



ASSESSING STUDENT'S PERCEPTIONS OF RECYCLING INITIATIVES FOR PACKAGING WASTE MANAGEMENT AT UITM DUNGUN

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Abstract:

Packaging waste has become a significant issue in higher education institutions. The increasing usage of packaged food, beverages, and takeaway items among university students. Furthermore, this issue has also increased due to the growing demand for food delivery services and convenience foods. This phenomenon has contributed to the accumulation of packaging waste on campuses. Therefore, recycling is an effective waste management strategy because it helps reduce environmental pollution, conserve natural resources, and promote sustainable practices. Universities should encourage environmentally behaviours for students. In addition, universities should also implement recycling initiatives and provide sufficient waste management facilities. Although there are a lot of recycling initiatives, student participation is often inconsistent. Individual attitudes, personal recycling habits, and awareness of environmental issues were factors that can influence students' willingness to join in recycling initiatives. Therefore, to

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improve waste management practices on campus, understanding students' perceptions of recycling initiatives is essential. Positive attitudes toward recycling, strong environmental awareness, and established recycling habits have been identified as important determinants of recycling behaviour. In contrast, limited knowledge, lack of motivation, and inadequate access to recycling facilities may decrease participation in recycling programs. Therefore, this study determined students' perceptions on recycling initiatives for packaging waste management at Universiti Teknologi MARA (UiTM) Dungun. It also examines the influence of attitudes, personal habits, and awareness of environmental impacts on students' participation in recycling initiatives. The findings provide valuable insights into the effectiveness of current recycling initiatives and offer recommendations for enhancing sustainable waste management practices. Besides that, this study also contributes to promoting environmental responsibility and supporting the development of a more sustainable campus environment.

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Attitudes, Environmental Awareness, Packaging Waste, Recycling, Sustainable Packaging



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Introduction

The waste management process started with the collection, transportation, processing, recovery, and disposal of waste materials. Its main objective is to protect public health, maintain environmental quality, and minimise the risks related to waste management. Modern waste management extends beyond simple disposal. It also increasingly emphasises sustainable approaches such as waste reduction, recycling, resource recovery, and circular economy principles. This transition reflects growing global awareness to reduce waste management, optimise resource utilisation, and mitigate environmental degradation. As population growth and changing consumption patterns continue to increase waste volumes worldwide, effective waste management practices have become essential for maintaining environmental sustainability and promoting healthier communities (Ram & Bracci, 2024; Awino & Apitz, 2024).

The recycling, waste reduction, and resource recovery practices have become activities of sustainable waste management. Sustainable waste management approaches can reduce environmental impacts. Besides that, it also improves the resource efficiency. This concept is shown in the Waste Hierarchy framework. This framework shows the waste management level based on its environmental benefits. The framework starts with prevention, followed by reuse, recycling, recovery, and finally disposal (Awino & Apitz, 2024). Preventing waste at the source is the most effective prevention strategy because it reduces the additional treatment and disposal. Next, reuse and recycling support sustainability by extending the useful life of

materials and reducing dependence on original resources. By reducing the volume of waste that is sent to landfills and burning facilities, the Waste Hierarchy contributes to resource conservation, lower pollution levels, and energy savings, which are all consistent with broader sustainable development objectives (Karimi, 2023; Awino & Apitz, 2024).

Packaging also plays a significant role throughout the supply chain. Different materials, such as paper, plastic, glass, metal, wood, and composite materials, contribute to pollution. However, the growing reliance on single-use packaging, especially plastic packaging, has become a major contributor to waste production and environmental pollution worldwide. Therefore, it is important to understand the characteristics of packaging materials and how they enter waste spills. The effective waste management strategies can promote sustainability, improve resource conservation, and reduce the environmental burden associated with packaging waste (Corona et al., 2024; Cerqueira-Streit et al., 2023).

Literature Review

Recycling initiatives in higher education institutions rely on proper individual waste practices. Plastic packaging needs to sort properly into recycling systems. This is because contamination can occur when plastics are disposed of in organic, residual, or paper waste streams. Improper sorting of plastics reduces recycling efficiency and undermines circular economy objectives (Nemat et al., 2020; Awino & Apitz, 2024). Improper disposal of plastic packaging may lead to long-term environmental persistence or toxic emissions during incineration and contributing to environmental degradation. Therefore, effective recycling systems require not only infrastructure but also behavioural compliance from users. In universities, structured recycling initiatives and awareness programs are essential in improving student participation and waste management efficiency (Ram & Bracci, 2024).

Recycling Initiatives

Nowadays, packaging usage is increasing in urban university environments due to food delivery and convenience consumption. While packaging guarantees food safety, hygiene, and logistical efficiency, it also contributes significantly to solid waste generation, especially through single-use plastics. The increasing usage of takeaway and delivery services has intensified packaging waste accumulation in campuses and urban areas (Zhang et al., 2023). Although packaging may influence a small portion of a product's total environmental footprint, its improper disposal contributes significantly to environmental pollution and landfill pressure (Corona et al., 2024). Therefore, universities play a critical role as platforms for promoting sustainability through green campus initiatives, waste reduction programs, and Material Recovery Facilities that encourage responsible consumption behaviour.

Attitudes

Understanding human attitude patterns is paramount as they significantly influence environmental quality. Limiting plastic use exemplifies pro-environmental behaviour, reflecting voluntary actions aimed at conservation and preservation. The extent to which people avoid purchasing single-use plastics depends on their awareness of the negative impacts of plastic, their concerns about the environment, and third-party commitments to reduce those effects. Through raising knowledge and encouraging sustainable practices, environmental education has been demonstrated to successfully lower microplastic pollution. Hence, there are

two main reasons why environmental education content in higher education is important. First, research indicates that a variety of commonplace actions frequently cause waste and pollution issues. To ensure sustainability after graduation, environmental education can also include concerns, habits, and knowledge in the work environment of student's futures workplaces (Butt et al., 2014; Malik et al., 2019). Students, as individuals with a high degree of knowledge, have an important effect on the environment through their attitude and awareness. This is due to the essential part that higher education takes in producing talent for the community. Campuses continue to confront many challenges in adopting sustainable development, at least. When the campus is unclean, this issue prevents it from being a comfortable location to carry out the educational process. Green behavior and green consumption are now significantly influenced by environmentally friendly social environments (Trong et al., 2023).

Customers, particularly students, are still unwilling to alter their first buying habits, and they rarely participate in packaging recycling initiatives. The overpackaging of express items is one of the primary causes of resource waste in express packing. The promotion of recyclable express packaging has been studied by researchers. To raise awareness, this study suggested introducing a system for recycling packaging and promoting its visibility. While there has been improvement in recycling express packaging, there is research analyzing its management from the perspective of customers' actions. Attitudes can be influenced by providing thorough information and this method can be applied using modifying emotional experiences and cognitive processes. Research from the past has shown that campaigns like instructional content on social media are crucial in influencing people's opinions and, eventually, their behavior (Maulidini and Sumarwan, 2022).

Personal Habits

Student's perceptions of recycling initiatives for packaging waste management are shaped by various factors. Research indicates that the convenience and features of packaging play a crucial role in influencing recycling behaviors among students. Williams et al. (2018) highlight that packaging with easy cleaning processes and resealable features can significantly enhance the correct sorting of plastic packaging waste. This suggests that students are more likely to engage in recycling practices when packaging is designed for easy handling and reuse. According to Soderberg et al. (2022), students' recycling practices are influenced by their opinions on the importance of packaging. High-value packaging is more likely to be properly sorted and recycled, which reflects students' views on waste management and sustainability.

Moreover, social influences and regulatory factors also play pivotal roles in shaping student's recycling habits. It is emphasized that social norms, altruism, and local regulations are key drivers of strong recycling habits within communities. Students who are influenced by their peers or who comply with local recycling regulations are more likely to adopt recycling behaviors. The proximity to recycling bins further enhances these habits, as individuals who regularly dispose of general refuse in nearby bins are more inclined to recycle at home. This proximity effect underscores the importance of accessible recycling infrastructure in improving sustainable behaviors among students. Additionally, the increasing trend of online food delivery and the consumption habits of students contribute significantly to packaging waste generation.

Awareness of Environmental Impact

Students' influence on the environment is substantial, given their high level of knowledge and awareness (Li et al., 2019; Malik et al., 2019). As future decision-makers and educators, students play a pivotal role in addressing environmental challenges (Shafiei & Maleksaeidi, 2020). The Indiana Department of Environmental Management advocates for the 3Rs of waste which are reduce, reuse, and recycle as effective waste management strategies (Waste, 2021). Additionally, the research underscores the significance of environmental behaviour in achieving zero-waste environments (Ulhasanah & Goto, 2017) which emphasizes the need to study student's environmental behaviour as future environmental stewards. However, challenges persist in integrating sustainable development practices on campuses, necessitating more guidance, education, and information campaigns to promote sustainable solutions. Consumer expectations are evolving towards minimal waste generation and recyclable packaging materials (Otto et al., 2021).

Since there is now a lack of public awareness, education offers an important opportunity to encourage recycling and separating waste as a habit. Formal educational institutions can promote an attitude of environmental responsibility (Wu et al., 2019). Instead, it requires a significant financial and time commitment in addition to an essential educational change. Educational institutions are an effective tool that should always be used to educate a future generation of environmental protectors. Every country and educational level has a different approach to promoting environmental engagement, behavior, and understanding. Alshehri (2025) demonstrated a strong connection between the student's understanding and the quality of environmental education, particularly at the university level. Others demonstrated that pro-environmental conduct greatly influences the workplace in a green university setting (Blok et al., 2015). Additionally, Akhtar et al. (2021) examined how motivation and other green human resources management methods affect student's pro-environmental behavior in higher education, which is one of the key factors.

Methodology

Research Design

This research used a comparative survey design. It was conducted at UiTM Dungun. Students from the Faculty of Hotel and Tourism Management were involved in this research. A quantitative research design is used in this study, and data analysis is done using SPSS (Statistical Package for the Social Sciences) and Microsoft Excel. The main objective of this study is to collect quantitative information about attitudes toward recycling, personal habits, and awareness of environmental impact.

Population and Sampling

The study population involved students from the Faculty of Hotel and Tourism Management at Universiti Teknologi MARA (UiTM) Dungun. This faculty was selected because it offers academic programs related to hospitality, tourism, culinary arts, and foodservice management, thus providing a suitable setting to examine students' perceptions of recycling initiatives for packaging waste management. Respondents from Semester 1 to Semester 6 were considered eligible to participate because they had sufficient exposure to campus waste management practices and recycling activities.

The total student population on the faculty was approximately 1,620. Based on the sample size determination table developed by Krejcie and Morgan (1970), a minimum sample of 318 respondents was considered adequate for this study. 318 questionnaires were distributed to students in the faculty. A convenience sampling technique was employed in selecting the respondents. Students who were accessible and willing to participate were invited to complete the questionnaire. This approach was chosen because the study focused on recycling activities among students within the Faculty of Hotel and Tourism Management at UiTM Dungun. In addition, this approach allowed the researcher to reach respondents efficiently.

Study Instrument

For the survey instrument, the researcher used Google Forms as a platform. The questionnaire was divided into four sections: (1) Packaging Waste Behavior, (2) Attitudes Toward Recycling, (3) Personal Recycling Habits, and (4) Awareness of Environmental Impacts. The tools in Section A refer to demographic information such as age, gender, and academic background/faculty. The other sections B, C, D and E measure attitudes, personal habits and awareness on environmental impacts in packaging waste management. These remaining sections employed a 5-point Likert scale from "Strongly Disagree (1)" to "Strongly Agree (5)". The questionnaire included closed-ended questions.

The statements are organized into five sections with four sections corresponding to each dimension mentioned above while Section A covers demographic information, including age, gender, and academic background/faculty. This allows for a better understanding of the respondents' characteristics and how they relate to their attitudes towards packaging waste management. Sections B, C, D, and E were evaluated on a 5-point Likert scale from "Strongly Disagree (1)" to "Strongly Agree (5)". For consistent responses, closed-ended questions were used while open-ended questions allowed participants to elaborate on their opinions which facilitated a deeper understanding of their viewpoints. This approach enables a comprehensive assessment of respondents' attitudes towards packaging waste management across different behavioural dimensions. The survey was categorized into multiple sections to collect detailed information

Data Collection

Data collection is the process of collecting and evaluating information from multiple sources. It is proposed to answer research problems, answer questions, evaluate outcomes, and forecast trends and probabilities. Primary data were collected from the respondents to achieve the objectives of this study. As previously stated, the survey was carried out by distributing a questionnaire about factors influencing student's decisions on the disposal and recycling of packaging materials, as well as examining the effectiveness of the current recycling infrastructure and programs at UiTM Dungun. The target sample for this study is 318 students from UiTM Dungun. The data collection was carried out via a link shared using WhatsApp and Telegram for convenience and accessibility. The survey took 5 to 10 minutes to complete, and data was gathered over the month. REC letter approval is required before collecting data to share the questionnaire. To conduct the study, formal ethics approval was obtained from PJI UITMCT, resulting in an approved REC letter with reference number: 600-UiTMCTKD (PJI/RMU 5/2) IPN. The breakdown of the questionnaire sections is tabulated in Table 1.

Table 1: Frequency of Demographic Respondents

Variables	Category	Frequency	Percent (%)
Gender	Male	103	32.4
	Female	215	67.6
	Total	318	100.0
Age	18 – 22 years	168	52.8
	23 – 27 years	133	41.8
	28 - 32 years	16	5.0
	33 - 37 years	1	0.3
	Total	318	100.0
Academic Background	HM110 - Diploma in Hotel Management	41	12.9
	HM111 - Diploma in Tourism Management	37	11.6
	HM112 - Diploma in Food Service Management	48	15.1
	HM115 - Diploma in Culinary Arts	76	23.9
	HM240 - Bachelor of Science (Hons) in Hotel Management	27	8.5
	HM242 - Bachelor of Science (Hons) in Food Service Management	89	28.0
	Total	318	100.0

Table 1 presents the demographic characteristics of the respondents. It represents gender, age, and academic background. Female respondents represented the majority of the sample (67.6%), while male respondents accounted for 32.4%. This distribution reflects the demographic composition of the respondents who participated in the study. The largest age group of respondents (52.8%) was between the ages of 18 and 22, with 168 participants. The next largest age group (41.8%) was between the ages of 23 and 27, with 133 respondents. The 28–32 age group had a lower percentage of responders (5.0%) than the 33–37 age group, which had just 0.3%. As for their academic backgrounds, most respondents (89, or 28.0%) were from the HM242 Bachelor of Science (Hons.) in Food Service Management program, followed by those from the HM115 Diploma in Culinary Arts (76, or 23.9%). HM110 Diploma in Hotel Management (12.9%), HM111 Diploma in Tourism Management (11.6%), HM240 Bachelor of Science (Hons.) in Hotel Management (8.5%), and HM112 Diploma in Food Service Management (15.1%) were among the other programs. This distribution shows the lowest representation in the age category of 33–37 years while highlighting the majority of responses in specific categories, such as female and 18–22 years old.

Data Analysis

All data collection used an online survey through the convenience sampling technique as mentioned above. Convenience sampling is used because it enhances the effectiveness of data collection. In addition, this sampling was chosen based on respondents' availability and willingness to participate. This method makes it simple to reach respondents. Furthermore,

convenience sampling was chosen because it allows for a rapid, operationally efficient and cost-effective method of primary data collection.

The research questions are aligned with the topic of assessing students' perceptions of recycling initiatives for packaging waste management at UiTM Dungun. Frequency tables and graphs were used to present the findings of the data analysis, which highlight the factors that impact student's perceptions of UiTM Dungun's recycling initiatives for packaging waste. The results will be effectively illustrated with several tables and graphs. This study used descriptive statistics, including mean, standard deviation, frequency distribution, Pearson correlation, and multiple regression analysis. The Statistical Package for the Social Sciences (SPSS) version 26 will be used to analyse the gathered data.

Findings

Pilot Test

The pilot test would involve 10% of the total sample size, which is approximately 30 students who answered the questionnaire. In this study, a pilot test has been distributed to 30 samples to improve the structure of the questionnaire. The pilot survey had two primary objectives which were to investigate factors influencing student's decisions on the disposal and recycling of packaging materials and to examine the effectiveness of the current recycling infrastructure and programs at UiTM Dungun in promoting proper disposal and recycling behaviours among students. The data from the pilot test will be entered and evaluated for the reliability test using the IBM Statistical Package for the Social Sciences (SPSS) in Table 2.

Table 2: Reliability Test

Variables	Cronbach's Alpha	Number of Items	Number of Respondents
Recycling Initiatives	0.726	5	30
Attitudes	0.779	6	30
Personal Habits	0.657	5	30
Awareness of Environmental Impacts	0.933	5	30

Reliability and Normality of Data Distribution

Table 3: Summaries Of Reliability Analysis

Variables	Numbers of Items	Cronbach's Alpha	Relationship
Recycling Initiatives	5	0.785	Good
Attitudes	6	0.835	Very Good
Personal Habits	5	0.773	Good
Awareness of Environmental Impacts	5	0.897	Very Good

According to the results shown in Table 3, the scales used for evaluating recycling initiatives and attitudes have Cronbach's alpha values of 0.785 and 0.835. This indicates the items on each scale measure their intended constructs with reliability and show a good degree of internal consistency. Cronbach's alpha scores for the measures evaluating awareness of environmental impacts and personal habits are 0.897 and 0.773, respectively, further indicating good internal consistency. The alpha values above 0.7 as acceptable and those above 0.8 as good indicators of reliability, as highlighted by Frost (2022).

Table 4: Normality Test

	N	Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
Recycling Initiatives	318	0.174	0.137	-0.170	0.273
Attitudes	318	-1.211	0.137	3.049	0.273
Personal Habits	318	-0.095	0.137	0.539	0.273
Awareness of Environmental Impacts	318	-1.135	0.137	2.382	0.273
Valid N (listwise)	318				

The normality of the data was assessed using skewness and kurtosis, where values between -2 and +2 indicate normal distribution. For recycling initiatives, the skewness was 0.174 and the kurtosis was -0.170, indicating a normal distribution. Average personal habits also showed normality with skewness of -0.095 and kurtosis of 0.539. Awareness of environmental impacts had skewness of -1.135, which is within the normal range, but kurtosis was 2.382, slightly exceeding the threshold. Similarly, attitudes showed skewness of -1.211, within the acceptable range, but kurtosis was 3.049, which is above the normal range. Overall, most variables met the normality assumption, except for minor deviations in kurtosis for attitudes and awareness of environmental impacts.

Characteristics of Variables

Table 5: Descriptive Analysis

Descriptive Statistics			
	N	Mean	Std. Deviation
Recycling Initiatives	318	4.2673	0.59808
Attitudes	318	2.6082	0.58460
Personal Habits	318	3.7119	0.64962
Awareness of Environmental Impacts	318	4.3415	0.62622
Valid N (listwise)	318		

The following tables present the variables along with their descriptive statistics, including the mean and standard deviation for each. The results indicate that respondents demonstrate recycling initiatives ($M = 4.2673$, $SD = 0.59808$), attitudes ($M = 2.6082$, $SD = 0.58460$), personal habits ($M = 3.7119$, $SD = 0.64962$), and awareness of environmental impacts ($M = 4.3415$, $SD = 0.62622$). The mean scores are particularly significant as they provide a comprehensive measure by incorporating responses for each item in the study. Note: The Likert scale used is as follows—1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, and 5: Strongly Agree.

Relationship Between Variables

Table 6: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.605 ^a	0.366	0.360	0.46783
a. Predictors: (Constant), Recycling Initiatives, Attitudes, Personal Habits, Awareness of Environmental Impacts				

According to Table 6, the R^2 value indicates that the independent variables explain 36.6% of the variance in recycling initiatives, while the remaining 63.4% is explained by factors not included in this model. The adjusted R^2 is 0.360. The Standard Error of the Estimate (0.46783) indicates the average prediction error of the regression model.

Table 7: ANOVA Test Result

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.615	3	13.205	60.335	<.000 ^b
	Residual	68.723	314	0.219		
	Total	108.339	317			
a. Dependent Variable: Recycling Initiatives						
b. Predictors: (Constant), Attitudes, Personal Habits, Awareness of Environmental Impacts						

Table 8: Multiple Regression Coefficients

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.789	0.210		3.763	<.000

Attitudes	0.141	0.067	0.144	2.093	<.037
Personal Habits	0.534	0.047	0.593	11.321	<.000
Awareness of Environmental Impacts	-0.176	0.061	-0.188	-2.903	<.004

a. Dependent Variable: Recycling Initiatives

Based on Table 8, the multiple regression coefficients indicate that the independent variables have a significant effect on the dependent variable, recycling initiatives. The standardized coefficients show that personal habits had the strongest influence on recycling initiatives ($\beta = 0.593$), followed by attitudes ($\beta = 0.144$). Awareness of environmental impacts also had a statistically significant effect; however, its regression coefficient was negative ($\beta = -0.188$, $t = -2.903$, $p = .004$), indicating a significant negative relationship with recycling initiatives after controlling for the other predictor variables. The t-values for attitudes ($t = 2.093$) and personal habits ($t = 11.321$) further indicate that both variables significantly influenced recycling initiatives.

The regression analysis showed that awareness of environmental impacts had a significant negative coefficient ($\beta = -0.188$, $t = -2.903$, $p = .004$). Although the Pearson correlation analysis indicated a weak positive relationship between awareness of environmental impacts and recycling initiatives ($r = 0.186$), the regression coefficient changed direction when other predictor variables were included in the model. This indicates that the contribution of awareness differs between the bivariate and multiple regression analyses.

The significance level used in this study was 5% ($p < 0.05$). In this study, personal habits had a significant p-value of less than 0.05, showing a strong effect on recycling initiatives (p-value < 0.001). Additionally, attitudes also had a significant p-value of 0.037, indicating its impact on recycling initiatives. On the other hand, awareness of environmental impacts had a significant p-value of ($<.004$), revealing its negative influence on recycling initiatives. Based on the multiple regression analysis, all the hypotheses in this study were accepted. The factors of attitudes, personal habits, and awareness of environmental impacts significantly influenced recycling initiatives among students at UiTM Dungun.

Pearson Correlation Analysis

A bivariate analysis that measures the strength and direction of a relationship between two variables is called correlation. It can reveal the strength or weakness of the relationship as well as if it is positive or negative. In this study, Pearson correlation analysis was used to assess the relationship between the dependent and independent variables.

Table 9: Results Of Correlations

Correlations		Recycling Initiatives	Attitudes	Personal Habits	Awareness of Environmental Impacts
Recycling Initiatives	Pearson Correlation	1	.347**	.612**	.186**
	Sig. (2-tailed)		.000	.000	.001

	N	318	318	318	318
	Strength of the Relationship	No Correlation	Positive, Moderate	Positive, Strong	Positive, Weak
Attitudes	Pearson Correlation	.347**	1	.510**	.720**
	Sig. (2-tailed)	.000		.000	.000
	N	318	318	318	318
	Strength of the Relationship	Positive, Moderate	No Correlation	Positive, Moderate	Positive, Strong
Personal Habits	Pearson Correlation	.612**	.510**	1	.404**
	Sig. (2-tailed)	.000	.000		.000
	N	318	318	318	318
	Strength of the Relationship	Positive, Strong	Positive, Moderate	No Correlation	Positive, Moderate
Awareness of Environmental Impacts	Pearson Correlation	.186**	.720**	.404**	1
	Sig. (2-tailed)	.001	.000	.000	
	N	318	318	318	318
	Strength of the Relationship	Positive, Weak	Positive, Strong	Positive, Moderate	No Correlation

** . Correlation is significant at the 0.01 level (2-tailed).

The results presented in Table 9, show a moderately positive relationship between Recycling Initiatives and Attitudes ($r = 0.347$, $p < 0.000$). This implies that students' views about recycling tend to improve as they participate in more recycling-related activities. To put it another way, students who actively engage in recycling initiatives are probably going to have more positive opinions about how important recycling becomes. Recycling Initiatives and Personal Habits also show a significant positive relationship ($r = 0.612$, $p < 0.000$), suggesting that students who recycle more are also more likely to develop personal habits that encourage recycling. Additionally, there is a weak positive relationship ($r = 0.186$, $p < 0.001$) between Recycling Initiatives and Awareness of Environmental Impacts. This implies that more involvement in recycling initiatives does not always reflect a greater understanding of the wider impacts of packaging waste. It suggests that even when students recycle, this action could not have a major impact on their understanding of the broader impacts on the environment. Furthermore, students who have more positive attitudes about recycling are more likely to develop better personal recycling practices, as seen by the moderately positive relationship found between attitudes and personal habits ($r = 0.510$, $p < 0.000$). There is a particularly strong correlation between attitudes and awareness of environmental impacts ($r = 0.720$, $p < 0.000$), showing that students who have a positive attitude toward recycling are more likely to be aware of the negative environmental effects of packaging waste. Last but not least, there is a positive relationship between awareness of environmental impacts and personal habits ($r = 0.404$, $p < 0.000$), showing that students who recycle regularly are also more knowledgeable of the effects recyclable material has on the environment.

Discussion

The objective of this study is to determine the significant factors influencing recycling initiatives among UiTM Campus Dungun students. According to the findings, all the independent variables had a significant effect on the dependent variable, recycling initiatives. This is because attitudes, personal habits, and awareness of environmental impacts strongly influence student's recycling practices. The p-values for all the variables are below 0.05, indicating statistical significance.

Thus, students' involvement in waste management programs at UiTM Dungun appears to be strongly influenced by their attitudes toward recycling. The respondents recorded a mean attitude score of 2.6082, which is below the neutral midpoint of 3.00 on the five-point Likert scale. This indicates that students generally hold less favourable views toward the current recycling facilities provided on campus. The finding is supported by the responses to Question 1, where the largest group of respondents disagreed that sufficient recycling bins are available on campus.

Personal habits were also found to be an important factor in shaping students' perceptions of recycling initiatives for packaging waste management at UiTM Dungun. The regression analysis showed a high standardized coefficient ($\beta = 0.593$, $p < 0.001$), supporting Hypothesis 2 (H2). Previous studies have reported that younger consumers tend to generate more packaging waste compared with older age groups (Ferronato et al., 2020; Herbes et al., 2020; Ozanne et al., 2022). In this study, students who always practised separating waste and reducing the use of disposable items were more likely to participate in recycling activities. The mean score of 3.7119 suggests that these habits are common among the respondents. In addition, accessibility to recycling facilities such as bins placed in strategic locations may strengthen these positive behaviours. One questionnaire item, "I make an effort to reduce my consumption of single-use plastic items," received agreement from 52.9% of respondents. It indicates that sustainable habits can be improved by increased exposure to recycling campaigns and environmental awareness programs on campus.

Awareness of environmental impacts showed more complex results in the regression analysis. Although the variable showed a statistically significant negative coefficient ($\beta = -0.188$, $p < 0.004$), it demonstrated a weak positive relationship in the Pearson correlation analysis ($r = 0.186$, $p < 0.001$). The changes in direction suggest that a strong correlation between Awareness and Attitudes ($r = 0.720$, $p < 0.001$). Once the shared variance between these variables was controlled, environmental awareness appeared to represent a different aspect of student perception. Students who were highly aware of environmental issues may have been aware of the existing campus recycling system.

Several strategies can be implemented to increase students' participation in recycling initiatives. First, additional recycling facilities and drop-off points should be provided at campus entrances, cafeterias, and stairway areas. Besides paper, plastic bottles, and aluminium cans, designated collection points for items such as compact discs and rechargeable batteries could also be introduced. Second, recycling participation should be promoted as a positive campus culture through communication, marketing, and public relations campaigns. In addition, the participation of student leaders, senior management, and alumni as recycling role models may encourage greater participation. Campus organizations can also provide regular feedback and information on recycling achievements to demonstrate the effectiveness and

acceptance of recycling practices among students. Lastly, initiatives should be taken to improve knowledge and understanding of recycling and its effects on the environment. Promotional activities can concentrate on teaching the campus community about recycling facilities, proper sorting techniques, and other topics. Furthermore, to assist students in locating recycling stations, directional signage should be installed throughout the campus.

Conclusion

In conclusion, all of the hypotheses were accepted, and the study's objectives were effectively achieved. University student's involvement in recycling initiatives for packaging waste management at UiTM Dungun was significantly influenced by their attitudes, personal habits, and awareness of environmental impacts. These variables are important in affecting students' level of recycling involvement, according to the data analysis. Additionally, the findings showed that attitudes, personal habits and awareness of environmental impacts are significant predictors of recycling initiatives among UiTM students. However, although awareness of environmental impact was statistically significant, its negative regression coefficient indicates an inverse relationship after controlling for the other predictors. This result should therefore be interpreted with caution and warrants further investigation. The results showed that the most important factor impacting UiTM student's recycling activities was their personal habits. In fact, the study's data show that improving recycling knowledge and encouraging participation are crucial to enhancing waste management practices. This study indicates that students will be more likely to recycle if the university provides the necessary facilities, so the university management should take action to provide more recycling facilities and make it easier for students to recycle. However, students must also understand that recycling is not solely dependent on facilities; individual attitudes are equally important. Finally, UiTM students' awareness of recycling needs to increase over time. More benefits to the university and the environment will result from effective waste management and consistent efforts to educate students.

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