



## RESEARCH ARTICLE

## Assessing Students' Awareness on the Use of Biodegradable Products

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ARTICLE INFO	ABSTRACT
Received: Apr 24, 2024	<p>Awareness of biodegradation is crucial in addressing the waste problem and its impact on the environment. Education and outreach programmes are pivotal in informing the public, especially young people or youths, about the importance of biodegradation and the proper disposal of waste materials. Through workshops, campaigns, and educational materials, young people are empowered to learn eco-friendly habits and participate actively in waste management initiatives. The aim of this study is to assess students' awareness of using biodegradable plastic and how students' attitude mediates between the information needed and their behaviour among 180 students at local universities. A structural equation model analysis was conducted using PLS 4.0, the findings revealing that most respondents were aware of biodegradable products but fewer of them incorporated biodegradable materials into their daily lives. The study identifies a need for further education and awareness campaigns to encourage the adoption of biodegradable materials in daily life. The results of this survey will provide valuable insights into the current level of awareness and understanding of biodegradation among young people.</p>
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## INTRODUCTION

Awareness of plastic biodegradation among students is of the utmost importance in tackling the global issue of plastic pollution. Plastic pollution is a pressing environmental concern, and educating students about plastic biodegradation can empower them to become part of the solution (Moshood et al., 2022). To make educated decisions regarding plastic use and disposal, students should learn about the degradation processes of various plastics and the effects of microplastics on the environment, gaining more knowledge to take responsibility and support any activities related to saving the environment from excessive waste by plastic (Kumar, 2023). Future generations who care about the environment can be greatly influenced by incorporating teachings on plastic biodegradation into their educational curriculum and planning awareness campaigns. According to Sandu et al. (2020), plastic pollution is a big problem that needs everyone's help right now. Students need to learn about how plastic breaks down in order to feel responsible for the world and be able to make environmentally friendly choices in their daily lives. In addition, raising awareness and including lessons on plastic biodegradation in educational curricula can greatly influence the next generation to be ecologically mindful (Dalu et al., 2020). Hence, by educating students on the

consequences of plastic pollution and the significance of biodegradation, this study aims to investigate the need for information, behaviour and attitude towards awareness of biodegradable products to promote sustainable habits. The study suggests strategies to encourage saving the environment from excessive plastic usage.

### **Biodegradable Products in Malaysia**

Food scraps like fruits and vegetables, dead plants and animals, chicken, eggshells, paper products, and garden waste are all biodegradable, unlike non-biodegradable materials, which are never broken down by nature (Geevarghese et al., 2022). Concerns about the environment have grown in recent years, making the use of biodegradable products crucial in Malaysia (Khan et al., 2020). A biodegradable product is a product that may decompose into natural substances, such as carbon dioxide or water, without leaving any harmful chemicals (Pratt et al., 2020). Over the past few years, the Malaysian government has introduced several measures to encourage the adoption of biodegradable products. Initiatives have aimed at promoting the adoption of biodegradable packaging and containers among businesses and customers (Cheng et al., 2022; Rashid et al., 2023). Consumer awareness and demand for ecofriendly alternatives have contributed to Malaysia's transition towards biodegradable products. Many individuals and organisations are actively pursuing biodegradable alternatives in order to minimise their environmental pollution and apply sustainable practices (Isa et al., 2021)—for instance, the advancement and utilisation of biodegradable materials across several sectors such as food packaging, agriculture and textiles (Rai et al., 2021; Jam et al., 2017). The increasing adoption of biodegradable products in Malaysia is anticipated to have a substantial beneficial effect on the environment by reducing waste and minimising the environmental impacts of diverse industries (Isa et al., 2021; Kanval et al., 2024). With continued support from the government, industry and consumers, the use of biodegradable products is expected to grow and play a larger role in promoting sustainability in Malaysia. As mentioned by Isa et.al, (2021) that the production of biodegradable materials often requires a significant number of resources and energy, which could potentially offset any environmental benefits gained from their biodegradability.

Additionally, there are concerns about the disposal of biodegradable products, as they may not necessarily break down efficiently in typical landfill conditions and could release harmful methane gas during decomposition (Wojnowska, Bernat, & Zaborowska, 2022; Farooq et al., 2010). Critics of biodegradable products also point out that the term "biodegradable" is not strictly regulated, leading to potential greenwashing where products are marketed as environmentally friendly without meeting stringent biodegradability standards (Degli Innocenti & Breton, 2020). This lack of standardisation could mislead consumers into believing that they are making a positive environmental choice when in fact the impact may not be as significant as they hope. Furthermore, Moshood, et.al, (2022) argue that the emphasis on biodegradable products may divert attention and resources away from more impactful measures such as reducing overall consumption, promoting recycling, and investing in long-term sustainable alternatives. While Shen, Song, Zeng, Zhang, Huang, Wen, & Tang, (2020) acknowledge that using biodegradable materials is a positive development, they argue that this should not be seen as a solution to all environmental problems. They propose a more comprehensive strategy for sustainability.

## **LITERATURE REVIEW**

### **Students' Attitude towards Biodegradable Products**

The emphasis on educating students about biodegradable products has also positively impacted their attitudes towards sustainable living and environmental conservation. With a deeper understanding of the benefits and challenges associated with biodegradable products, students are becoming more conscious consumers and actively seeking eco-friendly alternatives. In a survey conducted among

students in various educational institutions, a significant majority expressed a willingness to choose biodegradable products over traditional options. Many cited their desire to minimise their environmental impact and contribute to reducing waste as motivating factors for their preference.

Furthermore, students are increasingly advocating the use of biodegradable products within their personal lives and their academic and extracurricular activities. Student-led initiatives for implementing biodegradable packaging in school events, reducing single-use plastics on campus, and promoting composting practices have become more prevalent, demonstrating a proactive approach towards embracing sustainable alternatives. The shift in attitude among students towards biodegradable products underscores the potential for a cultural change towards more eco-conscious consumer behaviour. As the young actively promote and utilise biodegradable products, they are laying the foundation for a more environmentally responsible society in Malaysia. Students' continued support and encouragement to participate actively in sustainable initiatives related to biodegradable products will further solidify their positive attitude and commitment towards a greener and more sustainable future. Hence, the hypothesis developed as followed:

Hypothesis 1: Attitude has positive relationship with biodegradable products.

### **Students' Awareness of Biodegradable Products**

Young people in Malaysia are starting to understand the value of eco-friendly goods. The role of biodegradable items in fostering environmental sustainability is being widely promoted by educational institutions and student organisations (Ma et al., 2023). Initiatives that promote the use of biodegradable materials on campus and in individuals' daily lives are being actively sought by students. Awareness campaigns and events led by students are also helping to get the word out about the benefits of biodegradable products and the right way to dispose of them. The involvement of students in this community initiative promotes a greater understanding and commitment to environmental responsibility, as the younger generation actively participates in developing a sustainable future for Malaysia.

As part of their education, students are also being taught about the possible limitations and drawbacks of biodegradable items, including the energy and resource requirements for production and the difficulty disposing of them. Students will be able to think critically about the overall effects of biodegradable goods and come up with other ways to protect the environment and live in a way that does not harm communities. The increased consciousness and active participation of students in promoting the use of biodegradable products demonstrate a favourable change in attitudes towards environmental responsibility and highlight the possibility of sustained improvement and advancement in Malaysia's sustainability initiatives.

### **Students' Behaviour regarding Biodegradable Products**

As students become more aware of the impact of their consumption choices, there has been a notable shift in their behaviour regarding the use of biodegradable products. This shift is evident in the increasing preference for biodegradable packaging, utensils, and other materials in both their personal and academic settings. Many students have actively embraced the use of biodegradable alternatives such as bioplastic cutlery and compostable packaging in their daily routines. They are consciously opting for these products to minimise their environmental footprint and contribute to reduced accumulation of non-biodegradable waste.

Moreover, student-led initiatives and campaigns have encouraged the widespread adoption of biodegradable products within educational institutions. For example, there has been a noticeable reduction in the use of single-use plastics on campuses as students advocate the implementation of biodegradable alternatives in cafeteria services, events, and student activities. In addition to personal choices, students have been proactive in influencing broader institutional practices. Through

petitions and organised advocacy efforts, they have successfully lobbied for the use of biodegradable materials in campus facilities, creating a more environmentally conscious environment within their educational institutions.

The collective actions of students in embracing and advocating biodegradable products reflect a significant shift in consumer behaviour towards more sustainable and eco-friendly options. By actively incorporating biodegradable products in their daily lives and influencing institutional practices, students are demonstrating a deep commitment to environmental conservation and responsible consumption. This behavioural change sets a positive example for the wider community and contributes to the momentum towards a greener and more sustainable future. Hence, the hypothesis developed as:

Hypothesis 2: Attitude has positive relationship with biodegradable products.

### **Students' Knowledge on Biodegradable Products**

Assessing the level of knowledge and understanding of biodegradable products among students is crucial in determining the effectiveness of educational initiatives and the impact of awareness campaigns. A comprehensive survey conducted across various educational institutions revealed a notable increase in students' knowledge about biodegradable products and their environmental significance. The survey findings highlighted that a majority of students demonstrated a clear understanding of the concept of biodegradability and the potential benefits it offers in reducing environmental pollution and waste accumulation. Furthermore, students were able to identify specific biodegradable materials and products commonly used in daily life, indicating a practical application of their knowledge. However, the survey also uncovered areas where students expressed a need for further education and information, particularly in understanding the nuances of different types of biodegradable material, their decomposition processes, and the proper disposal methods to maximise their environmental impact.

This insight underscores the importance of ongoing educational efforts to deepen students' knowledge and address any misconceptions or gaps in understanding. By expanding the scope of educational modules and interactive sessions, students can gain a more comprehensive awareness of biodegradable products and their role in sustainable living. Additionally, collaborative initiatives between educational institutions and relevant industries can provide students with hands-on experiences and exposure to the latest advancements in biodegradable technology, fostering a dynamic learning environment that equips them with practical insights into the ever-evolving landscape of sustainable materials and products. By assessing and addressing students' knowledge levels regarding biodegradable products, educational institutions can further enhance the impact of their educational endeavours and effectively nurture a generation of environmentally conscious individuals who are well-informed advocates for sustainable living practices. Hence, the hypothesis was developed as following:

Hypothesis 3: Information needed has positive relationship with biodegradable products.

## **METHODOLOGY**

To gather data, this study used a quantitative research strategy. A survey was conducted with 150 millennials to investigate their need for information, behaviour and attitude towards the awareness of biodegradation products. From local universities, 88 females (80%) and 22 males (20%) were chosen using the purposive sampling technique as the sample for this study. In this study, most participants were female students. Furthermore, all of them were in the fourth semester. Their ages were 21–30 (97.3%), 31–40 (1.8%), and 41–50 (the least represented). The data collection was female dominant, 80 per cent of students being female and just 20 per cent male. The items measured

were the need for information, awareness, behaviour, and attitude adapted from Boca and Saraçlı (2023).

Partial Least Square-Structural Equation Model (PLS-SEM) is used to validate hypotheses and complete a study's theory and forecast. In addition, PLS-SEM data can indicate the validity and dependability of social elements. For the PLS-SEM approach, the two primary forms of evaluation are the measurement and the structural model. Hair Howard and Nitzl (2020) asserts that the measurement model can figure out how the items relate to their latent indicators. The structural model supports the latent correlational construct, which is based on the hypothesised link.

## FINDINGS AND DISCUSSION

Based on responses to the question "Do you take part in environmental activities organised within the university?" it was found that 57 of the 100 participants did not participate in any of the university-sponsored environmental events. Beyond that, 78.2 per cent of respondents had heard of biodegradable plastic, while 21.8 per cent had not. Furthermore, 83 respondents (73.6%) had utilised biodegradable plastic, while 29 respondents (26.4%) had not. To sum up, the results show that most participants knew about biodegradable plastics.

### Measurement Model Assessment

#### Convergent Validity

Table 1 shows that the composite reliability (CR) for awareness was 0.898 and average variance extracted (AVE) was 0.512. Specifically, for the constructs of attitude (CR = 0.899, AVE = 0.500), behaviour (CR = 0.839, AVE = 0.512), and need for information (CR = 0.904, AVE = 0.655), the CR varies between 0 and 1, higher values indicating higher levels of reliability (Hair et al., 2020). CR is generally interpreted in the same way as Cronbach's alpha. Composite reliability values of 0.60 to 0.70 are acceptable in exploratory research, while in more advanced stages of research, values between 0.70 and 0.90 can be regarded as satisfactory.

**Table 1. Convergent validity analysis**

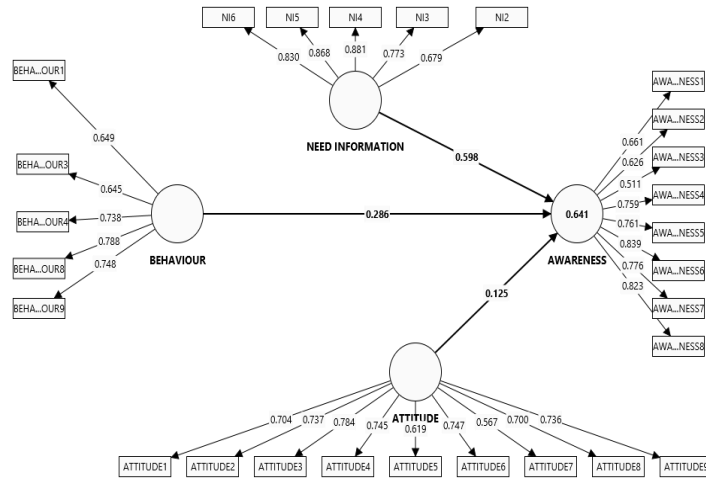
Variables	Composite reliability (rho_c)	Average variance extracted (AVE)
Attitude	0.899	0.5
Awareness	0.898	0.529
Behaviour	0.839	0.512
Need for information	0.904	0.655

#### Discriminant Validity

The Heterotrait-Monotrait Ratio of Correlations (HTMT) can serve as the basis of a statistical discriminant validity test using a procedure called bootstrapping, where subsamples are randomly drawn (with replacement) from the original set of data. Each subsample is used to estimate the model (Sarstedt et al., 2021). This process is repeated until a large number of random subsamples have been created, typically about 5,000. The estimated parameters from the subsample are used to derive standard errors for the estimates (Putra, 2022). With this information, it is possible to derive a bootstrap confidence interval. The confidence interval is the range into which the true HTMT population value will fall, assuming a certain level of confidence (Ringle et al., 2023). The HTMT results in Table 2 show that the values were above the conservative threshold value of 0.85, indicating that there was no significant discriminant validity.

**Table 2. Discriminant validity**

Variables	1	2	3
1. Attitude			
2. Awareness	0.531		
3. Behaviour	0.783	0.657	
4. Need Information	0.315	0.806	0.346



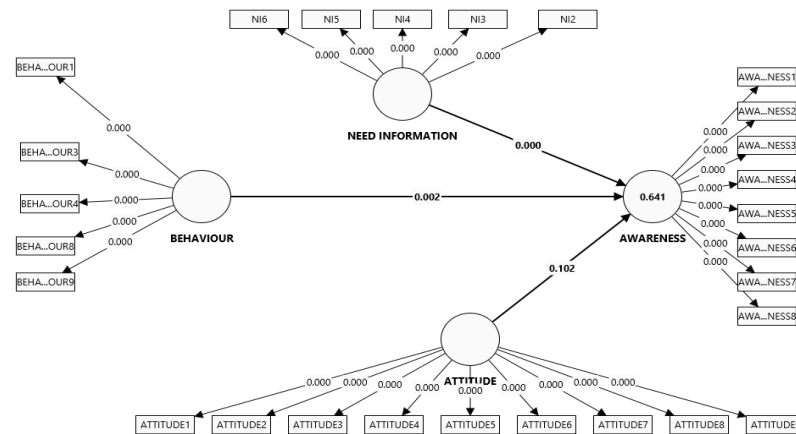
**Figure 1. Measurement model assessment showed the result of assessing the reliability and discriminant validity of the latent variables**

**Structural Model Assessment**

In next analysis, structural model assessment was applied to test the hypotheses as a direct relationship between characteristics of virtual work and adaptive performance. The R squared ( $R^2$ ) value found that 64.1 per cent of awareness was explained by the need for information, behaviour and attitude. Table 3 shows the path coefficient of attitude was not significant in awareness ( $\beta = 0.125$ , t-value = 1.636, p-value >0.05). Behaviour ( $\beta = 0.286$ , t-value = 3.031, p-value <0.05) and need for information ( $\beta = 0.598$ , t-value = 6.129, p-value <0.05) were significant in awareness of biodegradable products. Therefore, hypothesis 1, hypothesis 2 and hypothesis 3 were all supported.

**Table 3. Structural model analysis**

Relationship	Beta value	SE	T-values	P-values	F-values	Result
Attitude -> awareness	0.125	0.077	1.636	0.102	0.025	H1 not supported
Behaviour -> awareness	0.286	0.094	3.031	0.002	0.129	H2 supported
Need for Information -> awareness	0.598	0.098	6.129	0.000	0.901	H3 supported



**Figure 2. Structural model of need for information, behaviour and attitude towards awareness of biodegradable products among students**

## CONCLUSION

In light of the growing emphasis on the use of biodegradable products in Malaysia, it is crucial to focus on raising awareness and educating students about the benefits and challenges associated with such products. As the next generation of consumers and industry leaders, students play a pivotal role in shaping the future of sustainable practices. Educational institutions can incorporate modules or courses that specifically cover topics related to biodegradable products, including their production, usage, disposal, and overall environmental impact. By integrating these concepts into the curriculum, students can gain a deeper understanding of the complexities surrounding biodegradability and develop critical thinking skills to evaluate the true environmental implications of such products. Furthermore, organising awareness campaigns and interactive workshops within schools and universities can actively engage students in discussions about the role of biodegradable products in mitigating environmental impact. Hands-on activities such as composting demonstrations and waste management initiatives can provide students with practical experiences that highlight the importance of responsible consumption and disposal practices. Empowering students with knowledge about biodegradable products will not only foster a culture of environmental consciousness but also equip them with the tools to make informed decisions as future consumers and industry professionals. By instilling these values early on, educational institutions can contribute significantly to the widespread adoption of sustainable practices and the responsible use of biodegradable products in Malaysia.

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