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Young People's Involvement in Reused Cooking Oil

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Abstract: Uncontrolled recycling practices have led to increased waste disposal in landfills over the past ten years, especially using cooking oil. If more young folks choose to recycle their wasted cooking oil and turn it into more affordable biodiesel fuel, this issue may be avoided. Thus, to better understand young adults' intentions to recycle, this study looks at the relationships between attitude, subjective norms, perceived behavioral control, environmental values, and moral standards. A survey was created and disseminated online to reach university students in Peninsular Malaysia. The investigation results demonstrated a significant association between the influence of perceived behavioral control, environmental values, and subjective norms on young adults. Moral standards and attitude, however, did not significantly correlate. While businesses can enhance their marketing strategies, policymakers should concentrate on recycling measures. Outreach efforts in the form of education and community initiatives can help to encourage sustainable behaviors. This will make it easier to optimize the procedures involved in resource recovery and lessen environmental damage.

Keywords: *Young Adults, Recycling Intention, Malaysia, Used Cooking Oil*

1. Introduction and Background

The escalating disposal of household waste into landfills globally has prompted stakeholders, particularly in developed and developing nations, to focus intently on identifying effective waste management solutions (Salvia, Zimmermann, Willan, Hale, Gitau, Muindi & Davies, 2021). This increased attention has enhanced the visibility of recycling and promoted good recycling habits. As a result, society is increasingly concerned about maintaining a clean environment and striving for a higher quality of life due to its significant impact on living conditions.

This current trend has prompted many stakeholders to seize the opportunity to promote the concept of good recycling habits (Van Langen, Vassillo, Ghisellini, Restaino, Passaro & Ulgiati, 2021). Concurrently, shifts in recycling practices for various items are accelerating worldwide, including in Malaysia (Chen, Bodirsky, Krueger, Mishra & Popp, 2020). Environmental NGOs have praised the Malaysian government's commitment to sustainable municipal waste management through separation and recycling at the source (Shaharudin, Fernando, Ahmed & Shahudin, 2020). However, a study by Tiew, Basri, Watanabe, Zain & Wang (2019) reveals that solid waste recycling in developing countries like Malaysia remains challenging compared to other developing nations. Despite twenty-four years of government efforts, the national recycling rate only rose 24.6 percent in 2017. This finding indicates that the majority of Malaysians have yet to adopt recycling habits. Although local governments in Malaysia have been proactive in raising recycling awareness, the public's behavioral change toward recycling remains uncertain (Tiew, Basri, Deng, Watanabe, Zain & Wang, 2019).

Household waste encompasses a variety of materials, including plastic bags, paper bags, electronic waste, glass bottles, metal, aluminum cans, and food waste. One significant type of household food waste is cooking oil, which, like other waste, is crucial to recycle. The increasing population has led to a higher demand for edible oils, which provide essential nutrients and energy. However, used cooking oil contains harmful substances that pose health risks when consumed or processed. Consuming repeatedly heated cooking oils can lead to various cancers (Ganesan, Sukalingam & Xu, 2019). Additionally, pouring used oils down drains can clog pipes, produce foul odors from bacterial growth, and disrupt wastewater treatment services (Ahmad, Abdullah, Koji, Yuzir, Mohammad, Show & Khoo, 2022). Furthermore, improperly disposed materials often end up in the ground, rivers, and oceans, causing significant environmental pollution.

In Malaysia, the company Alam Flora is tasked with household waste disposal and has initiated a separate waste

collection system. Alam Flora's buy-back recycling centers offer RM 4.40 for every 4 kilograms of used cooking oil, incentivizing households to earn money through recycling. This initiative aims to motivate environmentally conscious Malaysians to maintain and enhance their recycling habits.

The activities of separating waste and recycling used oil are still in their early stages in Malaysia, requiring further efforts to advance these initiatives. Focusing on young adults is crucial as their behaviors and lifestyles significantly impact future pollution levels (Piscitelli & D'Uggento, 2022). Due to the increasing daily demand for energy, the current trend aims to encourage young adults to recycle waste materials and convert them into useful resources.

Research on waste materials and the shift towards recyclable materials has been actively conducted and appears to be accelerating in many regions, including Malaysia (Ayub, Othman, Khan, Hubaidillah, Kuniawan, Ismail & Jaafar, 2021). Social psychology has made significant advances in understanding the mechanisms underlying pro-environmental behavior (PEB), such as waste separation, commonly referred to as trash classification or waste segregation. These studies aim to explain human behavior related to environmental conservation. According to Kollmuss and Agyeman (2002), PEB is defined as actions that intentionally attempt to reduce the adverse impact of one's activities on the built and natural environments. Prominent research in human behavior studies includes the Norm Activation Model and the Theory of Planned Behavior, which have been used to clarify many PEBs.

The Theory of Planned Behavior, an extension of the Theory of Reasoned Action, postulates that people make decisions based on their intended behavior. According to this theory, behavioral intention is influenced by attitude (AT), perceived behavioral control (PBC), and social norm (SN) (Ajzen, 1991). AT is based on the anticipated consequences of an action and the evaluation of these outcomes. SN reflects the standard expectations of behavior and adherence to these standards. PBC refers to the degree to which the behavior is controllable by the individual, often assessed by the perceived ease or difficulty of performing the behavior (Ajzen, 2020; Ajzen, 1991). The Norm Activation Model explains human behavior in terms of individual norms (Schwartz, 1977).

Recent studies have focused on understanding customer participation in solid food waste collection (Lee, Sakamoto, & Yoshizawa, 2023) and applying the Theory of Planned Behavior to comprehend recycling behavior (Ayob, Sheau Ting, Abdul Jalil & Chin, 2017). Additionally, several studies have explored the use of waste cooking oil to produce sustainable biodiesel, creating value-added products (Goh, Chong, Ge, Ong, Ng, Tian & Józsa, 2020; Zheng, Wang, Rajaeifar, Heidrich, Zheng, Liang & Zhang, 2020).

However, there is limited knowledge about the intention to recycle waste cooking oil, particularly among young adults in Malaysia (Law, Lye & Ng, 2023; De Feo, Di Domenico, Ferrara, Abate & Sesti Osseo, 2020; Farid, Roslan, Hasan, Othman, & Shirai, 2020). Understanding young adults' intentions and actual practices regarding recycling waste cooking oil is essential for improving separation and recycling behaviors. Young adults significantly impact sustainability as they are future change agents. They are also more technologically savvy and globally connected, staying informed about the latest environmental trends (Law, Lye & Ng, 2023). Thus, this study aims to identify the factors influencing young adults' intentions to recycle waste cooking oil in Malaysia.

Research objectives: The following were the objectives of this study.

- To examine if there is a significant relationship between young adults' attitudes and their intention to recycle used cooking oil
- To examine whether young adults' subjective norms significantly influence their intention to recycle used cooking oil.
- To examine whether perceived behavioral control among young adults is significantly related to their intention to recycle used cooking oil.
- To examine whether young adults' environmental values have a significant impact on their intention to recycle used cooking oil.
- To examine if there is a significant relationship between young adults' moral norms and their intention to recycle used cooking oil.

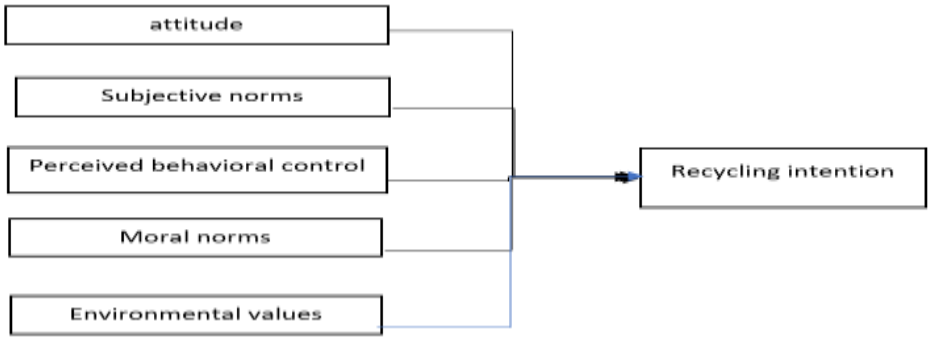
Based on the research background and problem statement, this study seeks to address the following research questions.

Research Question: The following were the questions of this study.

- Does the young adult attitude have a significant relationship with the recycling intention of used cooking oil?
- Do the young adult subjective norms have a significant relationship with the recycling intention of used cooking oil?
- Does the young adult's perceived behavioral control have a significant relationship with the recycling intention of used cooking oil?
- Do young adult environmental values have a significant relationship with the recycling intention of used cooking oil?
- Does the young adult moral norm have a significant relationship with the recycling intention of used cooking oil?

Conceptual framework and hypotheses Development

Figure 1: The Conceptual Framework



2. Literature Review

The research framework indicated that there were three independent variables: attitude, subjective norms, perceived behavioral control, environmental values, and moral norms.

Attitude: Research on household recycling intentions indicates that people's recycling behaviors are heavily influenced by their attitudes (Al Mamun, Mohiuddin, Ahmad, Thurasamy & Fazal, 2018). The level of these attitudes varies across different countries and cultures (Oztekin, Teksoz, Pamuk, Sahin & Kilic, 2017; Zhang, Lai, Wang & Wang, 2019; Xu, Ling, Lu & Shen, 2017). These studies show that individuals' surroundings impact their decision to develop a positive attitude. People with positive attitudes generally strive to maintain clean and hygienic environments and contribute to a better environment (Escario, Rodriguez-Sanchez & Casalo, 2020).

Based on this discussion, the following hypotheses are proposed:
H1: The young adult attitude has a significant relationship with the recycling intention of using cooking oil.

Subjective Norms: Interest in recycling behavior is often driven by perceived social pressure to engage in recycling activities. Subjective norms describe how social influence affects an individual's behavior. The intention to perform a behavior is perceived to be influenced by significant people in one's life. Individuals are likely to be influenced by others' opinions about the appropriateness of a particular behavior, seeking reinforcement or validation when making decisions. The greater the support from social norms, the more likely individuals are to choose to recycle (Czajkowski, Zagorska, & Hanley, 2019; Czajkowski, Hanley, & Nyborg, 2017). This indicates that individuals with supportive surroundings are more likely to continue recycling (Knickmeyer, 2020). Previous studies have shown the impact of subjective norms on intentions for pro-

environmental behavior, including recycling plastic waste (Aikowe & Mazancova, 2021), agricultural waste (Zeng, Tian, He & Zhang, 2019), and e-waste (Ang, Mohammad & Shobri, 2023).
Therefore, the following hypothesis is investigated in this study:
H2: Subjective Norm has a significant relationship with the recycling intention of used cooking oil.

Perceived Behavioral Control: Perceived behavioral control refers to the anticipation of barriers and reflects prior experiences, describing how easy or difficult behavior is perceived to be (Rodrigues, Figueiredo, Jacinto, Monteiro & Morouco, 2023). The perceived ease or difficulty of performing an activity can be seen as perceived control (Ajzen, 2020). Therefore, people who understand how to recycle are more likely to do so. Previous research has shown that perceived behavioral control can influence behavioral intention (Arli, Badejo, Carlini, France, Jebarajakirthy, Knox & Wright, 2020), including intentions to recycle used cooking oil (Lee, Sakamoto & Yoshizawa, 2023), and engage in pro-environmental behavior (Vicente, Marques & Reis, 2021). Procedural knowledge of recycling has been proven to influence recycling behavior (Wang, Long, Wang, Ding & Cai, 2021). Thus, perceived behavioral control significantly impacts recycling rates (Pamuk & Kahriman, 2019).
Based on this discussion, the following hypothesis is proposed:
H3: Perceived Behavioural Control has a significant relationship with the recycling intention of used cooking oil.

Environmental Values: Values play a significant role in explaining pro-environmental behaviors (Primc, Ogorevc, Slabe Erker, Bartoli & Murovec, 2021). They shape a person's identity and personality, driving their behavior (de Groot & Thogersen, 2018). People's intentions to engage in certain actions can be influenced by their values. According to Tamar, Mirawan, Arfah & Putri (2021), values can predict pro-environmental behaviors such as driving electric cars (Lee, Kim & Roh, 2023) and staying in green hotels (Rahman & Reynolds, 2019). Consumers' activities are influenced by their values, and they consider how well a particular behavior aligns with their values, past experiences, current beliefs, and established needs when making decisions (Chan, 2020). Numerous studies have shown that environmental values impact pro-environmental behaviors like recycling (Tonglet, Philips & Bates, 2004; Nordlund & Garvill, 2002). Based on this discussion, the following hypothesis is proposed:
H4: Environmental values have a significant relationship with the recycling intention of used cooking oil.

Moral Norms: While there is growing evidence that "moral norms" (MN) significantly explain the variation in pro-environmental behaviors, there is still debate about how MN fits within the Theory of Planned Behavior (TPB) framework. Beyond considering values and preferences, it is important to define how they relate to norms in an abstract sense (Serramia, Lopez-Sanchez, Rodriguez, Morales & Ansotegui, 2018; Schwartz, 1968). Based on this discussion, the following hypothesis is proposed:
H5: Moral Norm has a significant relationship with the recycling intention of used cooking oil.

Thus, the objectives of this study are to determine factors like attitude, subjective norm, perceived behavior, moral norm, and environmental values in influencing young adult intention in Malaysia.

3. Methodology

A quantitative research study was conducted to identify the factors influencing young adults' motivation to recycle. An online survey was administered to a sample size of 280 respondents, primarily targeting young adults, especially university students across different universities and regions. This group was chosen due to their high homogeneity, such as similar age and education levels. Additionally, they are active in both society and online, making them more likely to be aware of recycling activities. The total population for this study was considered to be the university student population in Malaysia, which numbers approximately 1.2 million.

Respondents received a self-administered questionnaire via email and WhatsApp. The questionnaire was designed to measure dependent and independent variables and also collected demographic information such as gender, age, race, and education level. The measurement scales for the constructs were adapted and modified from previous studies (Wan et al., 2017) and analyzed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). After performing a descriptive analysis of the demographic profiles, multiple

regression was conducted using SPSS, and Cronbach's alpha was used to test the normality and reliability of the data.

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4. Results and Findings

Based on the demographic profiles, the study revealed that the majority of respondents were female, accounting for 68.6%. The predominant age group among respondents was 20-24 years old (55.5%), followed by 25-29 years old (12.1%), and those below 20 years old (11.4%). Notably, most respondents were Malays, comprising 78.3% of the sample, while 10.7% were Bumiputra Sabah and 9% were Bumiputra Sarawak.

The reliability of the measurement items for all variables, and the values of Cronbach Alpha obtained from the test were between 0.848 and 0.957. Therefore, the instrument used in the study was consistent and highly reliable (Table 1).

Table 1: Reliability Test of The Measurement Item

No.	No of items	Cronbach's Alpha
1 ATTITUDE	6	0.957
2 SUBJECTIVE NORM	5	0.923
3 PERCEIVED BEHAVIOURAL CONTROL	6	0.906
4 ENVIRONMENTAL VALUES	10	0.964
5. MORAL NORM	4	0.848

Multiple regression in Table 2 shows an F value of 143.167 and all the independent variables used in this research were significant and the p-value obtained was less than 0.05 ($p<0.05$), hence the hypothesis can be tested. Then, Table 3 summarizes the hypothesis' results. Based on the multiple regression coefficients, only H2, H3 and H4 have a significant relationship ($p<0.05$), while H1 and H5 are not.

Table 2: Multiple Regression - Annova

Model	Sum of Squares	df	Mean square	F	Sig.
Regression	361.692	5	72.338	143.167	<.001
Residual	143.497	284	.505		
Total	505.189	289			

a. Predictors: (Constant), ATTITUDE, SUBJECTIVE NORM, PERCEIVED BEHAVIOURAL CONTROL, MORAL NORMS, ENVIRONMENTAL VALUES
b. Dependent variable: INTENTION

Table 3: Coefficients of The Regression Model

		Unstandardized coefficients	Standardized coefficients			Result
Variable	B	Standard Error	Beta	*t*	Sig.	
(Constant)	-.231	.228		-1.013	.312	
ATTITUDE	.053	.036	.057	1.463	.144	**REJECT**
SUBJECTIVE NORM	.467	.047	.489	9.984	<.000	**SUPPORT**
PERCEIVED BEHAVIOURAL CONTROL	.093	.40	.096	2.300	.022	**SUPPORT**

ENVIRONMENTAL VALUES	357	0.045	.323	7.912	<.001	**SUPPORT**
MORAL NORMS	.064	0.57	.060	1.126	.261	**REJECT**
Dependent variable: INTENTION						

Multiple regression analysis in Table 4 indicates an R-squared value of 0.716, signifying that 71.6% of the variance in the dependent variable, which represents the factors influencing young adults to engage in recycling behavior, can be explained by changes in the selected independent variables: attitude, subjective norm, perceived behavior control, moral norm, and environmental values. The remaining percentage is attributed to other factors not included in the model.

Table 4: Multiple Regression -Model Summary

Model	R	R Square	Adjusted R Square	Std Error of the estimate
1	.846[a]	.716	.711	.71082

a. Predictors: (Constant), ATTITUDE, SUBJECTIVE NORM, PERCEIVED BEHAVIOURAL CONTROL, MORAL NORMS, ENVIRONMENTAL VALUES
b. Dependent variable: INTENTION

Discussion

This study examines the relationship between attitude, subjective norm, perceived behavioral control, moral norm, and environmental values in influencing young adults' recycling intentions among university students. The study successfully achieved its objective of understanding these relationships. However, the findings indicate that attitude and moral norms were not significant factors influencing young adults' recycling intentions. This indicated that the way individuals feel about recycling (whether good or bad) does not have a strong influence on their intention to recycle. In contrast, subjective norms, perceived behavioral control, and environmental values were significant factors.

This study is aligning with Kumar's (2019) research, which found that subjective norms positively impact adult recycling intentions. Similarly, a study by Arli, Badejo, Carlini, Jabarajakrithy, Knox, and Wright (2020) showed that perceived behavioral control positively explains adult recycling intentions. Many adults believe that friends and family will approve of their recycling actions, especially when announced on social media.

Young people find recycling cooking oil convenient and have ample opportunities to engage in recycling activities in their living areas. They are more likely to begin recycling if their subjective norms and perceived behavioral control are both high (Soomro, Hameed, Bhutto, Waris, Baeshen & Al Batati, 2022). Environmental values also significantly influence young adults' recycling behavior (Balunde, Perlaviciute, Truskauskaite-Kuneviciene, 2020). This study implies that environmental values are crucial for young adults. A country's commitment to environmental values is a good indicator of its progress toward a better environment and higher living standards, contributing to sustainability (Boca & Saracli, 2019; Diddi, Yan, Bloodhart, Bajtelsmit & McShane, 2019).

The study also found that attitude is not a significant factor in recycling behavior for used cooking oil. A study by Thoo, Tee, Huam & Mas'od (2022) similarly demonstrated that attitude has little impact on actual recycling behaviors. Since attitude is not significant, universities have a role in changing students' attitudes by creating awareness about recycling activities. Additionally, moral norms were found to be insignificant to young adults' recycling intentions, consistent with a study by Khan, Ahmed & Najmi (2019), which showed that moral norms had little influence on recycling behaviors.

5. Conclusion and Recommendations

These young adults understand the benefits of recycling for society and academia. To enhance young adults' attitudes and moral norms towards recycling, universities can raise awareness by conducting hands-on workshops that demonstrate how to properly collect and store used cooking oil for recycling purposes. Implementing rewards or incentives, such as offering discounts at local campus shops for active recycling participants, can also be effective. Universities could collaborate with campus cafes to set up collection points for used cooking oil and provide clear guidelines and easy access for disposal, ensuring recycling bins are strategically placed in convenient locations.

Promoting knowledge about recyclable and reusable cooking oil can contribute to environmental sustainability. Basic tips or simplified infographics in multiple languages displayed on posters around campus can appeal to young adults from various backgrounds. This approach can help young adults become more ambitious and understand the impact of the unconscious mind on environmental consciousness, equipping them with information to make the world a cleaner, more beautiful place.

Engaging young adults in recycling initiatives can enhance their sense of responsibility, motivating them to encourage friends, neighbors and family to recycle. Universities should develop educational campaigns to explain the environmental impact of improper disposal of used cooking oil. Inviting speakers or experts in the field to share success stories of individuals and communities that have successfully implemented used cooking oil recycling programs can also be beneficial. These programs can provide information and facts to increase awareness and highlight places where used cooking oil can be properly disposed of for waste separation and recycling. Future studies could focus on other factors that might influence the decision to reuse cooking oil.

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