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Inconvenience and Perceived Behavioral Control as The Main Predictive Factors of Recycling Behavior: Malaysian University Students Context

Muhamad Al Fatih Sudin[2], Aini Azeqa Ma'rof[1,2], Haslinda Abdullah[1,2], Zeinab Zarimohzzabeih[1]

[1]Institute for Social Science Studies, Universiti Putra Malaysia, 43400 Serdang, Selangor, MALAYSIA, [2]Faculty of Human Ecology, Universiti Putra Malaysia, 43400 Serdang, Selangor, MALAYSIA.

Email: azeqa@upm.edu.my

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Abstract

The research aimed to examine the relationship between attitude, behavioral control, moral obligation, and inconvenience regarding recycling behavior among students attending public universities in the Klang Valley, Malaysia. A total of 400 participants were chosen from three public universities in the Klang Valley, and data was collected through questionnaires. The study's findings indicate that the majority of respondents hold a moderately positive attitude toward recycling behavior, possess a low sense of perceived behavioral control, feel a lesser moral obligation toward recycling behavior, view recycling behavior as inconvenient, and exhibit a low level of engagement in recycling behavior. The results also reveal that perceived behavioral control and inconvenience have a significant association with recycling behavior. Furthermore, the regression analysis demonstrates that perceived behavioral control and inconvenience exhibit significant relationships with recycling behavior, with perceived behavioral control exerting the greatest influence on recycling behavior. Both of these factors underline the importance of designing and implementig recycling systems that are accessible, easy to use, and well-explained. Doing so can increase perceived behavioral control and decrease the sense of inconvenience, thereby promoting more consistent and widespread recycling behaviors. Recycling is fundamentally important for environmental sustainability as it conserves natural resources, reduces pollution from waste, decreases the demand for raw materials, and mitigates the negative impacts of disposal, contributing significantly to the preservation of our planet for future generations.

Keywords: Recycling Behaviour, Recycling Attitudes, Perceived Behavioral Control, Perceived Moral Obligation, Inconvenience

Introduction

Recycling behavior encompasses the decisions and actions made by individuals and societies aiming to preserve natural resources and minimize waste in landfills. It can involve various activities like segregating recyclables from garbage, using reusable items like bags and bottles, composting kitchen waste, and buying recycled products. In nations like Malaysia, recycling is a significant aspect of environmental preservation and waste management. However, it is a nuanced behavior influenced by factors like attitudes, perceived control, and convenience. The recycling rates in Malaysia differ by region and material; the municipal solid waste recycling rate is around 11.9%, however materials like paper and cardboard have a higher recycling rate of 40% (Pariatamby & Agamuthu, 2020). Malaysia's recycling rate is comparatively low vis-à-vis developed countries, indicating a substantial opportunity for improvement. The low recycling rate is attributed to factors such as inadequate infrastructure, lack of education and awareness, and insufficient government support. Therefore, understanding the elements affecting recycling behavior is crucial for devising effective strategies to boost recycling rates and encourage sustainable living in Malaysia.

Achieving the Sustainable Development Goals (SDGs) 2030, particularly the 12th and 13th goals concerning environmental stewardship involves practices such as waste management and the 3Rs (Recycle, Reuse, and Reduce). These are crucial for every country to adopt for environmental sustainability and in alignment with the United Nations' mission to preserve the earth, applicable to both developed and developing nations.

Recycling behavior among university students has gained attention recently due to heightened environmental awareness and waste reduction needs. Numerous studies have explored factors influencing students' recycling behavior and strategies to increase recycling rates. A study by Teoh et al (2018) found that Malaysian university students' recycling behavior was relatively low, with only 37% recycling regularly, a concerning trend considering recycling's importance in waste reduction and environmental conservation. Another study by Soomro, Ali, and Zailani (2023) identified barriers to recycling among Malaysian university students, such as insufficient knowledge and perceived inconvenience. Thus, understanding factors affecting recycling behavior in students and developing strategies to increase recycling rates is vital. These strategies may include raising awareness about recycling's environmental benefits, providing educational resources to support effective recycling, and addressing barriers like knowledge gaps and perceived inconvenience.

Numerous Malaysian universities have implemented strategies for sustainable Solid Waste Management (SWM) on their campuses. For instance, Universiti Kebangsaan Malaysia (UKM) initiated the Zero Waste Campus Programme (ZWCP) in 2010 (Nawi & Choy, 2018). Universiti Teknologi Malaysia (UTM) and Universiti Tun Hussein Onn (UTHM) have established green living labs and sustainability offices to encourage campus sustainability (Ahmad et al., 2018). University of Malaya (UM) launched the UM Zero Waste Campaign (UMZWC), while Universiti Putra Malaysia (UPM) created a campus waste bank (UMZWC, 2019).

Considering these contexts, this paper aims to explore the determinants of recycling behavior among public university students in Klang Valley. These students, as future consumers, will have consumption patterns tied to environmental sustainability issues. They were assessed via survey questionnaires to understand the factors influencing their recycling behavior. This

study specifically investigates how attitudes, perceived behavioral control, perceived moral obligation, and inconvenience shape their recycling practices.

Recycling Behavior among University Students

Recycling behavior problems are complex, stemming from inadequate education, resources, motivation, infrastructure, and market challenges for certain materials (Wheat, 2012). Often, individuals and communities lack proper recycling knowledge and resources, leading to contamination of recyclable materials that end up in landfills (Eriksen et al., 2018). Even with awareness and resources, the absence of motivation or incentives can result in low recycling participation (Thomas & Sharp, 2013). In some areas, insufficient recycling facilities also hinder the process (Herat & Agamuthu, 2012).

Universities are gaining global focus, and their role in promoting sustainability is significant (Johari et al., 2009). Public universities' recycling often mirrors national household recycling rates (Creighton, 1998). Universities, especially residential ones, are like small towns contributing to environmental pollution (Johari et al., 2009). Although many Malaysian higher education institutions have implemented the 3Rs strategies, community awareness about these programs is low, resulting in low recycling rates (Chen et al., 2021).

Research indicates that university students' recycling rates are low, with students often displaying negative attitudes towards recycling, considering it inconvenient and lacking necessary resources and skills (Asmuni et al., 2017; Sorkun, 2018). Only around 30% of university students recycle (Bashir et al., 2020), and perceived inconvenience is a significant barrier (Mannheim & Simenfalvi, 2020). Furthermore, students often have low levels of perceived moral obligation towards recycling, which may contribute to low recycling rates (Han & Hyun, 2018; Janmaimool & Khajohnmanee, 2020). Meanwhile, differing educational institutions across countries lead to variations in recycling behavior acceptance. Past research indicates differences between higher learning institutions in the Philippines and Malaysia, influencing students' recycling behavior (Dumanig & Symaco, 2020). Rizkita and Supriyanto (2020) suggested that differences in education levels create varying acceptance of specific behaviors.

In light of the above concerns, this study aims to look at the attitudes, perceived behavioral control, perceived moral obligation and the inconvenience of recycling behavior with specific research questions as follows:

1. What are the levels of attitudes, perceived behavioral control, perceived moral obligation, the conveniency of recycling behavior and recycling behavior among university students?
2. What are the relationships between attitudes, perceived behavioral control, perceived moral obligation, conveniency, and recycling behavior among university students?
3. What are the unique factors that predicts recycling behavior among university students?

Factors of Recycling Behavior

Attitudes

Attitude refers to the level in which an individual has a positive or negative evaluation or assessment of the behaviour concerned (Kumar, 2019). The results of a survey involving respondents from the two culturally distinct emerging markets showed that the key influencing e-waste recycling behaviour amongst young adults were: Attitude, Perceived Control, Subjective Norm, and Individual Responsibility (Kumar, 2019). Based on Khan et al., 2019, the finding of this study indicates that subjective norms, awareness consequences and convenience are major predictors of return/recycling intention. Other than that, the attitude, perceived behavioural control, and moral norms were shown that they have an insignificant impact on return/recycling intention. Other than that, there have a study that identifies environmental concerns, attitudes towards recycling, social norms, university environmental policy, and availability of recycling facilities at higher education institutions as the factors affecting recycling intentions or behaviours in higher education institutions (Sallaku et al., 2019). While Echegaray and Hansstein (2017) stated that attitude recycling is motivated by the belief that recycling is beneficial for both the environment and human health.

Perceived Behavioral Control

Perceived behavioural control (PBC) is the perception and understanding of the capability of a person based on his or her previous experience and perceived challenges or difficulties to perform certain behaviour (Wang et al., 2019). The findings of the combined model suggests that while values (biospheric, egoistic), environmental concern, awareness of destructive consequences, ascription of responsibility to self, personal norms, subjective norms, attitudes toward behaviour, perceived behavioural control, and intention do significantly predict recycling behaviour. Perceived behavioural control seems to be the strongest predictor of recycling intention (Onel & Mukherjee, 2017). According to Echegaray and Hansstein (2017), the existence of nearby disposal facilities could influence PBC in recycling so that the consumers believe they can save their time to conduct e-waste recycling activities. On the contrary, Wang et al., 2018 indicated that PBC is primarily evaluated by the experience of recycling. Hence, a person with experience in recycling is more interested in taking part in further recycling compared to a person who does not has experience in recycling activity.

Other studies show that subjective norms, perceived behavioural control, personal norms, and environmental knowledge were essential predictors of waste management behaviour, whereas the direct effect of attitude was not statistically significant. Environmental concern and subjective norms could influence waste management behaviour through personal norms. Environmental knowledge could influence waste management behaviour indirectly through environmental concern, personal norms, and perceived behavioural control. Moreover, perceived behavioural control served as a mediator between the relationship of personal norms and waste management behaviour (Wu et al., 2022).

Perceived Moral Obligation

Moral obligation refers to an individual's feelings that emerge from the sense of responsibility to perform or omit a behaviour. Environment consequences, perceived convenience, and moral obligation. The study show that the moral obligation positively affects pro-environmental behaviour intention, while moral disengagement has significant negative impact (Wu et al., 2020). Based on Al Mamun et al (2018), moral obligation could improve the prediction of an individual's intention to recycle or willingness to recycle through subjective norms since both environmental and recycling issues are often viewed as social dilemma. Past

study also indicates that subjective norms, perceived behavioural control, past behaviour and intention significantly predict household waste separation behaviour, with past behaviour being the most significant construct to predict individuals' intention and behaviour (Lin et al., 2017). While Mohamad and Chin (2020) studies show that factors such as awareness of the environment consequences, perceived convenience, and moral obligation have a significant impact to recycling intention.

Conveniency of Recycling Behavior

Inconvenience is one of the factors that can negatively affect recycling behaviour (Miafodzyeva & Brandt, 2013). Inconvenience refers to the effort required to recycle, such as the time, energy, and resources needed to sort and transport recyclable materials, as well as the availability and accessibility of recycling facilities (Lou et al., 2022). Studies have found that individuals who perceive recycling as being inconvenient are less likely to engage in recycling behaviour (Yadav et al., 2022). Factors that contribute to the inconvenience of recycling can include a lack of access to recycling facilities, limited hours of operation, and a lack of clear instructions on how to recycle properly. Additionally, the lack of curb side collection services, the distance to the recycling facilities, and the complexity of the recycling process can make it difficult for individuals to recycle (Matiiuk & Liobikienė, 2021).

Findings from a study by Sharif and Soo (2017) reveal that attitude toward recycling, awareness of environment consequence, perceived social norms, perceived convenience were positively correlated with behaviour toward logistics e-waste recycling. While Hong et al (2018) revealed that environmental awareness and attitude toward recycling, social pressure, laws and regulations, cost of recycling, and inconvenience of recycling significantly directly affected residents' behavioural intention, with laws and regulations being the strongest construct significantly to predict individuals' intention. Convenience was the most common reason for recycling regularly MEWR's survey found that convenience was one of the most commonly cited reasons by Singaporeans for recycling regularly. In addition, encouragement by the Government, concerns about being "wasteful", and the feeling that one should match others' recycling efforts were also important motivators of recycling. NEA's survey found that recycling was "second nature" to households which recycled regularly and came more naturally as part of their daily routine.

Method

Population and Sample Selection

The targeted population for this study were public universities in Klang Valley who were aged 19-27. Klang Valley public universities undergraduate students from Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM) and Universiti Malaya (UM) were the samples of the current study. Those students were from various races and regardless of their years of study as well as programmes were considered eligible to participate in this study. The sample size in the current study was 400 respondents from the total number of Malaysian undergraduate students in UPM, UKM and UM of 44,467. The details of the respondents as reported in Table 1.

Table 1
Details of respondents.

Demographic	Frequency	Percentage (%)
Gender		
Male	189	47.25
Female	211	52.75
University		
Universiti Putra Malaysia	134	33.50
Universiti Kebangsaan Malaysia	132	33
Universiti Malaya	134	33.50
Student Living Place		
Off Campus	152	38
On Campus	248	62

Data Collection

Measures

Attitudes. The recycling attitudes items were adapted from study by Tonglet et al (2004) with 9- items related to examine the respondents' attitudes towards recycling behavior with examples of items; "Recycling is good", "Recycling is useful", "Recycling is rewarding". Response categories by using a 7-point Likert scale with 1(strongly agree) to 7 (strongly disagree). The reliability was α = .83.

Perceived Behavioral Control. The perceived recycling behavioral control items were adapted from study by Tonglet et al (2004) which was used to assess the level of behavioral control toward recycling behavior with 5 items. Example of items are; "There are plenty of opportunities for me to engage in recycling at the university", "It will be easy for me to engage in recycling on campus", Recycling is easy". Response categories by using a 7-point Likert scale with 1(strongly agree) to 7 (strongly disagree). The reliability was α = 0.89.

Perceived Moral Obligation. The perceived moral obligation on recycling items were adapted from study by Tonglet et al (2004) which was used to assess the level of moral obligation towards recycling behavior with 7 items. Example of items are; "I feel I should not waste anything if it can be used again", "It would be wrong of me not to recycle my waste", "I would feel guilty if I did not recycle my waste". Response categories by using a 7-point Likert scale with 1(strongly agree) to 7 (strongly disagree). The reliability was α = 0.90.

Inconvenience. The inconvenience of recycling items was adapted from study by Kelly et al (2006) which was used to assess the level of the inconveniency of the recycling behavior. Example of items are; "I do not have time to recycle", "Recycling is inconvenient", "Recycling

is too complicated". Response categories by using a 7-point Likert scale with 1(strongly agree) to 7 (strongly disagree). The reliability was α = 0.82.

Recycling Behavior. The recycling behavior items were adapted from study by Yasmina (2015) which was used to assess the level of recycling behavior with 12 items. Two types of statement categories been used to assess the recycling behavior; (1) The frequent of recycling behavior; "How frequently do you recycle your waste at the campus?", "How frequently do you recycle your waste at home?" with 7-point Likert scale with 1(Always) to 7(Never); and (2) The recycling behavior act; "How likely are you to recycle your waste at the campus for the next four weeks", "I will try to recycle my waste at the university each day in the forthcoming month", "I intend to recycle my waste at the campus every day in the forthcoming month". Response categories by using a 7-point Likert scale with 1(strongly agree) to 7 (strongly disagree). The reliability was α = 0.94.

Results and Discussion

Table 2 reveals that the majority of respondents (99.0%) expressed moderate attitudes towards recycling. It's essential to understand that such attitudes reflect an individual's evaluation of recycling behavior, not necessarily their engagement in it. Studies indicate that even with positive attitudes towards recycling, university students may choose not to participate (Thoo et al., 2022). Factors like recycling facilities, moral obligation, and convenience significantly influence recycling behavior among university students, suggesting that attitudes alone don't guarantee action. Thus, the moderate attitude levels towards recycling behavior in this study may not directly correlate with actual recycling practice.

Regarding perceived behavioral control, 87.0% of respondents felt low control over recycling behavior, with 9.3% indicating moderate and just 3.8% expressing high control. Low perceived behavioral control (PBC) among university students, signifying a belief in insufficient resources and skills for recycling, can affect behavioral intentions and actions (Ajzen, 1991). If university students perceive recycling as inconvenient or challenging or lack access to recycling facilities or proper recycling information, their PBC levels tend to be lower (Effendi et al., 2020). This scenario can lead to diminished recycling participation.

In terms of perceived moral obligation, 51.0% of respondents reported low levels, while 49.0% indicated moderate levels. Perceived moral obligation (PMO) refers to an individual's belief in their moral responsibility to engage in a particular behavior. Low PMO regarding recycling among university students suggests they don't feel a strong moral responsibility to recycle. This perception can be influenced by various factors such as awareness of environmental impacts, infrastructure, personal values, and doubts about recycling programs' effectiveness. Furthermore, students might externalize responsibility, believing that it's up to institutions, governments, or industries to address waste and environmental issues, thereby downplaying their role as students.

On the convenience of recycling behavior, a vast majority of respondents (96.3%) reported finding recycling inconvenient. This perception among university students indicates that they consider recycling to be difficult, demanding, or time-consuming. Perceived inconvenience significantly influences behavioral intentions and actions, representing the challenges and facilitators individuals face when attempting to recycle (Dixon & Parker, 2021). A high level of

perceived inconvenience among university students suggests they see recycling as burdensome, potentially discouraging their participation. Research demonstrates that students who find recycling inconvenient or lack proper recycling facilities or information tend to perceive recycling as more troublesome (Arain et al., 2020), leading to reduced recycling participation.

Meanwhile, for recycling behavior, the majority of respondents reported a low level of engagement (85.5%), followed by moderate (13.3%) and high (1.3%). A low level of recycling behavior among university students signifies minimal or sporadic involvement in recycling activities. Even with generally positive attitudes towards recycling, university students often engage less due to factors like perceived behavioral control, inconvenience, and lack of recycling knowledge (Sallaku et al., 2019). Additionally, cultural and social norms within the university environment can impact recycling behavior. If recycling isn't emphasized, students might be less inclined to participate (Udall et al., 2020).

Table 2
Level of attitudes, perceived behavioral control, perceived moral obligation, inconvenience and recycling behavior.

Level	n	%	Mean	SD	Min	Max
Attitudes			1.99	.100	0	42
Low (0 - 21)	4	1.0%				
Moderate (22 - 42)	396	99.0%				
Perceived Behavioural Control			1.17	.464	0	36
Low (0 - 21)	348	87.0%				
Moderate (13 - 24)	37	9.3%				
High (25 - 36)	15	3.8%				
Perceived Moral Obligation			1.49	.501	0	32
Low (0 - 16)	204	51.0%				
Moderate (17 - 32)	196	49.0%				
Inconvenience			2.96	.190	15	42
Low (15-28)	15	3.8%				
Moderate (29 - 42)	385	96.3%				
Inconvenience			1.16	.398	0	84
Low (0 - 28)	342	85.5%				
Moderate (29 - 56)	53	13.3%				
High (57 - 84)	5	1.3%				

Table 3 reveals the correlations between attitude, perceived behavioural control, perceived moral obligation, and inconvenience on recycling behavior. It indicates that there were no significant relationships between attitude and perceived moral obligation and recycling behaviour ($r = -.004$, $p > .939$; $r = -.084$, $p > .094$ respectively). Research suggests that knowledge and attitude did not significantly influence recycling behaviour (Almasi et al., 2019). This implies that a positive attitude towards recycling might not necessarily prompt actual recycling behaviour. Conversely, perceived behavioural control, attitude, and inconvenience are more potent predictors of behaviour than personal moral obligation (PMO) (Ajzen & Fishbein, 1977). PMO refers to an individual's sense of moral duty to perform a behaviour, but this alone may not be enough to drive behaviour change, especially when other factors like ease of performance and attitude towards the behaviour are negative. Research has shown that Malaysians might not see recycling as a moral duty, as they often have a low level of perceived moral obligation towards recycling and may not prioritize it in their daily lives (Md. Noor et al., 2014). Their low level of environmental concern and lack of awareness about recycling's importance may contribute to their low level of perceived moral obligation towards recycling (Teoh et al., 2018).

Additionally, there was a significant positive correlation between perceived behavioural control and recycling behavior, with $r = .832$, $p < .001$. The findings indicate that the lower the perceived recycling behavioral control among the students, the less likely they are to recycle. According to Cho (2019), self-determined motivation, perceived behavioural control, and negative anticipated emotion directly influence recycling intention on campus, while recycling intention and self-determined motivation affect actual recycling behaviour among students. As per Ajzen's (1991) theory of planned behaviour, perceived behavioural control (PBC) is a key predictor of behavioural intentions and behaviour. PBC, which is an individual's belief in their capability to perform a behaviour, can boost their confidence and assurance in their recycling abilities, subsequently increasing the likelihood of recycling. PBC is a potent predictor of recycling behaviour because it accounts for personal factors like self-efficacy and self-regulation and external factors like access to recycling facilities and the availability of recycling bins (Scalco et al., 2017). These factors directly affect an individual's ability to recycle. Furthermore, research suggests that PBC is a more potent predictor of behaviour than attitudes or subjective norms (Hagger et al., 2022), as PBC reflects a more concrete predictor of behaviour than abstract attitudes.

Moreover, there was a significant negative correlation between the perceived inconvenience of recycling behavior and the recycling behavior itself ($r = -.471$, $p < 0.01$), suggesting that the more inconvenient the respondents find recycling, the less likely they are to recycle their waste. This aligns with previous studies which found that the perceived inconvenience of recycling negatively influences residents' intent to recycle (Thi Thu Nguyen et al., 2018). On the other hand, positive personal norms, perceived behavioural control, and perceived convenience of recycling have been demonstrated to positively impact recycling behaviour (Söderberg et al., 2022). Individuals who view recycling as a cumbersome or challenging process are less likely to participate in recycling activities, given that the inconvenience negatively correlates with recycling behaviour.

Inconvenience plays a significant role in predicting behavioural intentions and actual behaviour as it signifies the obstacles and aids individuals face when trying to recycle (Manzo

& Weinstein, 2003). These factors could include the accessibility of recycling facilities, the presence of recycling bins, and the complexity of recycling instructions. When individuals find these aspects challenging or demanding, it may dissuade them from recycling. Inconvenience is a critical predictor of recycling behaviour as it includes both objective and subjective elements of difficulty. It accounts for external factors like access to recycling facilities and internal factors like an individual's perception of the ease or difficulty of recycling (Arain et al., 2020). Research has indicated that inconvenience is a more potent predictor of behaviour than attitudes, perceived moral obligation, and subjective norms (Ajzen, 1991), as it embodies the real-life barriers and enablers individuals encounter when attempting to recycle, which can directly influence behaviour.

Table 3
The relationship between attitude, perceived behavioural control, perceived moral obligation, and convenience on recycling behaviour.

Variable	**Recycling behaviour**	
	r	***p***
Attitude	-.004	.939
Perceived behavioural control	.832**	.000
Perceived moral obligation	-.084	.094
Inconvenience	-.471**	.000

Note: *** Level of significant is at $p < 0.001$

A multiple regression analysis was conducted to evaluate if perceived behavioral control and inconvenience could significantly predict recycling behavior. As indicated in Table 4, significant contributions were made to recycling behavior, $F(4, 395) = 23.65$, $p < .001$. Specifically, perceived behavioral control ($\beta = .776$, $p = .000$) and inconvenience ($\beta = -.453$, $p < .001$) made significant contributions to the prediction of recycling behavior among the respondents, with these predictors accounting for 71 percent of the variance. Perceived recycling behavioral control pertains to an individual's conviction in their capability to undertake recycling activities. This conviction is founded on the individual's evaluation of their resources, abilities, and opportunities to carry out the behavior. When individuals perceive that they have command over the essential resources and skills required for recycling, they are more likely to display recycling behavior. This is because perceived behavioral control mirrors an individual's degree of confidence and self-efficacy in their capacity to undertake the behavior. When individuals exhibit higher levels of confidence and self-efficacy in their recycling capabilities, they are more likely to surmount barriers or challenges that might arise when attempting to engage in the behavior. Therefore, perceived recycling behavioral control is a vital predictor of recycling behavior, as it directly impacts an individual's propensity to engage in recycling. In conclusion, a higher cognitive workload appeared to exacerbate issues related to achieving quality sleep among the students.

Table 4
Multiple regression in determining the main indicator of recycling behavior.

Variable	**Recycling Behaviour**			
	B	**SE. B**	**Beta, β**	***p***

Perceived Behavioural Control	.169	.066	.776	.000
Inconvenience	-.453	.107	-.129	.000
R^2	.71			
Adjusted R^2	.70			
F	23.65			

Significance of perceived recycling behavioral control and the inconvenience of recycling from the Malaysian University context

Perceived behavioral control (PBC), a construct in the Theory of Planned Behavior, refers to the belief in one's capability to perform a given behavior and has been found to be a crucial determinant in recycling behavior. A study by White et al (2009) found that individuals are more likely to engage in recycling behavior when they perceive that they have the necessary resources and opportunities. This includes having easy access to recycling facilities, understanding what materials can be recycled, and knowing how to separate recyclable waste correctly. The study suggests that by enhancing PBC, we can increase recycling behavior.

Moreover, perceived behavioral control has been observed to compensate for a lack of positive attitudes or social pressure towards recycling. According to a study by Cheung et al (1999), even if individuals do not have strong positive attitudes towards recycling, or if they do not perceive strong social pressure to recycle (i.e., subjective norms), they may still engage in recycling behavior if they perceive a high degree of behavioral control. This highlights the importance of PBC in recycling behavior and suggests that interventions to promote recycling should focus not only on improving attitudes and social norms but also on enhancing individuals' perceived behavioral control.

While recycling behavior has numerous benefits, its implementation in Malaysian universities may face certain challenges, impacting its convenience and effectiveness. One primary issue is inadequate recycling infrastructure. According to a study by Jamaludin and Majid (2012), many Malaysian universities lack sufficient and conveniently located recycling bins, which can be a deterrent for students to recycle. This issue is compounded by the lack of clear signage or instructions on recycling bins, leading to confusion about what can be recycled and where.

The second challenge lies in the lack of awareness and education about recycling. A study conducted by Thoo et al (2022) found that while students in Malaysian universities are generally aware of the importance of recycling, they often lack specific knowledge about recycling processes and procedures. This gap in knowledge can lead to incorrect recycling behaviors, such as contamination of recyclable materials with non-recyclable waste. Further, this lack of knowledge and awareness can also result in apathy or lack of motivation to recycle.

Meanwhile, cultural norms and attitudes towards waste can also hinder recycling behaviors. According to research by Sulaiman et al (2019), waste is often perceived as 'dirty' or 'disgusting' in Malaysian culture, which can discourage individuals from handling recyclable materials. Moreover, there is a lack of social pressure or normative cues to recycle, which can further discourage recycling behaviors. To overcome these barriers, it is crucial for universities to invest in infrastructure, education, and initiatives that can shift cultural perceptions and promote recycling.

The impact and implications of recycling behavior on university students

Recycling behavior has considerable impacts on university students, both individually and collectively. According to a study by Darby and Obara (2005), student engagement with recycling programs on campus significantly influences their understanding and attitudes toward sustainability. The research shows that consistent exposure to recycling facilities and initiatives leads to a deeper understanding of environmental issues. This understanding, in turn, influences students' values and attitudes towards sustainability, making them more likely to behave sustainably in their everyday lives.

Furthermore, recycling behavior in a university context contributes to the development of lifelong sustainable habits. Wam et al (2012) have suggested that when students are involved in recycling programs during their university years, they are more likely to continue these habits into their future life, home, and work settings. This is especially crucial, given that universities are key spaces for learning and development for a significant population of young adults. By encouraging students to adopt recycling behavior, universities can foster a culture of sustainability that extends beyond the campus.

However, the effectiveness of recycling programs in universities can be influenced by several factors. For instance, according to a study conducted by Wan et al (2014), the design and accessibility of recycling facilities, as well as the quality of education and communication about recycling, significantly impact students' participation in recycling. The study also suggested that universities could improve recycling rates by investing in user-friendly recycling infrastructure and by providing clear and frequent communication about recycling procedures and the importance of recycling.

Despite these benefits, there are potential negative implications of relying solely on recycling behaviors for sustainability. Yamaguchi et al (2015) argue that while recycling is an important part of waste management, it is not a panacea for all environmental problems. They suggest that universities should not only promote recycling behavior but also focus on reducing consumption and encouraging reuse. This holistic approach to sustainability can help students understand the broader environmental issues and empower them to make more sustainable choices in their lives.

Conclusion

In conclusion, recycling plays a pivotal role in environmental conservation, not only reducing the volume of waste in landfills but also conserving natural resources and decreasing the energy required for the production of new materials. It is an essential part of sustainable waste management that, if adopted widely, can significantly mitigate the impacts of human activities on the environment.

However, to make recycling a more prevalent behavior, it is crucial to make it more convenient. This can be achieved by ensuring accessible and clearly marked recycling facilities in all areas, from residential to public spaces. Comprehensive education and communication about the importance of recycling and the correct procedures for different materials are also essential. Technology can be harnessed to improve convenience, with apps and online platforms providing information on local recycling facilities, pickup schedules, and guidelines for various types of waste.

Additionally, policy interventions such as the implementation of deposit-refund systems for recyclable items like bottles and cans could incentivize recycling. But, it's also important to remember that recycling is just one part of the larger sustainability puzzle. Efforts should also be made to reduce overall consumption, and when consumption is necessary, prioritize reusable and sustainable products. By integrating these aspects into a holistic approach, we can greatly enhance our overall impact on environmental sustainability.

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