudi Vision 2030 is to bridge the gap between higher education and the job market requirements, in the frame of sustainable development for the country by defining suitable curricula according to future needs. This also includes investing in strategic partnerships with apprenticeship providers in the public and private sectors [8]. In taking this agenda forward, universities in Saudi Arabia need to incorporate environmental and sustainability themes into their curricula and research while updating their teaching strategies to reach the Saudi Vision 2030 goals [9]. Based on the study conducted by Alshuwaikh et al. in the Saudi Arabian context, they listed five core areas for sustainability in higher education: (i) teaching and curriculum, (ii) research and scholarship, (iii) campus operations, (iv) management and community, and (v) financial management. In this paper, the analyses are focused on the first area: teaching and curriculum. To understand the current situation of faculty members’ sustainability awareness, a survey was conducted among the faculty members in the benchmark university located in Saudi Arabia.

In this non-profit university, a comparative analysis of the results was done between the College of Computer and Information Sciences, College of Engineering, and College of Humanities. Questions in the survey investigated the concept of sustainability defined and operationalized at the department level and the method of integration and teaching social sustainability by instructors. Moreover, teaching methodologies, course content, resources, and institutional support that are needed to improve the sustainability awareness of teachers and program leaders were inquired about in the survey. The survey results provide an opportunity to reflect and put forward suggestions on what it means to have sustainability as a core value and strategic priority.

This research develops an evidence base of faculty members existing expertise, experience and interest in sustainability. According to Sammalisto and Lindhqvist [10], the level of integration of the concept of sustainable development can range from formulations of policy statements to integration of courses, curricula, and other selected activities for a total reform of the educational system. Hence, it is crucial to understand the faculty members’ approaches on planning, integrating, and implementing sustainability aspects in the courses under the curricula. Nowadays, many higher education institutions, both non-profit and for profit, have embraced the concept and practices of sustainability [11]. It is critical that the next generations of professionals be equipped with the knowledge and skills that lead to a more sustainable society. Therefore, the education must be based on strong technical concepts immersed in accurate social, economic and environmental awareness [12].

### *Higher Education and the Challenge of Sustainability*

Despite the existence of good examples of institutions moving in the sustainable development direction, the majority of higher education institutions in the world still do not consider sustainability concepts in their strategic actions [13]. Therefore, higher education institutions must re-evaluate learning procedures and strategies to accurately embed sustainability concepts into their courses [14]. The aim should be to ensure that graduates in their future professional lives will take social, environmental and economic costs and benefits of sustainability into consideration [15,16].

Higher education has over the years been seen as catalyst for transformation and a solution to problems confronting humanity [17,18]. Over the past three decades, higher education has been actively involved in creating awareness and attempting to find solutions to the challenges of sustainability [19]. Higher education institutions have become increasingly aware of their impact on the environment, and have been trying to develop a better understanding of the environmental dimensions and implications of their operations [20]. Higher education has both a direct and indirect impact on local, regional and national environment, as well as on graduates and their future decisions [21]. Thus, universities perform an important role in knowledge creation and dissemination through education and communication. In regard to students, practical experiences are more likely to result in good sustainability and environmental education creating the opportunities for students to learn about interdisciplinary environmental issues is key to delivering better sustainability education [22].

However, sustainability has a dynamic, regularly changing definition. Along these lines, the concepts of sustainability should be continually assessed by instructors because yesterday's sustainability plan will not be that of tomorrow. There is no prepared formula to embed sustainability into higher education, and each institution must apply practices that best suit its existence [14]. Thus, one of the key questions that universities are now facing is how education sustainable for development can be translated into practice such that it can be effective in transforming society [23] and if universities are going to survive into the next century, they must not only respond to this new force, the environmental imperative, but they must also provide leadership for broader society [24]. The learning and benefit to society of higher education forming partnerships with local and regional communities to help make them socially vibrant, economically secure, and environmentally sustainable [25]. Acting sustainably is about balancing social, environmental and economic needs in a way that does not compromise future generations and helps ensure well-being and a better quality of life. The significance will move between the economic, environmental, and societal influences depending on the project and location. These are the three traditional pillars for sustainability. Burford et al. [26] identified three new pillars for sustainability. These new pillars are the cultural diversity pillar, political pillar, and spiritual pillar. Educators must better understand these concepts to upgrade their disciplines and develop effective educational projects and to act as agents in promoting these principles within society [27].

Higher education institutions have two fundamental roles as major contributions to sustainable development: first, to ensure that the educational subject prepares individuals to be more involved in decision-making concerning environmental issues in the future. Second, to ensure that the implementation of environmental management systems presents models and practical examples of sustainable management for all society [28]. To ensure that the educational subject prepares individuals to be more involved in decision-making concerning environmental issues a set of competencies that might define more closely the skills and dispositions conducive to building more sustainable development patterns in work and personal life is available in Dave Report [29]. Moreover, a framework designed specifically about teaching and learning was developed in UK by the Higher Education Academy (HEA) on how to embed sustainability in curricula [30].

Generally, there are three types of education: academic, market-oriented, and integrative [28]. The integrative approach appeases the capacity to solve problems based on technical and scientific knowledge with critical analyses of the problems [31]. However, many engineering instructors experience issues embedding the sustainability concept into their disciplines because the concept envelops wide knowledge in the subject matter. They still consider just the economic and environmental

aspects of sustainability and experience issues in conceptualizing social sustainability [32]. In this way, it is important to prepare instructors for this activity [33].

The role of higher education institutions goes far beyond sustainable education. They should become learning and knowledge generation poles, with examples of sustainability practices. The campus ought to be available to the community to inspire discussions about the main local, regional, and global issues. Higher education institutions should lead these procedures, preparing all members of society to discuss and find solutions to the main issues [34].

Education in Saudi Arabia is still quite focused on technical aspects, but the market demands new and wider professional skills, including critical thinking about social, environmental, political, and cultural aspects. This paper focuses on the awareness of faculty members about sustainability concepts and what type of sustainability education they provide. The study took place in a private non-profit higher education institution in Saudi Arabia.

## 2. Literature Review

This survey is divided into two parts wherein the first part we reviewed the theoretical framework in the literature and in the second part we summaries some of the related previous studies.

### 2.1. Theoretical Framework in the Literature

The focus of studies in higher education sustainability may be divided into four categories [35] including foundations, knowledge, personal and integrative assets. Each of these assets has multiple attributes that characterize them. Table 1 shows a summary of the attributes link to each category.

**Table 1.** Main attributes for sustainability in higher education.

Foundations			
Philosophy	Epistemology	interdisciplinarity	
Knowledge			
Pedagogy	Literacy	Learning	Teaching
Personal			
Values	Beliefs	Attitudes	Behaviors
Integrative			
Constructivism	Complexity	Holistic thinking	

The focus of our research is on the knowledge aspects of sustainability, mainly on learning and teaching. In addition, the content analysis conducted by Vaughter et al. [36] shows significant variations that occur because:

- Different research methodologies.
- Locations (Africa, Americas, Asia, Europe, Oceania).
- Comparative scale ((local, national, regional, and global).

However, Vaughter et al. [36] claimed that the prevalent themes in higher education sustainability research compare:

- Sustainability curricula among institutes.
- Campus operation policy and practice.
- Output measures of sustainability implementation.

### 2.2. Related Previous Studies

In this part, we review related researches. Sammalisto and Lindhgqvist [10] study the effect of performed producers at a Swedish university to cooperate sustainability among a diversified set of

courses. The study proceeds by developing a questionnaire that requires the faculty members to classify their courses and research findings in terms of its contribution to the development of sustainability. Four categories are introduced in the research where the first category indicates heavy involvement of the sustainability concept in the course. The second category suggests moderate association and the third category point to potential collaboration. However, the fourth category indicates that sustainability is not relevant to the taught course. The results from analyzing the classifying method show that the concept of sustainable development can be integrated into a valid strategy.

Crotese [17] wrote about the role that higher education can play in creating a sustainable future. He asserts that higher education can take a leadership part in advancing the development of sustainability, as it did in many other disciplines such as cancer-fighting, by providing the information and knowledge through teaching and research. In addition, he emphasizes the obligations of the universities toward community services and how that can help to boost the awareness of the impotency of sustainability. He explained how this can be achieved by providing examples through four main points that discuss the environmental and sustainability literacy, incorporating environmentally sustainable design in the campus, curriculum involving improvement in local communities, and broaden the architectural education.

Filho et al. [37] provided two case studies at the Hamburg University in Germany and Bournemouth University in the UK to discuss the changes and properties toward transferring education of sustainability into practice in an integrative approach. The two cases demonstrate that most challenges come from the lack of resources, weakness in the incentives process, demerit in the written policy and producers, availability of discipline culture and the decentralized budgeting process.

Lozano et al. [38] prepare a survey by collecting data from Higher Education Institutions (HEIs) on sustainability development commitment and implementation practice in their institutions. The survey focuses on the institutional framework, campus operations, education, and research and outreach and collaborations. The survey contains 121 closed-end questions that receive 87 responses with 79% coming from European institutions, 15% from USA institutions, and 5% from Asian, African and Australian institutions. The responses have been analyzed using descriptive and inferential statistics. The results demonstrate that the interest of sustainability being greater within the European institutions. Besides, it seems that students and faculties do not play a major role in the implementation of sustainability. Furthermore, the results show that improving and signing the declarations, charters, and initiatives (DCIs) policy can lead to better implementation. However, the causality between commitment and implementations could not be revealed.

### 3. Methods

Educators should always consider material they already deliver and explore how making changes to its delivery might enhance sustainability skills in students. The curriculum should also be linked to informal learning through designing co-curricular activities which bridge the formal and informal spheres [39]. The benchmark university implements top-down approaches, which include creating missions, programs, and courses based on sustainability concepts, theory, or practice [40]. The top-down approach requires that faculty members demonstrate awareness and understanding of sustainability to design and apply their courses in the frame of the program curriculum. Since the top-down approach relies on the faculty members' knowledge about sustainability, in this study, we have designed a survey to explore how sustainability is treated in education with the predetermined sample of faculty members. Of the 41 responses, 14 responses were from female faculty members and 27 were from male faculty members. Out of these responses, 20 were from the engineering school, nine were from the computer science school, and 12 from the orientation, humanities, and business schools combined.

#### 4. Results and Discussion

The survey is divided into four sets, each with various questions. In the first set of questions, we aim to find the level of general understanding of the concept of sustainability across the schools at the benchmark university. The first set of questions include the following:

Do you have a good understanding of the concept of sustainability?

Do you believe sustainability is a very important concept?

Do you believe sustainability is just being green?

Do you think that sustainable development focuses on the environmental, economic, and/or social aspects?

The responses for the first question show in Figure 1 that the majority of participants have a good understanding of the concept of sustainability, where 90% of faculty members in engineering, orientation, humanities, and business schools claim that they have a good understanding. However, only 70% of the computer science faculty claim a good understanding of the sustainability concept. In addition, all the participating faculty in engineering, orientation, humanities, and business schools believe that sustainability is a very important concept, while 89% of the participating faculty of the computer science school believe it is important. When asked whether sustainability means being green, 80% disagree in engineering, orientation, humanities, and business schools, while only 56% disagree in computer science school. 80% disagree in engineering, orientation, humanities, and business schools, while only 56% disagree in computer science school.

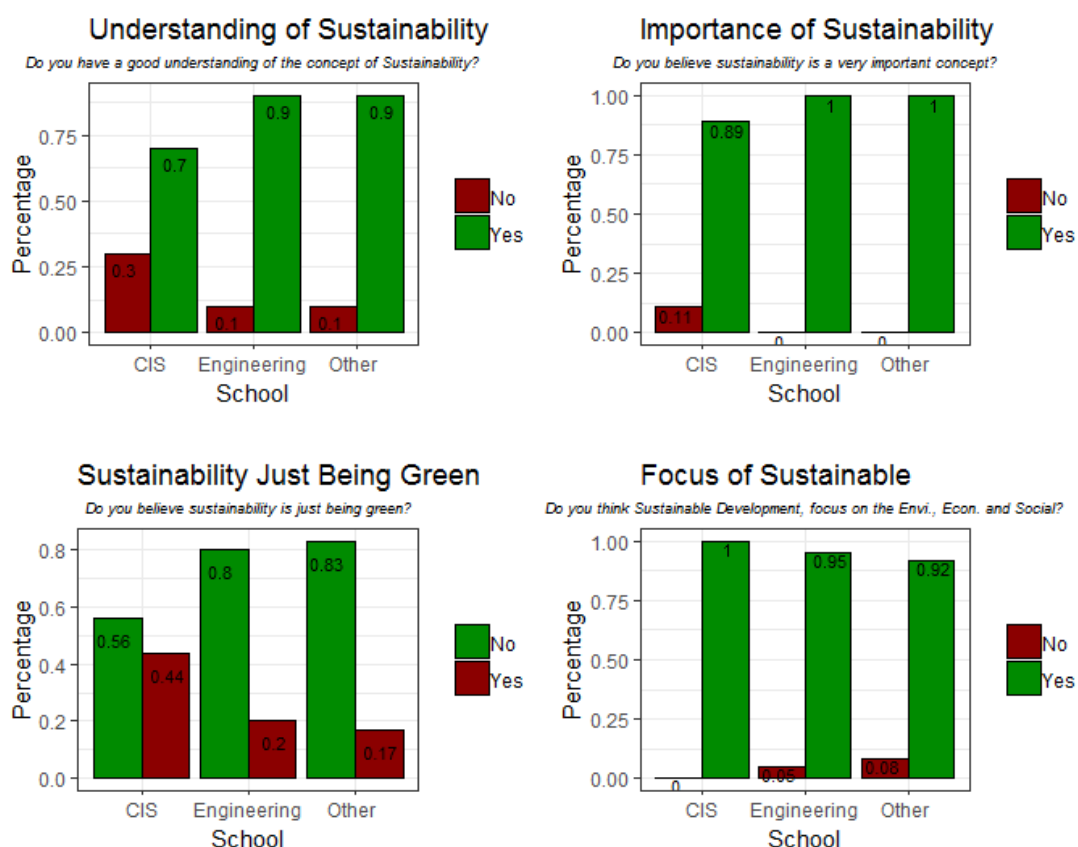


Figure 1. The first set of survey questions (general knowledge of sustainability).

However, the discrepancy decreases regarding those who think that sustainability focuses on environment, economic and social aspects, with 95% agreement in engineering school, 92% in orientation, humanities, and business schools, and 100% in computer science school.

Clearly, the computer science school is behind on the general understanding of the concept of sustainability. This might be because the concentration of computer science programs is on the advancement of technology rather than the environment, economy, or society. Considering the



curriculum, the awareness level of sustainability may be increased for the computer science faculty by inviting and encouraging them to attend seminars and conferences that discuss sustainability issues.

The second set of questions relates the concept of sustainability to the courses taught by the faculty members and the program of the participants. It tests whether sustainability is well defined and operationalized within the program domain and whether the college provides the necessary courses that boost the level of awareness of sustainability among students. In addition, it explores how the education of sustainability is handled at the course level by determining whether it is relevant to what the instructor teaches and whether it is well integrated with the program outcomes, Tables 2 and 3 show sustainability in teaching, courses and colleges, as well as social sustainability and basis of sustainability teaching.

**Table 2.** Sustainability in teaching, courses and colleges.

	Engineering		CIS		Other	
	Yes	No	Yes	No	Yes	No
Relevance of sustainability to teaching	95%	5%	33%	67%	75%	25%
Courses, students and sustainability	75%	25%	44%	56%	42%	58%
Colleges, students and sustainability	70%	30%	44%	56%	50%	50%

**Table 3.** Initiation of sustainability, teaching of social sustainability and basis of sustainability teaching.

	Engineering			CIS			Other		
	Excellent	Good	Poor	Excellent	Good	Poor	Excellent	Good	Poor
Initiation of sustainability in the program	15%	35%	50%	22%	56%	22%	8%	33%	58%
Teaching of social sustainability	10%	70%	20%	11%	56%	33%	8%	42%	50%
	Academic	Market	Integrated	Academic	Market	Integrated	Academic	Market	Integrated
Academic and market driven Sustainability courses	10%	20%	70%	11%	33%	56%	8%	50%	42%

In addition, we test whether the approach of teaching is driven academically or according to the market needs. These meanings are offered in terms of the following questions:

- (1) How is the concept of sustainability defined and operationalized in your program?

Do you consider knowledge in sustainability relevant to your teaching?

How social sustainability is integrated and taught (learning objectives, teaching methods, and pedagogical strategies/tools) in your program?

Do you believe your course(s) give students awareness about sustainability?

Do you believe your college courses give students awareness about sustainability?

Do you believe the way these courses are being taught is more:

- (a) Academic-driven
- (b) Market-oriented
- (c) Integrated

The results show that the concept of sustainability is poorly defined and operationalized within the programs of the university, especially in the engineering school and orientation, humanities,

and business schools, where more than 50% of the participants complain about how it is presented. More than 56% of the participants of the computer science school affirmed that sustainability is well operationalized in their program. This can refer to the scarcity of the understanding of the definition of sustainability, as indicated in the first set of survey questions.

The majority of participants believe that what they are teaching is relevant to sustainability, especially in the engineering school (95%). However, only 75% of them think that the courses provide the students with an awareness of sustainability. On the other hand, less than half of the sample size in the other schools presumes that the courses provide sufficient awareness to the students. At the college level, a similar conclusion is observed where more than 50% of participants in schools other than the engineering school think that the courses fall short in providing awareness of sustainability to the students.

The last question in this set concerns how sustainability is indoctrinated at the university programs. Most of the participants think that it has been taught in an academically driven manner. A mechanism of integrating the education of sustainability to comprehend both the academic and market needs should be sought.

The third set of questions concerns the resources for adequate sustainability teaching. In addition, it explores the important areas in sustainable development and those areas of attention in education. The set of questions includes the following:

- (2) What resources (training efforts, material/tools, etc.) are required (according to the participants) to support teachers and program leaders in their professional roles as social sustainability educators?

Rank the most important areas needed to work with sustainable development:

- (a) Environment
  - (b) Economics
  - (c) Resources
  - (d) Social impacts
  - (e) Assessment tools
  - (f) Green technologies
  - (g) Values
  - (h) Policies and politics
  - (i) Management
  - (j) Stakeholders
  - (k) Communication
- (3) Which of the following areas should be given more attention in education for sustainability (similar areas as the previous question)?

The results show in Tables 4 and 5 that training is the most required resource for appropriate education at 65% for engineering, 33% for computer science, and 58% for the other schools. The computer science participants ranked tools as the second-ranked resource, while the participants of the engineering and other schools believe that material should be ranked the second-most important resource in the education of sustainability. However, some participants suggested a mixture between the resources as the best practice for education enhancement, and some recommended field practice and intensive education courses.

All the participants among the schools agree on the environment as the most important area to work with sustainability. The participants could not reconcile the second-to-last area. However, the computer science school participants consider management to be the second-most important area in sustainability development, while engineering school participants think it should be the economic area. The participants for other schools see policies and politics as the second-most substantial area in sustainable development with an insignificant difference in areas of resources, social effects,



stakeholders, and values. The least important area of sustainable development from the point of view of computer science and engineering participants was the communication area. On the other hand, participants from the other schools perceive green technology as the least meaningful area in sustainability development.

**Table 4.** Resources needed for sustainable education.

	Engineering	CIS	Other
<b>Material</b>	20%	22%	33%
<b>Training</b>	65%	33%	58%
<b>Tools</b>	0%	44%	0%
<b>Other</b>	15%	0%	8%

**Table 5.** Areas associated and areas needed in education for sustainability.

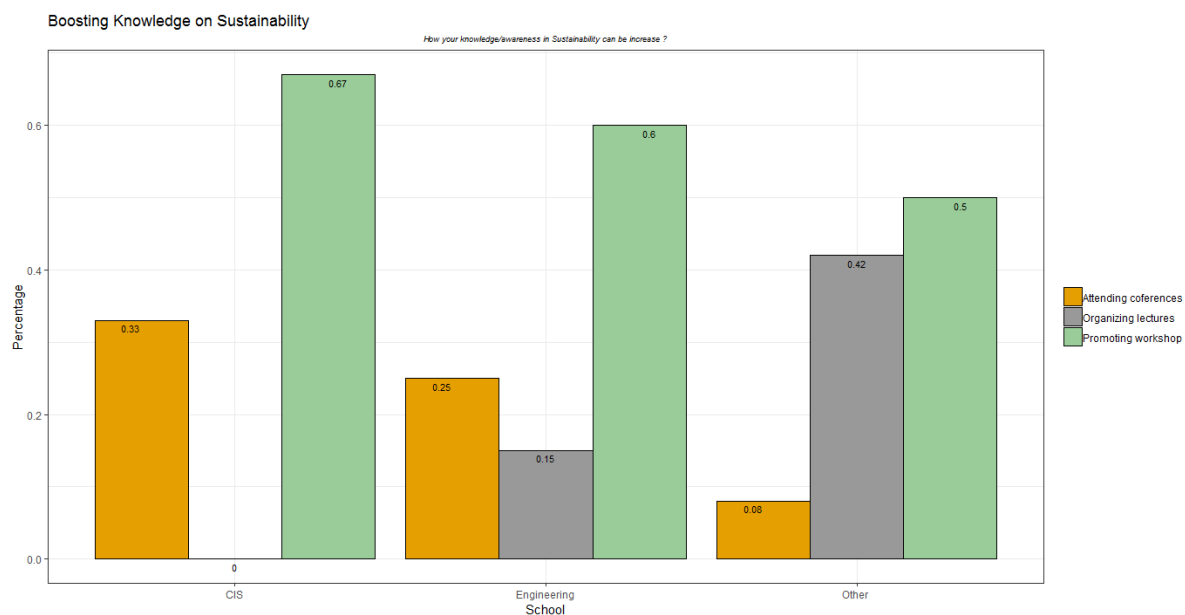
	Engineering		CIS		Other	
	Associated	Need Attention	Associated	Need Attention	Associated	Need Attention
Environment	19%	17%	18%	13%	19%	10%
Economics	16%	10%	10%	9%	9%	10%
Resources	11%	13%	10%	16%	10%	10%
Social impacts	11%	10%	8%	6%	9%	14%
Assessment tools	7%	5%	5%	3%	4%	4%
Green technologies	6%	14%	8%	6%	5%	10%
Values	6%	10%	11%	13%	10%	14%
Policies and politics	7%	6%	7%	6%	11%	10%
Management	15%	6%	15%	13%	7%	6%
Stakeholders	10%	5%	4%	9%	10%	4%
Communication	3%	6%	3%	6%	7%	6%

In terms of the focus on the education of sustainability, the participants from the computer science school believe that the education of sustainability should concentrate on the resources rather than the environment, management, and economy. On the other hand, the contributors for the engineering school deemed that attention to be given to the environment, then to green technology and resources. The collaborators from the other schools concluded that it should be assigned to social and economic areas. However, all the collaborators from all the schools think that the least attention should be given to assessment tools. Thus, it is recommended to direct the focus of education in sustainability towards resource, environment, and economy effects.

The last category includes only one question, which is as follows:

How can the university increase your knowledge/awareness in sustainability?

The results of the survey on Figure 2 for this question show agreement among the schools on promoting workshops as the most important tool that can be used to increase the knowledge and awareness of sustainability with 67% for computer science, 60% for engineering, and 50% for the other schools. On the other hand, there is disagreement on the second method to increase the awareness of sustainability, where the participants from computer science think that attending conferences will advance the awareness of sustainability, while the engineering and other schools think it should be done by organizing lectures.



**Figure 2.** The fourth survey question category (improvement of sustainability in education).

There were four categories of questions. The first group was focused on the general knowledge of sustainability. The responses showed that 90% of participants in all colleges except one had a good understanding of the concept of sustainability. On the other hand, 70% of the faculty at one college stated that they had good knowledge of sustainability. Moreover, all of them stated that sustainability is a very important concept. The second group of questions was about sustainability and education, which showed that the majority of the participants wanted more input on sustainability concepts in their programs. The third group of questions was about the focus area of sustainability in education, and all agreed that training is the most needed resource to support faculty and program leaders in their professional roles as social sustainability educators. All participants ranked the environment as the most important area in sustainability. The last question was focused on how to improve sustainability in education, and all agreed that workshops are the most necessary tool to increase the awareness of sustainability among faculty.

Few universities around the world has implemented some examples of various environmental initiatives such as recycling, energy efficient lighting, water conserving fittings, composting toilets, green building designs, public transportation initiatives, etc. In contrast, very few cases of universities have really implemented a systemic commitment to environmentally sustainable campus operation, research and curriculum greening. The results of the survey showed that sustainability is not being systematically implemented. To do this, sustainability must be incorporated into institution objectives. Programs should be flexible, and disciplines must be redesigned to provide a multicultural vision. Communities should be involved in education. All university relations must be reassessed, including relationships with stakeholders, governments, and the community for external cooperation. Encouraging critical thinking and the use of differentiated teaching methodologies to enhance teaching through sustainability pedagogies. Such approaches to teaching and learning could involve student-centered and interactive enquiry-based approaches [40]. These include participatory and inclusive learning processes, trans-disciplinary collaborations, experiential learning and the use of local environment and community as learning resources. Sustainability pedagogies include role play, simulations, stimulus activities, debates, reflexive accounts, personal development planning and problem-based learning. Educators should always consider material they already deliver and explore how making changes to its delivery might enhance sustainability skills in students. The curriculum should also be linked to informal learning through designing co-curricular activities which bridge the formal and informal spheres [40].

## 5. Conclusions

This paper contributes to the literature by providing statistics description of the implementation of sustainability at a specific university in Saudi Arabia. The purpose of higher education institutions is at least two fold: (a) to transfer technical knowledge and professional skills to a new generation, in other words, to help students obtain the best possible academic outcomes (i.e., excellent grades); and (b) to reinforce students' values, principles, and moral development [39]. It is clear that there is no definitive understanding among faculty members about the concept of sustainability in higher education at the university where the survey was conducted. This research will work as an awareness tool in the developed world to work on the sustainability concept and educate the education students in this topic. Accordingly, the universities to which they belong should adapt a suitable approach to increase the awareness of this topic by developing a sustainability mission at the institutional or departmental level. This approach will lead to spreading and incorporating the sustainability concept at different colleges. Having a mission can help reduce conflicting faculty definitions regarding sustainability. Based on the stated analysis, it is necessary to start the processes of spreading the definition of sustainable development among faculty members by starting with specific courses. Once the meaning of sustainable development for the course is reached, and it is clear how the concept can be operationalized, the measurement instrument of the curriculum should be adapted to this.

Then, instructors can incorporate the concept of sustainability in their course content, and the overall importance of sustainability will be integrated into the educational system.

Educators should activate key competencies for sustainability programs and course development. The results clearly demonstrate that professors will adapt the top-down methodology as the first stage, then the bottom-up methodology. This is critical because most programs will follow a bottom-up strategy and thus can incorporate sustainability teaching through key competencies regardless of the level of institutional support.

While university missions can address the overall goals of the programmer, key competencies, such as critical thinking, competence of self-knowledge, and interdisciplinary groups, are useful in developing what students should learn, which will aim to teach specific knowledge on sustainability that leads to enhancing social and practical skills for students that are beneficial to society at large. Finally, several universities have adapted the top-down sustainability approach, where the upper administration took the initiative to create a sustainable university through education, research, and campus operations [40].

A future extension can be achieved by increasing the sample size to cover multiple universities in Saudi Arabia and even more to cover the Middle East region. Also, a deeper statistical Inferential may be implemented on the larger sample size in order to discover the influence of the development of sustainability most.

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