

Article

Students' Attitude and Perception towards Sustainability: The Case of Universiti Sains Malaysia

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Abstract: Sustainability awareness is a vital component in ensuring sustainability initiatives as a global effort for the benefit of future generations, particularly in countries with emerging economies, such as Malaysia. In higher education institutions (HEIs), students play an important role in manifesting the sustainability agenda to the campus community, as well as the rest of the globe. However, there is a scarcity of data on Malaysian students' attitudes and perceptions towards sustainability. The purpose of this research is to establish a baseline for determining the level of positive attitude and perception among USM undergraduate students in regards to sustainability. A survey using a self-administered questionnaire via Google Forms was conducted with 513 undergraduate students between June 2020 and March 2021. The findings revealed that the students' level of positive attitude and perceptions of sustainability on campus ranged from moderate to high. The study also observed a strong, positive correlation between students' attitude and perception. The present study illustrated that "Attitudes Towards Sustainability on Campus" helps to explain 45% of the variance in respondents scores on "Perception of the USM Current Sustainability Program". It could be summarized that USM students were able to relate sustainability issues to current situations and assumed a positive attitude towards the implementation of sustainability programs at USM. It is intended that the research findings will contribute background information that will reflect the strategies of higher education institutions on sustainability.

Keywords: sustainability; sustainability awareness; attitudes; perception; universities; education for sustainable development; undergraduate students; sciences students; non-science students; Sustainable Development Goals



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1. Introduction

In recent years, the awareness of sustainability and related issues have been at the center of global interest [1]. The growing human population and rising levels of consumption per capita in the 21st century will lead to the depletion of natural resources and the increase of waste production. Therefore, global awareness on sustainability knowledge and practices have influenced many countries to mitigate and/or halt irreversible disasters due to unsustainable practices [2]. However, sustainability awareness did not reach many developing countries in terms of preserving and sustaining environmental resources [3]. For this reason, awareness of sustainability is a vital component in ensuring sustainability initiatives as a global effort for the benefit of future generations, particularly in countries like Malaysia with emerging economies.

The concept of sustainability is historically based on the triple bottom line theory, namely that the three spheres—social, economic, and environmental—have the same importance and are strongly interconnected. Meanwhile, the term sustainable development was defined in the Brundtland Report, *Our Common Future* (1987) as "meeting the needs

and aspirations of the present generation without compromising the ability of future generations to meet their needs" [4]. According to the report, the term sustainable development also includes three dimensions, namely, ecological, economic, and social sustainability. Following the report of the Brundtland Commission, the conception of "sustainable development" or "sustainability" has emerged as an important concept with participation from various organizations and institutions worldwide [5], even after more than 30 years of its conception.

In the context of sustainable development, in 2015, the United Nations established 17 Sustainable Development Goals (SDGs), and these goals are to be achieved worldwide by the year 2030 [6]. It is a global partnership for all countries to end poverty and other deprivations that should "go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth—all while tackling climate change and working to preserve our oceans and forests" [7]. The SDGs are the successor to the Millennium Development Goals (MDGs) and are widely known as Agenda 2030, or SDG2030. The SDGs represent a more comprehensive agenda, with 17 goals, 169 targets, and 232 indicators compared to the MDGs, with only 8 targets and 60 indicators [7]. To attain sustainable development, it is important to harmonize the three core elements: economic growth, social inclusion, and environmental protection. These elements are interconnected, and all play a key role to ensure the well-being of individuals and societies [8]. To achieve these sustainability goals, an individual's perception and attitude toward sustainability needs to change, which can be accomplished through the means of education [9]. This is an important context because sustainability on campus has become a fundamental criterion for any university to improve academic infrastructure, setting the right faculty priorities and practices [10]. In addition, higher education institutions are major drivers to foster the understanding of sustainability and shape the future leaders for achieving a sustainable future for everyone [11] through research, teaching, and practices [12,13].

Many universities around the globe are now incorporating and implementing numerous sustainability initiatives and approaches to achieve the SDGs at their institutions [14–17]. This is arguably due to the increased level of consciousness in the society of sustainability issues and the significant impacts of campus activities on both the environment and communities [18–20]. However, as reported by the United Nations, the progress towards the goals established in Rio de Janeiro has been slower than it was hoped it would be and, in some cases, we are worse off now than we were then [21]. In Malaysia particularly, due to its cultural diversity, cultural aspects will be critical to the overall success of the SDGs Agenda. In order to achieve the agenda, educational programs at all levels need to integrate the contents of local cultural aspects in sustainable development. Positive university development can lead to economic and democratic betterment; therefore, HEIs can act as catalysts for new ideas and change [22]. This is especially crucial for developing countries like Malaysia. However, due to the increased political involvement in Malaysian education, the noble principle of public education is structurally flawed [23]. Ponrahono et al. [24] also pointed out that, despite having state and national planning in place, Malaysia struggles to integrate sustainable development strategies at the local level.

Many works of literature on college students' perception are limited to the assessment of environmental sustainability or their roles in promoting campus sustainability and are largely concentrated on the West and developed countries. These studies include several universities in Austria [14], the United States [19], the UK [25], and Spain [26]. These studies found that most of the students are quite aware of and are willing to support and participate in sustainable initiatives at their colleagues/universities. The studies also reported that they have implemented and promoted many sustainability initiatives related to campuses.

Recently, in the developing countries, similar studies include an assessment of students' perceptions of some factors contributing towards higher education for Sustainable development in a university in China [27], a research study about the perceptions of students at a

Malaysian university towards factors of a sustainable university [28,29], and a study on sustainability awareness in Saudi Arabia among students and faculty members [1,30].

In Malaysia as a whole, the study of sustainability awareness in general among university students has been conducted recently by many researchers [28,31–37], supporting the importance of this study. A study on youth studying in public and private educational institutions in Penang found that they have a high level of awareness of the concept of sustainable development issues and are willing to practice a more sustainable lifestyle [32,34]. Meanwhile, based on the study at the University College Sabah Foundation in Sabah, “it can be deduced that efforts to further increase the awareness of the students can come from formal education and through the dissemination of sustainability information” [33]. However, there is a scarcity of data for Malaysian students on the level of attitudes and perceptions towards sustainability, especially in Universiti Sains Malaysia (USM). Our cognitive goal is to establish a baseline for determining the level of attitude and perception among USM undergraduate students in regards to sustainability. As specific research questions, we address the following:

1. What is the level of attitude and perceptions towards sustainability among USM undergraduate students?
2. Do gender, clusters (sciences and non-sciences), and residential status of students influence students’ attitude and perception of sustainability on campus?
3. Is there a relationship between “Attitudes Towards Sustainability on Campus” and their “Perception of USM Current Sustainability Programs”? If so, how strong is this relationship?

The hypotheses of this study are:

1. The level of attitude and perception towards sustainability among USM undergraduate students is high.
2. Gender, clusters, and residential status influence the level of students’ attitude and perception towards sustainability.
3. With a positive and proper perception of sustainability, a positive attitude towards sustainability could be developed.

The utilitarian goal of the study is to investigate the level of attitude and perception towards sustainability among undergraduate students on the USM main campus, Penang. It is intended that the research findings will contribute as background information that will reflect the strategies of higher education institution on sustainability and it is hoped that this study will be extended to other institutions to establish a comparison.

2. Materials and Methods

In order to investigate students’ attitudes and perceptions of sustainability, a survey using a self-administered questionnaire via Google Forms (online medium) was conducted between June 2020 and March 2021 on undergraduate students from USM Main Campus, Penang, Malaysia. Being the sole recipient of the Accelerated Programme for Excellence (APEX) by the Ministry of Higher Education Malaysia, USM embraced a whole-system sustainability transition into its core campus activities. Sustainability elements are integrated and embedded in all courses offered in the university, containing at least one SDGs element in each course. One of the most impactful agendas at USM was the establishment of a student-led program called *Kampus Sejahtera* [38]. The Malay word *sejahtera*, translated into English as “healthy”, cuts across spiritual, social, physical, mental, and environmental dimensions, and in a sense, reaches beyond health to include ideas of sustainable development [39]. This program was established in 2001 to pursue the goal of transforming the USM campus into a sustainable one.

2.1. Study Sample and Population

Covering approximately 231.75 hectares of campus area, the USM main campus houses more than 10,000 students. The study targets random undergraduate students from both

disciplinary (clusters)—Sciences Students (SS) and Non-Sciences Students (NSS)—enrolled in any full-time study programs (first degree) only offered by USM at the USM main campus. The respondents should age between 18–35 years old. Initially, data was collected for both “existing students” (those enrolled before the 2020/2021 academic year) and “new students” (those enrolled for the 2020/2021 academic year). However, we will not further discuss the enrollment year, as responses from “new students” are not sufficient. Hence, data provided by “new students” was neglected in this study. With the diversity of nationality background of undergraduate students at USM, the survey was conducted in English as the main language medium.

The survey collection was closed at 537 responses, where 4.46% did not meet the required criteria for this study, as mentioned above. Hence, a total of 513 valid responses (SS = 238, NSS = 275) were collected for this study, exceeding the minimum intended responses of 375.

2.2. Study Instrument

The questionnaire served as the primary instrument of this study. It was designed to comprise general to more specific questions on sustainability and SDGs knowledge covering different levels and study programs of students. Some of the questions were adapted from various published sustainability survey sources such as the Mediterranean Youth Responses Towards Sustainable Development and the Current Crisis [40], the Western Michigan University Student Sustainability Survey [41], and the Ohio State University Campus Sustainability Survey [42], while other questions were developed by the authors based on information retrieved from the USM Policy on Sustainability [43] and the USM-APEX Sustainability Roadmap: Aspiring to Meet Global Challenges [44].

The designed questionnaire consists of 60 close-ended questions in total, with four parts covering the demographic profile of the respondents, general knowledge and understanding of sustainability, attitudes towards sustainability, and perception of USM’s current sustainability programs. However, this paper will only discuss attitudes towards sustainability and the perception of USM’s current sustainability programs. To determine respondents’ level of attitude and perception, seven items on attitude and nine items on perception were presented to the respondents. Each item was measured using a 5-point Likert scale where 1 = strongly disagree; 2 = disagree; 3 = uncertain; 4 = agree; 5 = strongly agree.

2.3. Validity and Reliability of the Instrument

The questionnaire was distributed to USM experts for face validity, and it was then distributed to 20 students for a pilot test for constructed validity before the actual questionnaire was distributed to undergraduate students at USM. During the pilot study, conducted between December 2019 and January 2020 (before the outbreak of COVID-19 in Penang), Cronbach’s alpha test for internal consistency revealed a coefficient of 0.82 and 0.71 for the variable “Attitudes Towards Sustainability on Campus” and “Perception of USM Current Sustainability Programs”, respectively. For the present study (which was conducted during the pandemic of COVID-19), a Cronbach’s alpha test for internal consistency revealed a slightly increased coefficient of 0.87 and 0.72 for the variable “Attitudes Towards Sustainability on Campus” and “Perception of USM Current Sustainability Programs”, respectively. The internal consistency reliability of the measures for both the pilot and the present study has an adequate level of inter-item reliability [45], as both variables scored above 0.7. Thus, Cronbach’s alpha test provides evidence that the data collected under normal conditions and during the pandemic are valid and reliable.

2.4. Data Collection

The survey was conducted using a computer-assisted web interviewing (CAWI) technique, provided by Google Forms. Google Forms is a survey administration software used in the present study to gather information in which respondents were asked to complete an

electronic questionnaire. The questionnaire link was distributed to all USM undergraduate students through email notification from officials of the Student Development Affairs and Alumni Division (BHEPA). Respondents were encouraged to contact the study team, as mentioned in the email, should they require further explanation or have any inquiries or difficulties regarding the questionnaire. The survey was conducted online because students were not allowed to enter the university due to the outbreak of COVID-19. As a result, there were many reminders to obtain responses, although the voluntary nature of participation in the study was confidential and the survey was completed anonymously. We also distributed the Google Forms link through Facebook and WhatsApp for a faster route to disseminate information.

2.5. Statistical Data Analysis

Data were analyzed using the Statistical Package for Social Science Software (SPSS) version 27.0 [46]. In order to compare the mean score of some continuous variables for two different groups of respondents, an independent *t*-test analysis was performed. Other statistical methods used in data analysis include the normality test, reliability test, Pearson correlation test, and the bivariate regression test. Descriptive analyses were also used to present selected survey results.

3. Results and Discussions

3.1. Demographic Profile of Respondents

Table 1 summarizes the demographic profile of the respondents. From a total of 513 respondents who participated in the study and met the required criteria, 78.4 percent of them are female, and 21.6 percent are male. Most Malaysian public universities have a male to female ratio that is disproportional [47].

Table 1. Respondents' Demographic Profile.

Item	Percentage (%)
Gender	
Male	21.6
Female	78.4
Age	
below 20 years old	5.3
20–25 years old	91.0
26–30 years old	2.3
31–35 years old	1.4
Nationality	
Malaysian	95.1
Others	4.9
Cluster	
Sciences	46.0
Non-Sciences	54.0
Resident	
Off-Campus	43.7
On-Campus	56.3

The respondents are classified into 4 age ranges, where 5.3 percent of them are below 20 years old, 91 percent of them are between the age of 20–25 years old, 2.3 percent are between 26–30 years old, and 1.4 percent are between 31 to 35 years old. Most of the respondents are undergraduates that fall under the category of 20–25 years old. In terms of clusters, 238 respondents are from science backgrounds, while 275 respondents are from non-science backgrounds, showing slightly higher participation compared to the science students. Most of the respondents are Malaysian at 95.1 percent, and 56.3 percent of the respondents stayed on-campus in university-provided accommodations, while 43.7 percent of them stayed off-campus.

Table 2 depicts respondents' basic information on sustainability. In terms of familiarity with the term sustainability, 87.7 percent of the respondents are familiar with the term sustainability, while 12.3 percent are not.

Table 2. Respondents' Basic Information on Sustainability.

Item	Percentage (%)
Familiar with the term sustainability	
Yes	87.7
No	12.3
Aware of USM Policy of sustainability	
Yes	66.9
No	33.1
Aware of sustainability-related programs on campus	
Yes	71.5
No	28.5

In terms of awareness of the USM Policy on Sustainability, 66.9 percent are aware of it and 33.1 percent are not. Finally, in terms of awareness of sustainability-related programs on campus, 71.5% are aware and 28.5% are not. Overall, respondents' basic information on sustainability is very good, indicating very good familiarity and awareness of sustainability and its programs on campus. This is similar to the findings presented by Ariffin et al. [34], indicating that the level of knowledge on sustainable development among youths in Penang is well-developed.

In order to find out how the respondents obtained information on sustainability, they were asked to provide information about their sources of information on sustainability on campus (Figure 1). Respondents could select more than one source option and the data were then calculated and analyzed in Excel using Pivot Tables.

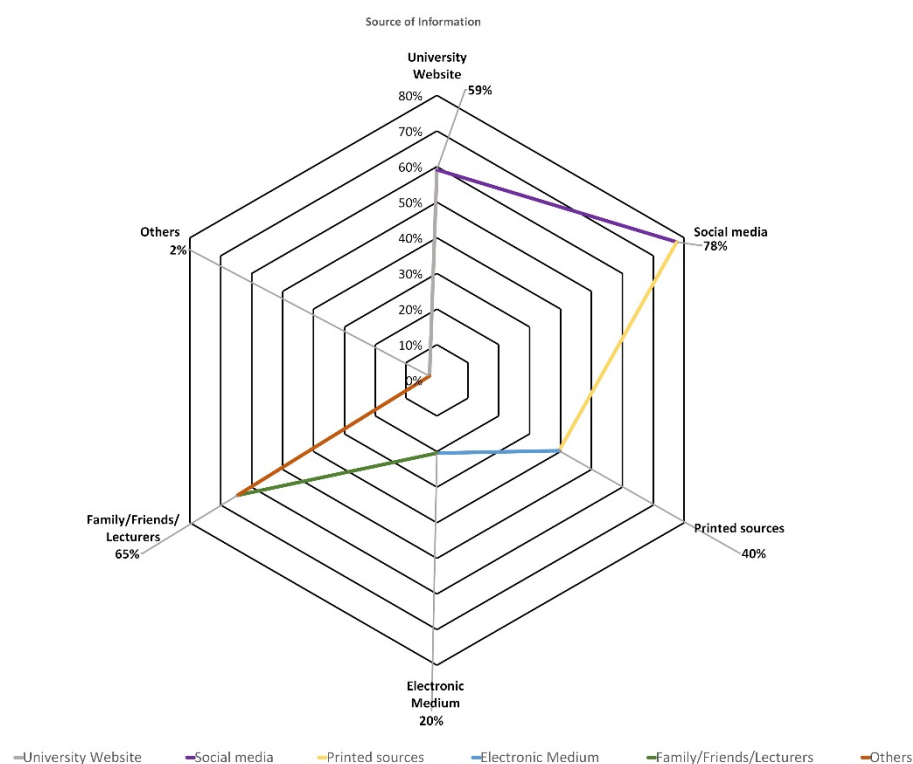


Figure 1. Sources of Information on Sustainability on Campus.

Out of the 71.5 percent (367 respondents) who were aware of the sustainability-related programs on campus, most of them obtained information about sustainability from social

media platforms such as Facebook, Twitter, Instagram, etc. (77.7%). This is consistent with the findings made by Ahamad and Ariffin [48]. Social media plays an important role in modern society. Social media communication is inexpensive, easily accessible on the internet, and has become even easier to use via smartphone apps [49]. As a result, social media has become the most preferred platform to facilitate fast and effective communication, as well as the medium for disseminating information and news to a wider audience [50].

At 64.6 percent, family, friends, and lecturers also play an important role in disseminating information regarding sustainability. In addition, at 59.1 percent, the university website is a good source of information for the respondents regarding sustainability programs on campus. The least important source appears to be the “other” category, which includes student clubs and associations on campus, NGO youth organizations, and campaigns, contributing only 2.0 percent in total.

3.2. Students’ Attitude towards Sustainability on Campus

Sustainability values are generally signified through specific attitudes. In psychology, an attitude is defined as “a set of emotions, beliefs, and behaviors toward a particular object, person, thing, or event” [51]. Attitudes are developed through our experiences, and they can have a powerful influence over our behavior; attitudes can also be changed [51]. Attitudes can be related to the degree of exposure and experience students have pertaining to sustainability. Students can have a change of attitude towards sustainability, meaning they will have a change of mindset when it comes to issues related to the environment, society, or economy. Through their exposure, they are able to develop a deep involvement in the well-being of the planet and life on earth (biotic or abiotic).

In this section, seven items were used to evaluate respondents’ attitudes towards sustainability on campus. An interpretative scale was used to evaluate respondents’ positive attitude towards sustainability on campus, where a mean of 1.00–2.33 represents low, 2.34–3.66 represents moderate, and 3.67–5.00 represents high [52]. A similar method using averaging scoring to interpret the Likert scale is found in recent research [32,34]. From the angle of respondents’ attitude, the results of the mean analysis showed that the positive attitude of the students towards sustainability on campus was moderate, with an overall mean value of 3.63.

Their attitude towards whether the decision to study at USM was influenced by the university’s sustainability programs and initiatives had a moderate mean value (3.28). Meanwhile, the level of positive attitude relating to the question concerning whether students at USM know how to dispose of waste and recyclable items properly on campus had a high mean value (3.81). This is the highest mean value in the respondents’ positive attitude towards sustainability on campus. The students’ positive attitude about influencing sustainability on campus was also high, with a mean value of 3.70. Whereas their awareness of the sustainability resources around their community had an overall mean value of 3.78 (high). The students’ sustainability awareness on campus was also high, with a mean value of 3.77. On the matter of USM leadership promoting students’ engagement in sustainability efforts on campus, the mean value was high (3.68). Finally, students’ involvement in leadership activities and/or student organizations involving sustainability had a moderate mean value (3.42). The summary of the findings is presented in Table 3.

Overall, the items shown in Table 3 have recorded positive mean scores, indicating that USM’s undergraduates have a positive attitude towards sustainability on campus. The same positive results were also recorded by Balakrishnan et al. [36]. Their study involved undergraduates from five universities in Malaysia, and they found that positive attitudes towards sustainable development among undergraduates in Malaysia are because the Malaysian higher education institutions play a key role in the education on sustainability issues. However, the results from this study and Balakrishnan et al. [36] contradict the findings from Zainordin et al. [53]. The results from their study showed that the awareness of sustainable development (SD) among Malaysian undergraduates is unfavorable, due to lack of exposure and emphasis on SD. We can suggest, with recent development in the

awareness of sustainability and sustainable development among university students in Malaysia, the level of awareness has taken a positive step.

Table 3. Respondents' Attitude Towards Sustainability on Campus.

Item	Mean	SD	Interpretation
1. When deciding to come to USM, I am influenced by the university's sustainability programs and initiatives.	3.28	1.11	Moderate
2. I know how to properly dispose of my waste and recyclables on campus.	3.81	0.94	High
3. I can personally influence sustainability on campus.	3.70	0.97	High
4. I am aware of the sustainability resources around my community.	3.78	0.95	High
5. I am aware of various sustainability initiatives on campus.	3.77	0.97	High
6. USM leadership promotes my engagement in sustainability efforts on campus.	3.68	0.95	High
7. I am involved in leadership activities and/or student organizations involving sustainability.	3.41	1.13	Moderate

In the context of respondents' attitudes towards sustainability on campus by clusters (Figure 2), findings for Item 1 show that the majority of SS (42%) and NSS (51%) students are influenced by the USM sustainability program when deciding to enroll for their first degree at USM. This indicates that the USM sustainability program has reached beyond the campus population. As for Item 2, the study found that the majority of SS (75%) and NSS (71%) agreed that they know how to properly dispose of waste and recyclables on campus. It is important to note that the SS percentage is slightly higher than that for the NSS group in terms of disposing of waste properly. Only a few of the respondents (SS: 12%, NSS: 10%) indicated that they do not know how to properly dispose of waste and recyclable items, while the others (SS: 14%, NSS: 21%) are uncertain about proper disposal and recycling methods. This might be an indication that proper disposal and recycling methods have been introduced on campus and are well received by many. In terms of Item 3, both SS and NSS show a fair agreement, with a percentage of 63% and 66%, respectively. The students believe that they can influence others towards sustainability on campus.

SS and NSS students also show an equally high level of positive attitude towards Item 4, with 70% agreeing that they are aware of the sustainability resources available on campus. Only a few disagree (SS: 9%, NSS: 9%), while the remaining are left uncertain. Similarly, both SS and NSS have an equally high level of positive attitude towards Item 5, with 67% agreeing that they are aware of various sustainability initiatives on campus. However, the study observes that NSS shows higher uncertainty of 25%, compared to SS with 23%. In the context of Item 6, both SS and NSS reported high levels of positive attitude of 60% and 63%, respectively. Almost one-third of SS (29%) and NSS (28%) are uncertain, while only 11% of SS and 8% of NSS disagree with Item 6. Findings observed for Item 7 indicate that there is still a lack of involvement of students in leadership activities or student organizations involving sustainability. About 55% of NSS agreed to Item 7, and the percentage was slightly higher for SS, at 47%, while almost one-third of both SS and NSS students are uncertain for this item. The results for uncertainty in Item 7 is similar to Item 6. Overall, a higher percentage of agreement is observed among NSS students.

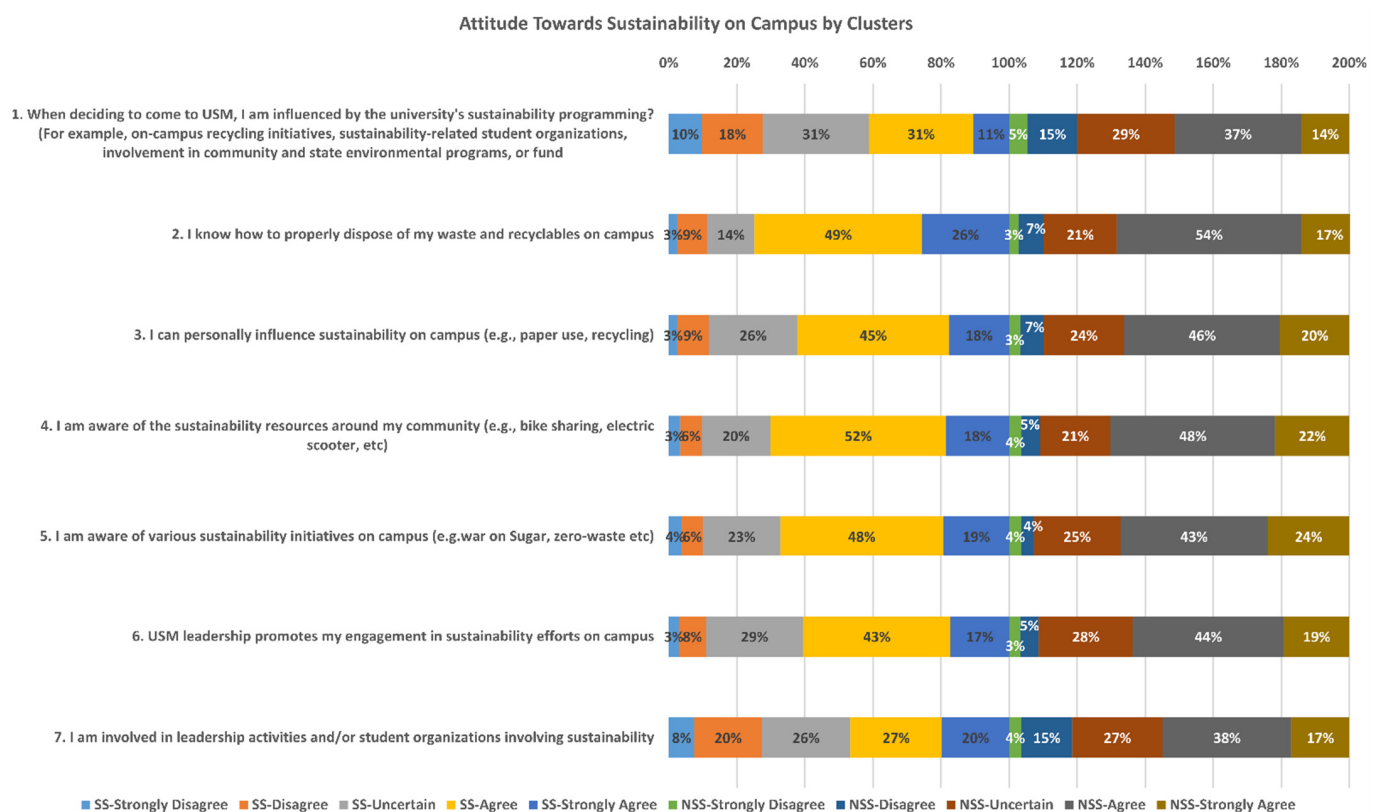


Figure 2. Attitude Towards Sustainability on Campus by Clusters.

3.2.1. Differences between Gender on Attitude towards Sustainability on Campus

The differences between gender on “Attitude Towards Sustainability on Campus” was investigated. “Attitudes Towards Sustainability on Campus” is normally distributed for both males and females, with skewness of -0.86 for the males and skewness of -0.68 for the females. Hence, an independent-samples *t*-test was conducted to compare the “Attitudes Towards Sustainability on Campus” scores for male and female students. Findings show that there was no significant difference in scores for male students (mean \pm SD): 3.56 ± 0.82 and female students (mean \pm SD): 3.65 ± 0.74 ; $t(511) = -1.20$, $p = 0.23$, two-tailed. However, it is important to note that the mean score for the female students is slightly higher than for the male students. The magnitude of the differences in the means in this present study (mean difference = -0.10 , 95% CI: -0.26 to 0.06) was very large (eta squared = 0.76). Similar findings were found in Mojilis [33], where there is no significant difference between gender. In contrast, Jannah et al. [52] revealed that females showed a higher level of positive environmental attitude compared to males.

3.2.2. Differences between Clusters on Attitude towards Sustainability on Campus

“Attitudes Towards Sustainability on Campus” shows strong evidence that it is normally distributed for both SS and NSS, with skewness of -0.07 for the SS and skewness of -0.82 for the NSS. An independent-samples *t*-test was also conducted to compare the “Attitudes Towards Sustainability on Campus” scores for SS and NSS. Findings show that there was no significant difference in scores for SS (mean \pm SD): 3.59 ± 0.76 and NSS (mean \pm SD): 3.68 ± 0.75 ; $t(511) = -1.34$, $p = 0.18$, two-tailed. The magnitude of the differences in the means (mean difference = -0.09 , 95% CI: -0.22 to 0.04) was very large (eta squared = 0.76), indicating that 75.56% of the variance in “Attitudes Towards Sustainability on Campus” is explained by clusters. It is worth noting that NSS shows a greater mean score in attitude compared to SS, contrary to the findings from Afroz and Ilham [29].

3.2.3. Differences between Student Residential Status on Attitude towards Sustainability on Campus

“Attitudes Towards Sustainability on Campus” is normally distributed for both on-campus and off-campus students, with skewness of -0.78 for the on-campus and skewness of -0.84 for off-campus students. An independent-samples *t*-test was conducted to compare the “Attitudes Towards Sustainability on Campus” scores for on-campus and off-campus students. There is a significant difference in scores for on-campus students (mean \pm SD): 3.71 ± 0.80 and off-campus students (mean \pm SD): 3.54 ± 0.68 ; $t(506) = 2.59$, $p = 0.01$, two-tailed. This provides evidence that students who live on campus have a greater exposure to sustainability issues and awareness, hence showing a higher positive attitude towards sustainability on campus. The magnitude of the differences in the means (mean difference = 0.17 , 95% CI: 0.04 to 0.30) was very large (eta squared = 0.75). Expressed as a percentage, 75.26% of the variance in “Attitudes Towards Sustainability on Campus” is explained by residential type. The findings contrast with a study by Mojilis [33], which observed no significant difference in sustainability awareness by residential type.

3.3. Students’ Perception of USM Current Sustainability Programs

Lindsay and Norman [54] define perception as the process by which organisms interpret and organize sensation to produce a meaningful experience of the world. In other words, it is a process where a person interprets a situation or stimuli into a meaningful experience based on prior experiences. As time passes, these meaningful experiences may transform into feelings and beliefs, shaping predetermined opinions about an issue or idea. Kaliyaperumal [55] commented that the feeling towards a particular topic, including the predetermined opinions, forms an attitude.

This indicates that perception plays an important role in influencing human attitude and behavior towards a particular object or situation. An in-depth study of student perception of sustainability programs at USM is therefore important, as it indicates the effectiveness of the programs and what measures can be taken to improve the existing programs for the campus community.

Hence, nine items were used to evaluate respondents’ perceptions of USM’s current sustainability programs. The results are presented in Table 4. In evaluating the level of respondents’ positive perception of USM’s current sustainability programs, an interpretative scale was used where mean 1.00 – 2.33 represents low, 2.34 – 3.66 represents moderate, and 3.67 – 5.00 represents high [52].

Table 4 shows that five out of the nine items used to evaluate the perception of the existing sustainability programs are highly positively perceived by the respondents. Item 1 measures the respondents’ perception of sustainability as the main focus of the university. Item 2 measures the respondents’ perception of the significance of the sustainability programs at USM. Items 3 and 9 specifically measure the respondents’ perceptions of sustainability elements in academic programs. Items 4 and 5 measure the respondents’ perceptions about sustainability advertisements and promotions on campus. Items 6, 7, and 8 measure the respondents’ perceptions of sustainability issues on campus.

The highest-ranked item in the respondents’ perception list, with a mean value of 4.32 , is about prioritizing sustainability at USM. It appears that most of the respondents perceive sustainability as important and that the university should prioritize it. The second-highest ranked item, with a mean value of 4.02 , is about introducing a ban on the use of plastic bags and straws throughout campus. The third highest ranked item, with a mean value of 3.92 , is about the significant impact of the programs carried out at USM on enhancing the sustainability knowledge and understanding of the respondents.

Table 4. Respondents' Perception of USM Current Sustainability Programs.

Item	Mean	SD	Interpretation
1. Sustainability should become a priority for Universiti Sains Malaysia.	4.32	0.86	High
2. My understanding of sustainability has grown due to programs that I have participated in at USM.	3.92	0.97	High
3. My course does not require a sustainability element.	3.60	1.21	Moderate
4. I do not see much advertisement about sustainability-related programs around campus.	3.10	1.17	Moderate
5. I consider myself highly informed about campus sustainability issues.	3.34	0.98	Moderate
6. Plastic waste is one major issue at USM.	3.89	1.01	High
7. I can see food waste is not discarded appropriately.	3.70	1.01	High
8. I highly recommend that USM ban the use of plastic bags and straws throughout the campus.	4.02	1.01	High
9. All my lecturers have integrated sustainability issues well in every subject taught at USM.	3.55	1.00	Moderate

These results indicate that sustainability is positively perceived at USM and should continue to be the main priority of the university. The respondents likewise believe that the university should also focus on finding ways to address sustainability issues such as plastic waste, food waste, and the usage of plastic bags and straws on campus. It is interesting to note that the issue of plastic bags and straw usage is ranked highest in terms of respondents' perception of sustainability issues on campus. Many developing countries face a paradox: customers are accustomed to using plastic bags in their daily lives, but they are not environmentally beneficial [56]. Not excluding the Malaysian culture, consumers tend to use plastic bags or plastic containers for food wrapping and takeaways, due to the nature of the food itself, to avoid spillage. According to Jayaraman et.al, [57], the use of the plastic bag in hawker stalls, food courts, and coffee shops is a very common practice in Malaysia.

In order to investigate whether residential status led to differences in the perceptions for Item 6, "Plastic waste is one major issue in USM", and Item 7, "I can see food waste is not discarded appropriately", an additional test was performed. An independent-samples *t*-test was conducted to compare Item 6 scores by residential type. The findings reveal a significant difference in scores for on-campus students (mean \pm SD): 3.92 ± 1.08 and off-campus students (mean \pm SD): 3.86 ± 0.91 ; $t(506) = 0.64$, $p = 0.53$, two-tailed. The magnitude of the differences in the means (mean difference = 0.06, 95% CI: -0.12 to 0.23) was very large (eta squared = 1.01). Additionally, an independent-samples *t*-test was also conducted to compare the Item 7 scores by residential type. There is a significant difference in scores for on-campus students (mean \pm SD): 3.74 ± 1.080 and off-campus students (mean \pm SD): 3.65 ± 0.90 ; $t(507) = 1.00$, $p = 0.32$, two-tailed. The magnitude of the differences in the means (mean difference = 0.09, 95% CI: -0.08 to 0.26) was very large (eta squared = 1.01). An independent *t*-test conducted on both Item 6 and Item 7 reveals that there is a significant difference in scores for on-campus and off-campus students. On-campus students are observed to have a higher mean score of perception for Item 6 and 7 compared to off-campus students, which might indicate that on-campus students are more aware of the current sustainability issues on campus.

Existing sustainability programs carried out at USM are deemed successful in enhancing the knowledge and understanding of sustainability for the respondents. This result is consistent with the findings of Balakrishnan et al. [36].

Finally, respondents' perceptions of sustainability elements in academic programs and sustainability advertisements and promotions on campus are at a moderate level. This indicates that improvements can be made in these areas to ensure more positive experiences for the respondents.

It is important to note that the list of items used in measuring respondents' perceptions is not comprehensive. Respondents' perceptions of other areas of sustainability such as water, electricity, and health have not been measured due to limited resources and time. A more comprehensive study that includes more areas and issues of sustainability could be carried out in future research.

In the context of respondents' perception of USM's current sustainability programs by clusters (Figure 3), findings for Item 1 show that a majority of SS (89%) and NSS (88%) agreed that sustainability should become a priority at USM. This indicates that sustainability is widely accepted among students and should become a priority to align with the SDGs Agenda. Findings for Item 2 show that the majority of SS (74%) and NSS (76%) also agreed that their understanding of sustainability has grown due to the programs that they have participated in at USM. Less than 20% of SS and NSS are uncertain on Item 2. The majority of SS (68%) and NSS (47%) disagree with Item 3 "My course does not require sustainability element", while only 8% of SS and 29% of NSS are uncertain on Item 3. In terms of Item 4, "I do not see much advertisement on sustainability-related programs around campus", a moderate result of "agree" (SS:33%, NSS:34%) and "disagree" (SS:38%, NSS:37%) was observed, while almost 30% of SS and NSS are uncertain about this. As for Item 5, NSS is observed to agree, with 52%, while only 37% of SS agreed. However, the study also observed that the majority of SS (42%) are uncertain about Item 5. In the context for Item 6, findings revealed that the majority of SS (67%) and SS (72%) agreed to the statement "Plastic waste is one major issue at USM". Only less than 10% of SS and NSS disagree on this, indicating that plastic waste is a concern among students studying at USM. Findings show that the majority of SS (63%) and NSS (61%) agreed with Item 7, "I can see food waste is not discarded appropriately". This is aligned with the result from Item 6, as most of the cafes and food providers on campus use plastic to cover food, or for take away purposes, hence causing concern about plastic waste issues. Meanwhile, the majority of SS (76%) and NSS (77%) agreed with Item 8, "I highly recommend that USM ban the use of plastic bags and straws throughout the campus". Findings also reveal that the majority of SS (54%) and NSS (58%) agreed with Item 9, "All my lecturers have integrated sustainability issues well in every subject taught at USM", with only 12% of disagreement between SS and NSS. However, the percentage of uncertainty for both SS and NSS is 34% and 31%, respectively. Overall, a positive perception is observed from both SS and NSS.

3.3.1. Differences between Gender on "Students' Perception of USM Current Sustainability Programs"

The differences between gender on "Students' Perception of USM Current Sustainability Programs" was investigated. "Students' Perception of USM Current Sustainability Programs" is normally distributed for both males and females, with skewness of -0.54 for the males and skewness of -0.57 for the females. Hence, an independent-samples *t*-test was conducted to compare the Students' Perception of USM Current Sustainability Programs scores for male and female students. Findings show that there was no significant difference in scores for male students (mean \pm SD): 3.71 ± 0.61 and female students (mean \pm SD): 3.72 ± 0.57 ; $t(511) = -0.19$, $p = 0.85$, two-tailed. However, it is important to note that the mean score for the female student is slightly higher than male students, similar to the result obtained in Section 3.2.1. The magnitude of the differences in the means (mean difference = -0.01 , 95% CI: -0.13 to 0.11) was very large (eta squared = 0.57).

Expressed as a percentage, 57 percent of the variance in “Students’ Perception of USM Current Sustainability Programs” is explained by gender.

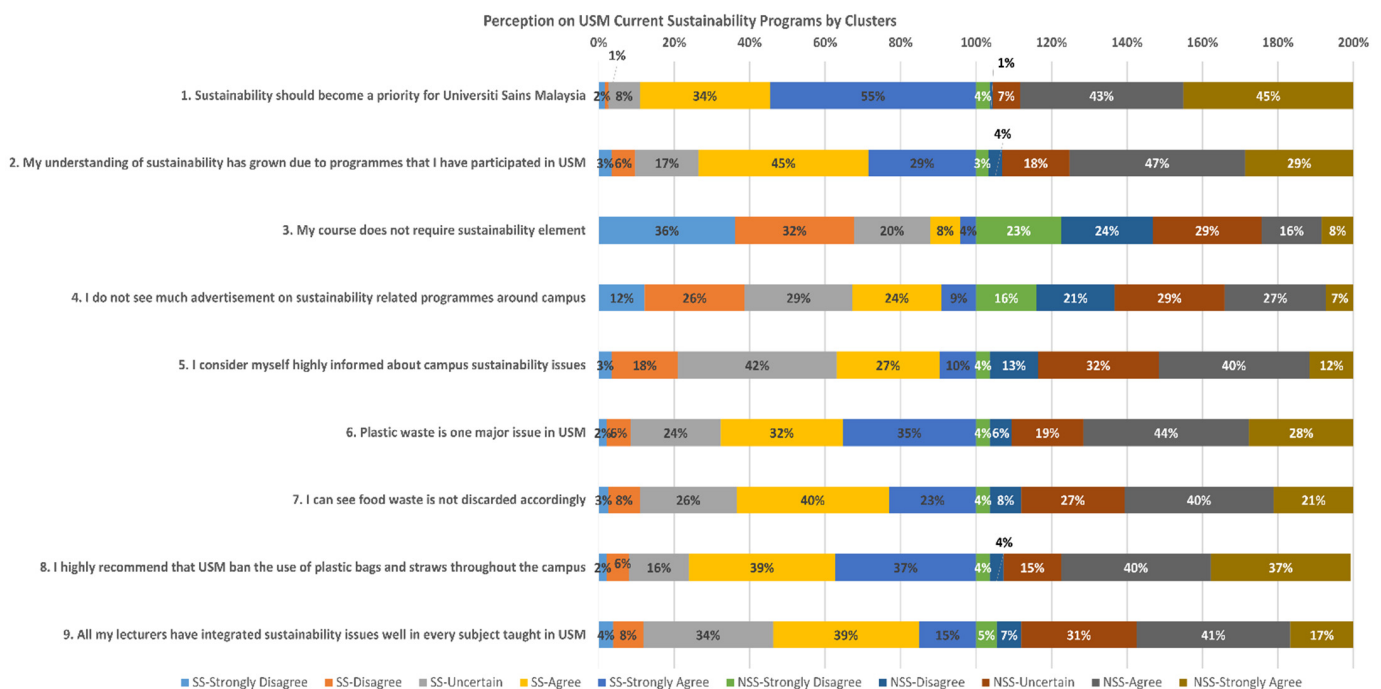


Figure 3. Perception of USM Current Sustainability Programs by Clusters.

3.3.2. Differences between Clusters on “Students’ Perception of USM Current Sustainability Programs”

“Students’ Perception of USM Current Sustainability Programs” shows strong evidence that it is normally distributed for both SS and NSS, with skewness of -0.661 for the SS and skewness of -0.484 for the NSS. An independent-samples t -test was also conducted to compare the “Students’ Perception of USM Current Sustainability Programs” scores for SS and NSS. Findings show that there was no significant difference in scores for SS (mean \pm SD): 3.74 ± 0.56 and NSS (mean \pm SD): 3.69 ± 0.58 ; $t(511) = 1.07$, $p = 0.29$, two-tailed. The magnitude of the differences between the means (mean difference = 0.05 , 95% CI: -0.05 to 0.15) was very large (eta squared = 0.57), indicating that 57% of the variance in “Students’ Perception of USM Current Sustainability Programs” is explained by clusters. It is worth noting that SS shows a greater mean score in perception compared to NSS, as presented by the findings from Afroz and Ilham [29].

3.3.3. Difference between Student Residential Status on “Students’ Perception of USM Current Sustainability Programs”

“Students’ Perception of USM Current Sustainability Programs” is normally distributed for both on-campus and off-campus students, with skewness of -0.59 for the on-campus and skewness of -0.790 for off-campus. An independent-samples t -test was conducted to compare the “Students’ Perception of USM Current Sustainability Programs” scores for on-campus and off-campus students. There is a significant difference between scores for on-campus students (mean \pm SD): 3.78 ± 0.62 and off-campus students (mean \pm SD): 3.63 ± 0.49 ; $t(511) = 2.939$, $p = 0.003$, two-tailed. This provides evidence that students who live on campus have a better perception of current sustainability programs on campus. The magnitude of the differences in the means (mean difference = 0.14 , 95% CI: 0.05 to 0.24) was very large (eta squared = 0.57). Expressed as a percentage, 57% of the variance in “Students’ Perception of USM Current Sustainability Programs” is explained by residential type. The findings are in contrast to a study by Mojilis [33], which observed no significant difference of sustainability awareness by residential type.

3.4. Relationship between Students Attitude and Perception

In this context, the relationship between “Attitudes Towards Sustainability on Campus” and “Perception of USM Current Sustainability Program” was investigated using the Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. The rating for “Attitudes Towards Sustainability on Campus” and “Perception of USM Current Sustainability Program” was (mean \pm SD): 3.63 ± 0.76 and (mean \pm SD): 3.72 ± 0.57 , respectively. Findings show that there was a strong, positive correlation between the two variables, $r = 0.67$, $n = 513$, $p < 0.05$, with a high score of “Attitudes Towards Sustainability on Campus” associated with a high score of “Perception of USM Current Sustainability Program”. Furthermore, the findings reveal that “Attitudes Towards Sustainability on Campus” helps to explain 45% of the variance in respondents’ scores on “Perception of USM Current Sustainability Program”. This is quite a respectable amount of variance explained when compared with much of the research conducted in the social sciences [58].

A bivariate regression was also conducted to examine how well the level of “Attitudes Towards Sustainability on Campus” could predict the level of “Perception of USM Current Sustainability Program”. A scatterplot (Figure 4) showed that the relationship between “Attitudes Towards Sustainability on Campus” and of “Perception of USM Current Sustainability Program” was positive and did not reveal any bivariate outliers. Findings reveal that the correlation between “Attitudes Towards Sustainability on Campus” and “Perception of USM Current Sustainability Program” was statistically significant, $r(511) = 0.671$, $p < 0.001$. The regression equation for predicting perception from “Attitudes Towards Sustainability on Campus” was $\hat{Y} = 1.874 + 0.507(x)$. The r^2 for this equation was 0.451; that is, 45.1% of the variance in “Perception of USM Current Sustainability Program” was predictable from the level of “Attitudes Towards Sustainability on Campus”. Furthermore, a strong relationship is observed. The bootstrapped 95% confidence interval for the slope to predict “Perception of USM Current Sustainability Program” from “Attitudes Towards Sustainability on Campus” ranges from 0.46 to 0.56; thus, for every one unit of increase in the positive level of “Attitudes Towards Sustainability on Campus”, the positive level of “Perception of USM Current Sustainability Program” increased by about 0.46–0.56 points.

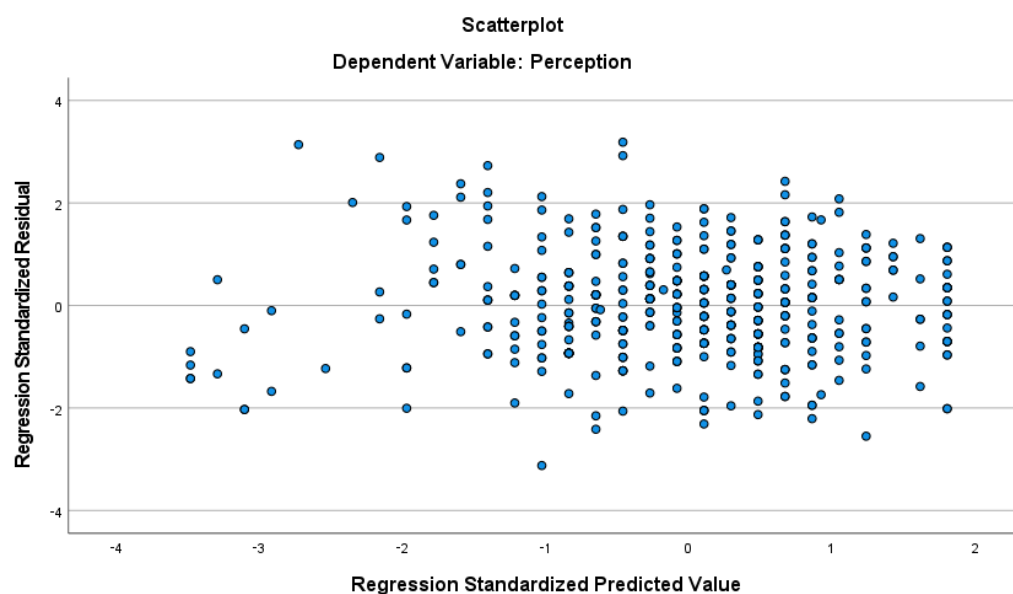


Figure 4. Scatterplot of “Attitudes Towards Sustainability on Campus” and of “Perception of USM Current Sustainability Program”.

4. Conclusions

This study was conducted to assess USM's undergraduate students' attitudes and perceptions towards sustainability, covering two major elements—their attitudes towards sustainability on campus, and their perceptions of the sustainability programs conducted at USM. From the survey conducted among 513 students, the study found that students' positive attitudes and perceptions on sustainability on campus ranged from moderate to high. This study also elucidates the factors that influence students' attitudes and perceptions towards sustainability on campus. Surprisingly, the present study found no significant difference in students' attitudes and perceptions towards sustainability based on gender or clusters, implying that gender and clusters had no bearing on the level of students' attitudes and perceptions towards sustainability. Student residential status, on the other hand, is shown exhibit considerable differences in attitudes and perceptions about sustainability on campus, implying that student residential status can influence students' attitudes and perceptions about sustainability on campus. There was also a strong, positive association between students' attitudes and perceptions, according to the findings. It could be summarized that USM students were able to relate sustainability issues to current situations and assumed a positive attitude towards the implementation of sustainability programs at USM.

Although the study is exploratory in nature, the findings are useful as a starting point to understand the impact of sustainability agendas advocated by the university and to assess whether there is positive acceptance of sustainability among students. The study could be further be extended to include students from different campuses, academics, and other higher education institutions (HEIs), given the recent strong emphasis on sustainability among HEIs. As Malaysia is also committing to the 17 SDGs, it is imperative that everyone, especially students, not only understand the meaning of sustainability, but also translate this understanding into meaningful practices.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: We do not have publicly archived datasets analyzed but can be available upon request.

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