

Students' Intention to Reduce Microplastic Pollution: A Future Solution

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Abstract

Microplastics are a growing environmental issue, posing risks to marine life and humans. Reducing plastic pollution requires understanding consumer behavior. This study aimed to test the Theory of Reasoned Action (TRA), combined with environmental concern, in predicting students' intentions to reduce microplastic pollution. Using data from 200 university students, hierarchical regression analysis revealed that both attitude and environmental concern significantly influenced intentions to reduce pollution. However, subjective norms had no effect, suggesting that social influence from friends and family may not be as pivotal in shaping these particular environmental intentions among university students. This study highlights the effectiveness of the Theory of Reasoned Action (TRA), enhanced by the inclusion of environmental concern, in predicting university students' intentions to reduce microplastic pollution. The strong influence of both attitude and environmental concern underscores the need to prioritize these factors in strategies aimed at fostering environmentally responsible behaviors. Although subjective norms did not show a significant effect, the findings offer important insights for future research and provide practical implications for shaping environmental policies and educational initiatives.

Keywords: Theory of Reasoned Action, Microplastics, Young Consumers', Environmental Concern, Extended Theory.

Introduction

Microplastic pollution is one of the top environmental concerns for governments around the world in this modern and polluted era. Primary microplastics are polymers designed to be created in tiny sizes, such as micro-beads in face cleansers, whereas secondary microplastics are minute plastic particles derived from the decomposition and breakdown of huge plastic trash (Geyer et al., 2017). Studies discovered that the contribution of microplastics within

river and marine water systems is a combination of both primary and secondary microplastic sources (Ng et al., 2023; Henderson & Green, 2020; Woodall et al., 2014; Wald, 2004; Thomson et al., 2004). However, several studies on Malaysian rivers have shown more microplastic particles and fibre generated by UV breakdown of plastic waste rather than roughly particles pellets from cosmetics items (Raja Sulaiman et al., 2023; Ma et al., 2020). Malaysia is one of the ASEAN nations with the highest annual rates of municipal solid waste generation (UNCRD, 2020; Ng et al., 2023), significantly increasing the likelihood of unmanaged plastic waste entering river and marine ecosystems. Consequently, substantial volumes of plastic waste are likely to be found in Malaysian rivers and oceans. Malaysia, along with the Philippines, Indonesia, and Singapore, is one of the four mega-diverse countries in the tropical ASEAN region, generating an enormous 0.5–1.9 kg of municipal solid wastes (MSW) per capita per day. Of this, plastic wastes accounts for an estimated 25 percent (Ng et al., 2023). This high rate of plastic waste generation has positioned Malaysia as one of the leading plastic producers among ASEAN countries (UNCRD, 2020).

The microplastic problem is linked to other global issues such as climate change (Shen et al., 2020) due to greenhouse gas emissions from plastics and microplastics throughout their life cycles (Hu et al., 2019). Another global issue that may be accelerated by microplastics is biodiversity loss, because plastic particles affect wildlife from plankton to top predators (de Sá et al., 2018). microplastics are also a global hazard for human health. Long-term intake of microplastics through food is expected to increase inflammatory responses and disturb the gut microbiota (Smith et al., 2018). The aggregation of microplastics acquired by breath is thought to induce lung cancer (Prata, 2018), and they can have negative neurological consequences when combined with hazardous compounds that cause chemical and biological harm (Campanale et al., 2020). Finding solutions is crucial because, despite the scarcity of studies and incomplete understanding of the global impact of microplastics, immediate action is necessary to prevent emissions from reaching levels that could cause irreversible damage (Hale et al., 2020). To get the microplastics problem under control, the world needs to take significant steps.

The global impact of microplastics and consumer behavior is not yet fully understood, and strategies to promote environmentally friendly behavior are still in their early stages (Moon et al., 2023; Wu et al., 2023). In the short term, society must drastically reduce the use of unnecessary single-use plastic items such as water bottles, plastic shopping bags, straws, and utensils. There is general acceptance that individual behaviors arising from economic, social, and political actions cause various environmental problems (Hale et al., 2020). In 2018, the government released Malaysia's Roadmap to Zero Single-use Plastics 2018-2030, which aims to guide the country in implementing strategies to reduce the impact of microplastics on humans (Ma et al., 2020). Achieving the goals of this roadmap by 2030 requires crucial actions from the demand side, which focusing on consumers' perspective. Hence, it is essential to motivate individual consumers to adopt behaviors that reduce the use of plastics or products containing microplastic elements. There is a need for research on consumer behavior regarding plastic use and the factors that motivate individuals to adopt environmentally friendly practices. Applying models like the Theory of Reasoned Action (TRA) can help predict and influence consumer behavior, but more studies are needed to tailor this model to specific cultural and regional contexts. Since 1975, the Theory of Reasoned Action (TRA) has been applied to examine various health and environmental issues, and this model has proven

effective in predicting consumer behaviors (Gill et al., 2021). Recently, environmental concerns has been recognized as significant factors influencing individual green behavior across regions (Dangelico, 2021; Xu, 2019). In Malaysia, this ecological concerns have gradually increased and developed with a focus on sustainability (Ogiemwonyi et al., 2023; Tan et al, 2022). This shift in consumers paradigm has led to a gradual change in consumption behavior towards the acceptance of green products. It indicates that people are now more willing to purchase green products due to the added benefits and values they provide to both individuals and the environment (Ogiemwonyi, 2021).

While numerous studies have explored microplastic issues within the Malaysia context (Raja Sulaiman et al., 2023; Ng et al., 2023; Tan et al., 2022; Fauziah et al., 2021; UNCRD, 2020; Shah et al., 2008), they predominantly focus on the origin and composition of microplastics. Therefore, there is a significant research gap regarding the behavioral aspects, especially among young consumers. To the best of authors' knowledge, little research has examined how environmental concerns interact with the two elements of the Theory of Reasoned Action (TRA), attitudes and subjective norms to influence behavioral intentions to reduce microplastic pollution among university students. By understanding these interactions, the study seeks to provide insights into effective strategies for promoting environmentally responsible behaviors in the young consumers segment, ultimately contributing to efforts to mitigate microplastic pollution in Malaysia. Furthermore, university students as a young adults age group are found to be the least concerned population about environmental issues, but they are also the most malleable group in term of raising environmental consciousness (Li, 2014). Understanding the younger generations behavior is indispensable. The younger generation need to pay more attention because they will be the future custodians of environmental issues who could affect the sustainability of our existence (Verma and Chandra, 2018). Therefore this study uses the extended TRA model to examine this issue among young adults which collect data from students in Universiti Putra Malaysia. A recent study (Liu et al., 2023) showed that environmental concerned are frequently used in global news stories to frame the phenomenon of environmental pollution. Therefore, it is important to understand how the use of environmental concern affects individuals' young adult behavioral intentions toward this issue. The young people are starting point to rationalize the environmental dilemma which the world is facing. We consider university students as the most influential consumer of green effort as they have a flexible behaviour, knowledge, idea and green consciousness (Fahmi et al, 2023; Wang, 2020). Many researchers have suggested that educated people have better abilities to understand the topic under consideration than people with less education (Han et al., 2010).

This study makes several important contributions to the field of consumer research. By examining the interplay between environmental concerns, attitudes, and subjective norms in shaping behavioral intentions, it offers valuable insights into the psychological drivers behind eco-friendly behavior among young consumers. This understanding aids in identifying the motivations and barriers to adopting sustainable practices. Furthermore, the findings enable business and policymakers to design more effective communication and intervention strategies. By highlighting the direct environmental impact of consumer behavior research, this study underscores its relevance to both academic enquiry and practical applications.

This paper is organized as follows. The first section introduces the topic, followed by a review of the relevant literature. The next section outlines the methodological requirements for the study. The third section presents the results, which are then discussed along with their implications. Finally, the paper addresses limitations, offers suggestions for future research and concludes the discussion.

Microplastic and its Impact

Scientists use the term microplastics crisis to characterize the growth in significant volumes of microplastic particles in the planet's ecosystems (Ng, 2023; Tan, 2022; Borriello, 2022; UNCRD, 2020; Katsnelson, 2015). Generally, these particles, measuring less than 5 millimeters in diameter, originate from various sources, including the degradation of larger plastic items like bottles and bags, as well as the presence of micro beads in personal care products such as exfoliating scrubs and toothpaste. There are two basic classifications of microplastics: primary and secondary. Primary microplastics refer to small plastic particles manufactured for specific uses, while secondary microplastics originate from larger plastic items that decompose into smaller pieces over time (Oliveira et al., 2012; Graham and Thompson, 2009). Additionally, microfibrils are minuscule plastic strands that shed from synthetic textiles like polyester and nylon during washing (Hu et al., 2019). Despite being invisible to the naked eye, they pose a substantial environmental threat. Plastics are versatile, low-cost materials that are lightweight, durable, long-lasting, and corrosion-resistant. They have good thermal and electrical insulating capabilities and are very useful (Thompson et al., 2004). Plastics are long chains of polymeric molecules composed of organic and inorganic raw materials such as carbon, silicon, hydrogen, oxygen, and chloride, which are frequently obtained from oil, coal, and natural gas (Shah et al., 2008).

microplastics in the environment are available to all stages of the food chain, from primary producers to higher trophic-level species (Oliveira et al., 2012). Wright and colleagues (2013) said people who consume microplastics may get internal abrasion and blockage. Population level impacts are also possible, but have mostly gone unexplored (Wright et al., 2013). microplastic pollution has grown widespread, having a negative effect on ecosystems and animals in a variety of ways. Based on the sources of micro plastic pollution, agro ecosystems are expected to be the most plastic-contaminated terrestrial system outside of landfills, metropolitan areas, and beaches (Duis and Coors, 2016). Studies (Cole et al., 2013, Graham and Thompson, 2009) show that, microplastics, because to their microscopic size, can be ingested by species that are generally unharmed by larger marine garbage. Short-term laboratory tests have indicated that minute plastic particles may be consumed by marine species with diverse eating patterns. Polychaetes, bivalves, echinoderms, and copepods will all consume microplastics at some time in their existence (Cole et al., 2013, Graham and Thompson, 2009). Once ingested, these microplastics can be eliminated via faeces or retained in the tissues of the exposed animals which called translocation (Thompson et al., 2004, Ward and Shumway, 2004). microplastics enter the ocean and become part of the sand on beaches, suspended in the water column, consumed by marine creatures, deposited on algae, or become part of the sediments in the deepest abyssal plains (Auta et al., 2017; Woodall et al., 2014). Because of the oceans' function as microplastic sinks, marine microplastics have received the most attention, while there has been a recent increase in study into microplastics in land and freshwater, where the problem is just as serious (Rochman, 2018).

Theoretical Framework and Hypotheses Development*The Theory of Reasoned Action*

The Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1977) is cognitive theory that offer a conceptual framework for understanding human behaviour which aimed to forecast individuals' intentions to undertake specific behaviors within various contexts. In particular, the TRA has been widely used to assist in the prediction and explanation of several environmental behaviour (Ajzen and Fishbein, 1980). According to this theory, an intention to engage in a certain behaviour is considered the best predictor of whether or not a person actually engages in that behaviour. Building upon earlier models, this theory posited that behavioral intentions, were primarily influenced by two factors, attitudes toward the behavior itself and the expectation that engaging in said behavior would lead to favourable outcomes. Furthermore, the theory emphasized the role of social norms, suggesting that adherence to these norms could bolster the likelihood of adopting the behavior in question. In essence, individuals are more inclined to act in accordance with behaviors perceived positively and socially accepted, this shaping their intentions and subsequent actions. In this study, we analyze the extended model of the Theory of Reasoned Action, integrating environmental concerns, to delve into consumer behavior regarding microplastic pollution within a structured conceptual framework. By incorporating environmental concerns, the extended model can better predict consumer behavior related to environmental issues (Ye, 2022) and the model can capture the intrinsic motivations that drive consumers to adopt environmental friendly behavior (Borriello et al., 2023). In fact, environmental concerns are increasingly important in today's context of global microplastics environmental challenges and studies show that these concerns can serve as powerful motivators for behavior change (Ma et al., 2023; Ye, 2022).

Intention to Reduce Microplastics Pollution

Intention refers to peoples' plan of action and represent their expressed motivation to perform behaviour. Ajzen and Fishbein (1980) defined intention as a state of mind directing a person's attention toward a specific goal or path to achieve something. Indeed, having a plan to achieve something entails setting specific goals or actions. When we mention someone having good intentions, it signifies that their motivations are noble and aligned with the right principles. Unintentional actions, on the other hand, are either unforeseen or, if anticipated, occur accidentally or as a consequence unintended by the initial goal. Within this study context, students' behavioral intention refers to the intention as a person subjective probability that he/she will reduce the microplastic pollution. With a focus on young generation green behavior, understanding the influences of this consumer segment is crucial in designing green policies and strategies that are pertinent to the target group (Fahmi et al., 2023). Students that are mostly in youth or adults categories is more diverse and segmented. Their style and preferences to adopt green behavior reflect a sustainable lifestyle (Ogiemwonyi, 2022). Young adults are threatened about the concern of the environmental problem and their actions helps to reduce environment (Yahya, 2019)

Many factors have been linked to green intentions. Studies utilizing the Theory of Reasoned Action have demonstrated a significant relationship between attitude and subjective norms with intention (Liaquat et al., 2024; Northern, 2023; Liu et al., 2017). Additionally, factors such as digital marketing (Alwan & Alshurideh, 2022), brand perception (Chen et al., 2020), awareness (Ansu-Mensah, 2021), and environmental concern (Kautish et al., 2010) have

emerged as a crucial drivers of consumer intention in the new era of consumerism. In recent times, research on consumers' intentions to reduce microplastic pollution and their influences on consumer behavior has predominantly focused on developed countries (Moon et al, 2023; Northern, 2023; Borriello et al., 2022). Northern (2023) found that, in addition to attitudes, the environmental value strongly correlates with the intention to reduce plastic among Portsmouth residents. Other studies demonstrate that social influences and perceived behavioral control (Borriello et al., 2022; Van et al., 2021), as well as perceived threat and perceived efficacy (Saarina et al., 2022) are significant predictors of stronger intention to reduce plastic consumption.

Attitude toward Reducing Microplastic Pollution

Attitude refers to "the degree of favourableness or unfavourableness of people's feelings regarding a psychological object" (Ajzen & Fishbein, 1975). Altmann (2017), defines attitude as an activity based on conscious or unconscious ideas established via living experiences. An attitude is an individual's disposition to respond favourably or unfavourably to an object, person, institution, or event or to any other discriminable aspect of the individual's world. Although formal definitions of attitude vary, most contemporary social psychologists seem to agree that the characteristics attribute is its evaluative (Bem, 1970; Fishbein & Ajzen, 1975). Attitude is a positive or negative evaluative reaction to something or someone, shown in one's thoughts, feelings, or intentional conduct. Attitude is an individual's characteristic way of responding consistently in a favourable or unfavourable manner to objects, people, or events in his environment. It is based on the certain behaviors or opinions. It is also reflecting on how an individual feel about something. Attitudes reflect settled behaviour and settled mode of thinking as well as feeling. Peattie (2001) refer attitude as rationality in decision. In this study, attitude is defined as individual behaviour toward negative or good thoughts about carrying out a target behaviour for environmental preservation in minimizing microplastic pollution.

Studies show a highly significant relationship of attitude and people's intentions and behaviors in various contexts such as energy saving (Zhao et al. (2019), psychological restoration (Byrka, 2010), sustainability issues (Dominguez et al., 2019), and microplastic pollution (Nothorn, 2023). Attitude is crucial to consumer intention (Ajzen & Fishbein, 1977) and serve as a reliable predictor of green-related behavior (Charitou et al., 2021; Domingues-Valerio, 2019; Byrka, 2010). Research indicates that attitude has substantial behavioral effects and is the most accurate predictor of behavioral intentions (Balakas et al., 2023; Borriello et al., 2022). Additionally, Chen et al (2020), found that a positive brand attitude increases the likelihood of consumer acceptance, whereas a negative attitude reduces it. However, not all studies find a positive relationship. For example, studies have identified a negative relationship between attitude and intention in various contexts such as fast food consumption (Smith et al., 2016), and recycling behavior (Van et al., 2006). Therefore, it is essential to further explore how attitude influences consumer intentions across different scenarios. The study's hypothesis is as follows;

H1: Attitude strongly influences the intention to reduce microplastic pollution.

Subjective Norms

Subjective norms are a person's perception of social pressure to do or refrain from performing the target behaviour (Ajzen & Fishbein, 1975). This is the perception that most people approve or disapprove of the action. Social pressure from others was very important

for an individual to behave in a certain manner and their motivation to comply with those people view. Studies (Alam et al., 2020; Han et al., 2010) show a strong relationship of subjective norms with green behavior. However, Some studies did not establish any significant direct relationship between subjective norms and environmental behavioral intention (Krueger et al., 2000; Santos et al., 2016). Kolveried & Isaksen (2006) also found subjective norms tend to contribute more weakly to intention. Earlier, Ajzen (2002) said this weak relationship is for individuals with strong internal locus control as compared to those with a strong action orientation (Bagozzi, 1992). The inconsistencies findings of the subjective norms towards intention need further research and improvement on the used measures and analysis. Therefore, study explore on how subjective norms relates to intention to reduce microplastic pollution. In this study, subjective norms refers to a person's opinions regarding whether peers, family, friends, colleague, and important individuals in his or her life believe he or she should engage in the conduct to reduce the microplastics pollution. Based on the preceding studies, the hypothesis proposed for this study is as follows:

H2: subjective norms strongly influence the intention to reduce microplastic pollution.

Environmental Concern

Environmental concern indicates that a person has knowledge, or perception of an environmental issue, which includes the response of them to these issues (Ziadat, 2010). Balaskas et al. (2023) said, green consumer behaviour could be referred as consumer behavior that is concerned with environmental issues which reflected in purchase decisions. In this study, environmental concern is one concept to understand the fragility of our environment due to microplastic pollution and importance of consumer to reduce consumption. Environmental concern is intricately linked to public awareness of the detrimental effects of their activities involving microplastic. Elevating public consciousness regarding the origins, consequences, and strategies to address microplastic pollution is imperative for fostering responsible stewardship and catalyzing impactful environmental action. Additionally, Dunlap and Jones (2002) said, environmental concern refers to the degree to which individuals are aware of environmental problems and support attempts to address them or signal a readiness to contribute directly to their solution. Studies shows that environmental concern as one of the important significant factors of intention of green purchasing (Balaskas et al., 2023; Kautish et al., 2019; Rahbar et al., 2011; Brick & Lewis, 2016; Mostafa, 2009). Environmental concern has also been demonstrated to be a key determinant of the purchasing green foods in various research studies (Donato & Adiguzel, 2022; Homar & Cvelbar, 2021). Therefore, this study operationally defined environmental concern as the students consideration and worriedness of the environmental effects of one's own actions. Environmental concern is one idea used in this study to comprehend the fragility of our ecosystem as a result of microplastic products and the significance of consumers reducing their use. Then, the hypothesis is as follow;

H3: Environmental concern strongly influences the intention to reduce microplastic pollution.

Based on the literature, this study proposed a model as follows:

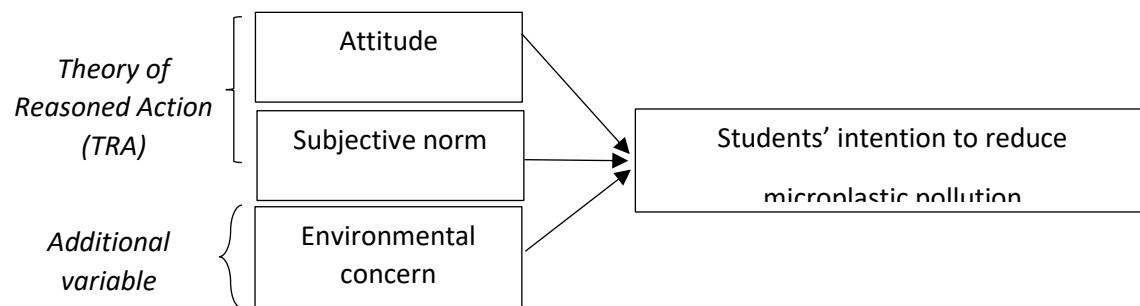


Figure 1: Proposed model based on the Theory of Reasoned Action (Ajzen & Fishbien, 1977)

Methodology

Subjects and Procedures

In this study, the target population comprised students from four faculties at Universiti Putra Malaysia. A stratified random sampling method was employed to select these faculties: Faculty of Human Ecology, Faculty of Educational Studies, Faculty of Science, and Faculty of Food Science and Technology. Students were contacted through their university email addresses, and questionnaires were distributed through this medium. This method enabled the survey to reach a broad audience within the target population. Out of the total responses received, 200 completed questionnaires were used in this study, resulting in a 66.7 percent response rate. According to Jia Wu et al (2022), and Fan & Yan (2010), a response rate of 30 percent or higher is typically considered good for online surveys, although achieving this without strong engagement strategies can be challenging.

The structured questionnaires were divided into two sections, A and B. The section A was on statements related to the four variables: Intention to reduce microplastics pollution, attitudes, subjective norms and environmental concern, while section B was about demographics. All are the close-ended questions. Illustrated in Table 1 are the respondents' demographics. These questionnaires were developed using the Google forms platform which later distributed via emails to the participants. It is worth mentioning that the questionnaires were simple, carefully modified and concisely worded to avoid ambiguity and formatted to avoid error. The questionnaire took approximately 20 minutes to complete.

Table 1

Respondents demographics (N=200)

Variables	Frequency (n)	Percentage (%)
Gender		
Male	95	47.5
Female	105	52.5
Age		
18-22 years old	70	35
23-27 years old	130	65
28-32 years old	0	0
33-37 years old	0	0
Marital status		
Single	196	98
Married	4	2
Races		
Malay	100	50
Chinese	57	28.5
Indian	40	20
Others	3	1.5
Location		
Rural	97	48.5
Urban	103	51.5
Educational Level		
Degree	199	99.5
Master/PhD	1	0.5
Faculty		
Faculty of Human Ecology	50	25
Faculty of Educational Studies	50	25
Faculty of Science	50	25
Faculty of Food Science and Technology	50	25

Measurement

The twenty-four (24) Likert-type scale measurement items that were used in this research were adopted and modified from previous studies. It is notable that a 5-point Likert-type scale that range from 1 to 5, with 1 being 'strongly disagree' to 5 being 'strongly agree' was used to measure the entire constructs. There are nine, five, four and six items were used to measure intention, attitudes, subjective norms and environmental awareness respectively (Table 2). The sources of the development of the items are as follows:

- a) Intention to reduce microplastic pollution (Li et al., 2021; Van et al., 2021, Borriello et al. 2022).
- b) Attitude (Charitou, et al., 2021).
- c) Subjective norms (Borriello et al., 2022).
- d) Environmental concern (Borriello et al., 2022).

Findings

Respondent Demographics

Table 1 displays more than half of respondents were female (52.5%) and the largest proportion fell within the age range of 23 to 27, making up 65% of the 200 participants. The vast majority of respondents (99.5%) were pursuing Bachelor's degrees with only 0.5% at the master's or PhD level. Single respondents represented the majority at 98.0%. In term of ethnicity, Malay respondents were the largest group at 50%, followed by Chinese at 28.5%, Indian at 20.0%, and others at 1.5%. Each faculty contributed equally to the sample, with each representing 25.0% of the respondents. Regarding residency, 48.5% of respondents came from rural areas, while 51.5% resided in urban areas.

Table 2

Details of the measures

Measure	M	SD
<i>Attitude ($\alpha = 0.916$)</i>		
1. Do you agree with the taxation of the single-use plastics?	3.43	1.025
2. Do you believe that the ban on products that include microplastics contribute to the preservation of the marine environment?	3.61	0.971
3. Would you change the store you go shopping in order to find environmentally friendly products?	3.40	0.967
4. Would you prefer to buy a product that doesn't contain microplastics or isn't made with plastic even if it costs more?	3.32	1.030
5. Are you ready to stop using the following plastic products in your daily life?	3.40	0.961
<i>Subjective norms ($\alpha = 0.950$)</i>		
1. If my friends choose not to buy products which contain microplastics, I would also not buy those products.	3.58	0.835
2. I share similar views to people close to me, so wouldn't buy products containing microplastics if they didn't.	3.60	0.803
3. If my family refuses to buy products containing microplastics, I would also refuse to buy them.	3.69	0.830
4. I would not buy products containing microplastics if my friends and family thought that was a bad thing.	3.73	0.814
<i>Environmental concern ($\alpha = 0.939$)</i>		
1. I am very concerned about the pollution caused by microplastics.	3.48	0.935
2. When companies manufacture product which contain microplastics, it produces bad results to the environment.	3.68	0.838
3. Humans are damaging the environment by microplastics ending up in the ocean.	3.82	0.843
4. I am worried that microplastics will damage marine life.	3.75	0.880
5. Environment is the most important issues of society.	3.87	0.819
6. Each of us, as individuals, can make a contribution to environmental protection	3.94	0.771
<i>Intention ($\alpha = 0.961$)</i>		
1. I intend to accept inconveniences to protect the environment.	3.40	0.913
2. I intend to actively practice environmentally responsible activities.	3.44	0.917

3.	I intend to switch to using plastic-free products.	3.46	0.966
4.	I intend to find the alternatives of instead using product that contain microplastic.	3.53	0.935
5.	I intend to educate my relatives about the way of reducing microplastic pollution.	3.52	0.930
6.	I intend to buy cosmetics and toiletries made with natural ingredients (e.g., facial cleansers, make-up, toothpaste) more often in the future.	3.55	0.907
7.	I intend to buy only clothes made by natural fibres, such as cotton or wool, in the future.	3.41	1.003
8.	I intend to read labels when buying cosmetics or clothes to make sure they do not contain synthetic materials.	3.37	0.989
9.	I intend to reduce my consumption of everyday items containing microplastics.	3.46	0.912

Note: M = Mean, SD = Standard Deviation, N=200

Descriptive Analysis

Table 2 presents the results of the descriptive analysis for the attitude, subjective norms, environmental concern and intention to reduce microplastic pollution. The value of mean and standard deviation for the items used to measure all the variables by using the Likert Scale, (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree. According to Sekaran (2003), the reliability coefficient, also known as Cronbach's alpha (α), approaching 1.0 indicates higher reliability. Generally, coefficients below 0.60 are deemed poor, those between 0.70 and 0.80 are considered fair, and those exceeding 0.80 are regarded as excellent. In this study of 200 respondents, the variable 'intention' demonstrated exceptional internal consistency with a reliability coefficient of 0.961. Similarly, attitude, subjective norm and environmental concern exhibited strong reliability at 0.951, 0.950, and 0.939 respectively, surpassing the recommended threshold of 0.80.

Based on Table 2, the respondents' attitudes towards microplastics and environmental preservation were measured through five specific questions. The highest mean score was 3.61, indicating that respondents strongly believe that banning products containing microplastics contributes significantly to the preservation of the marine environment. This suggests a high level of environmental attitude among the respondents regarding the impact of microplastics on marine ecosystems. The lowest mean score was 3.00, showing that respondents were less willing to purchase products free of microplastics or made without plastic if these products were more expensive. This indicates a reluctance among some respondents to incur additional costs for environmentally friendly products, suggesting that financial considerations can be a barrier to making more sustainable choices.

Regarding subjective norms, the analysis reveals that the highest mean score is 3.73, indicating that respondents would avoid buying products containing microplastics if their friends and family disapproved. This demonstrates that friends and family members significantly influence students' actions. The impact of social pressure on intentions can be effectively leveraged to reduce the consumption of goods containing microplastics. Specifically, respondents who agreed more with their family and friends' environmentally friendly views were also more likely to intend to purchase products free of microplastics.

Table 2 also presents the mean and standard deviation for items measuring environmental concern and the intention to reduce microplastic pollution. The highest mean score among the six questions measuring environmental concern is 3.94, indicating that respondents strongly agree with the statement that individuals can take action to save the environment. This suggests a high level of personal responsibility and proactive attitude towards environmental conservation. Among the nine items measuring the intention to reduce microplastic pollution, the highest mean score is 3.55. This score corresponds to the intention to buy cosmetics and toiletries made with natural ingredients in the future. This indicates that consumers are becoming more conscientious about the ingredients in their products and prefer natural alternatives. The lowest mean score is 3.37, relating to the likelihood of reading labels on cosmetics or clothes to ensure they do not contain synthetic materials. This suggests that while there is some awareness, there is less consistent behavior in actively checking product labels for synthetic content. In general, the data reveals a moderate sense of environmental concern among respondents, with a significant number believing in individual action to protect the environment. Additionally, there is a growing awareness and intention to reduce microplastic pollution by choosing products with natural ingredients. However, the slightly lower score for label-checking behavior indicates that there is still room for improvement in educating consumers about the importance of verifying product contents to avoid synthetic materials. This insight can inform strategies for enhancing consumer education and promoting sustainable purchasing habits.

Relationship of the Constructs

The relationship analysis demonstrates that all the established constructs of the Theory of Reasoned Action (TRA) framework with additional environmental concern variable have a strong correlation with the respondents' intentions, as detailed in Table 3. Here are the key findings:

- a) The most significant relationship was found between the students' attitude and their intention ($r = 0.001$, $\beta = 0.894$). This indicates that positive attitudes towards reducing microplastic pollution are strongly associated with the intention to take action.
- b) The subjective norm also showed a significant relationship with intention ($r = 0.001$, $\beta = 0.696$). This suggests that social influences, such as the opinions of friends and family, play an important role in shaping the respondents' intentions to reduce microplastic pollution.
- c) Environmental concern was similarly found to have a significant relationship with intention ($r = 0.001$, $\beta = 0.839$). This indicates that a higher level of concern for the environment is strongly linked to the intention to engage in behaviors that reduce microplastic pollution.

Table 3

Correlation between variables

	ENV.CON	ATT	SNORM	INT
ENV.CON	1			
ATT	.847*	1		
SNORM	.694*	.761*	1	
INT	.839*	.894*	.696*	1

*Note: ENV.CON - Environmental concern, ATT -attitude, SNORM - subjective norm, INT - intention. *correlation is significant at 0.001 levels (2-tailed).*

Testing of the Proposed Hypotheses

To demonstrate the incremental predictive power of each factor influencing students' intentions to reduce microplastic pollution, a hierarchical multiple regression analysis was conducted. This analysis included two models: Model 1, attitude and subjective norm, and Model 2, attitude, subjective norms and environmental concern. Model 1 was a good predictor of students' intentions to reduce microplastic pollution, with $R^2 = 0.799$, $F(2, 197) = 392.13$, $p < 0.001$. This indicates that 79.9% of the variance in intention can be explained by these two variables alone. The extended model, which included environmental concern as an additional variable, showed a significant increase in predictive power, with $R^2 = 0.822$, $F(3, 196) = 302.54$, $p < 0.001$. This means that 82.2% of the variance in intention is explained by the combination of all three variables.

Among the three predictors, the statistical analysis indicates that the two predictors namely attitude and environmental concern, significantly influences the intention of consumers (Table 4). Analysis based on the TRA model found that attitude significantly influence the student intention ($\beta=0.618$, $t=17.579$, $p<0.001$) and subjective norm shows non-significance impact on intention. This finding was confirmed in model 2 (an extended of TRA) which found the two predictors, attitude and environmental concern as predictors of the students' intention to reduce microplastic pollution. These two findings support the study's hypotheses, H1 ($\beta=0.586$, $t=10.183$, $p<0.001$) and H3 ($\beta=0.320$, $t=5.057$, $p<0.001$) However, the analysis found non significant relationship between subjective norm and intention to reduce microplastic pollution, thus hypothesis 3 was not supported ($\beta=0.320$, $t=5.057$, $p<0.001$).

Table 4

Hierarchical multiple regression of three predictors of intention to reduce microplastic pollution

Variable	b value	t value	p value
<i>Model 1 (TRA)</i>			
1. Attitude	0.618	17.579	0.001
2. Subjective norms	0.040	0.765	0.445
R^2	0.799		
<i>Model 2 (Extended TRA)</i>			
1. Attitude	0.586*	10.183	0.001
2. Subjective norms	0.004	0.075	0.940
3. Environmental concern	0.320*	5.057	0.001
F	302.544		
Df2	196		
R^2	0.822		
Adjusted R^2	0.820		
R^2 change	0.822		
N	200		

Note: * $p < 0.001$

Discussion and Implications

The hierarchical multiple regression analysis confirms that attitude, and environmental concern are significant predictors of students' intentions to reduce microplastic pollution. Attitude is the most influential predictor, followed by environmental concern. This suggests that strategies aiming to reduce microplastic pollution among students should prioritize enhancing positive attitudes while considering on raising environmental concern. The present study shows an extended framework of the TRA. The hierarchical analysis demonstrates the incremental contribution of each predictor: Model 1: Attitude and subjective norm together provide a substantial explanatory power for the intention to reduce microplastic pollution. Model 2: Adding environmental concern to the model significantly enhances its predictive capability.

This finding further consolidates the important roles of internal factors in shaping students' behavior. Individuals' attitude refers to the individuals' value judgement of environmental protection (Ajzen & Fishbein, 1975). In other words, attitudes tap the individuals' cognitive assessment of the value of environmental protection. The findings were supported based on research by (Anderson et al., 2016), which stated that attitude is critical in reducing the consumption of microplastic-containing items. The findings suggest that students' intention to reduce microplastic pollution is more easily activated by attitude (internal value) than by social norms assessment. According to Peattie (2001), there is a need to return to rationality when targeting students or youth age consumers in green behavior. This paper supports previous studies (Zhao et al., 2019, Byrka, 2010; Dominguez et al., 2019) which found a significant influence of attitude on the intention. Environmental concern was found to be the second predictor of intention to reduce microplastic pollution. Here, environmental concern refers to the degree of emotional involvement in environmental issues. It taps the individuals' affective response towards environmental protection. This finding confirms the claims of Henderson and Green (2020), and Li et al. (2021) that environmental information is important in influencing people's perceptions and encouraging environmentally conscious behaviour. This finding also supports Liu et al. (2023) contention that people who perceive environmental dangers are more inclined to engage in an ecologically beneficial manner. Subjective norm was found not a predictor and weak relationship to students' intention to reduce microplastic pollution which is consistent with Krueger et al. (2000), Santos et al. (2016) and Kolveried & Isaksen (2006).

This finding point to the importance of consumer segmentation because that works best for an age segment may not necessarily work the same for another group. Overall, the study shows that students displayed a quite promising opportunity for green behavior. Environmentalist efforts are advised to consider students as one of their potential targeted groups as they welcome new and innovative ideas and their anticipated life span is longer (Bakewell & Mitchell, 2003). All these imply a potentially great opportunity value-return in the long run. Applying the results to practical green planning are advised to consider in future green work. In this context, our findings suggest that those concerned about the environmental damage caused by microplastics are more likely to have a positive attitude toward products that do not contain microplastics, to believe they have control over green product selection, and to express intentions to purchase green products.

This suggests that efforts to enhance positive attitudes towards environmental actions and increase environmental concern can effectively promote intentions to adopt more sustainable behaviors. While the respondents recognize the importance of reducing microplastic pollution to protect the environment, there is a noticeable hesitation to pay higher prices for products that support this goal. This highlights a potential area for policymakers and businesses to address, possibly through subsidies, incentives, or the development of more affordable sustainable alternatives to encourage broader adoption of environmentally friendly practices.

Based on the results and analysis of why country's waste policies applying to households have low effect on consumers' waste reduction behavior, then we suggest the following recommendations. Firstly, the government needs to implement supporting policies and program for reducing microplastic pollution. Stimulate consumers' environmental attitude and concern and disseminate knowledge to consumers to form green consumption habits; this could be a long-term benefit in terms of making green behavior more common. Residential area have recently been encourage to do 3R at home or even 5R now to enhance circular economy activities. However, most consumers are still unable to identify the benefits of practising 3R, or simply because of non mandatory and lack of regulation by the government which make this as unresolved problem that make more attention in the future.

Furthermore, different incentive programs can be deployed simultaneously. Incentive-based program like KITARecycle should be continuously be a good program to encourage the public recycle by rewarding with Recycling Point. Moreover, the government should focusing more on the management and monitoring of support programs. The government should also strengthen international cooperation to share information and experiences, optimize positive impacts, and share lessons learned that have been summarized from other countries. This would be the lever that drives green behavior practices and reducing microplastic pollution. Finally, the government needs to increase publicity efforts on microplastic and environmental protection to improve people's environmental concern and awareness. We make use of the full coverage of the internet and the popularity of communication mediums such as television, smartphone, taking advantage of social media is also common. Since it was found that students' environmental concern also effects their intention to reduce microplastic pollution, green efforts in the future should also convey the message that "each of us as individuals can make a contribution to the environmental problem" with quotation "we do not inherit the earth from our ancestors; we borrow it from our children".

From the theoretical perspective, this study implied reinforces the Theory of Reasoned Action (TRA) by confirming that attitude and environmental concern are significant predictors of behavioral intentions. This aligns with TRA's premise that individual intentions to perform a behavior are primarily influenced by attitudes and subjective norms. Predominance of attitude factor was clearly benefit for framework development in the future research. Attitude has the strongest influence on intentions underscores the central role of personal beliefs and positive evaluations in driving pro-environmental behaviors. This suggests that within the TRA framework, attitude may be a more critical determinant of behavior than previously thought, especially in the context of environmental actions. At the same time, the significant role of environmental concern adds a nuanced layer to the TRA framework. It indicates that specific concerns about environmental issues can be potent motivators for

behavior change. This suggests a possible extension or adaptation of the TRA model to include environmental concern as a distinct construct influencing intentions. The study's results may encourage the integration of TRA with other variable, such as the environmental concern with this integration has provided a more comprehensive understanding of the factors that drive microplastic pro-environmental behaviors. In conclusion, this study not only validates key aspects of the TRA framework in the context of microplastic behavior but also suggests potential areas for refinement and integration with other variable. It highlights the need for a deeper understanding of the role of attitudes and environmental concerns and calls for further exploration into the conditions under which subjective norms influence behavior.

Limitation and Future Research

A quantitative study is an effective research method for examining subjective topics, such as this study of students' behavior and attitudes toward microplastics. However, this study has some limitations despite uncovering several findings. As a cross-sectional design, this study has captures data at a single point in time, which making it difficult to infer causality and limits the understanding of long-term impacts. Therefore, longitudinal studies would be needed to examine how attitudes and environmental concerns change over time and influence behavior. As a cross-sectional study using a small sample of higher education students with average age of 18 to 30, the insights gained may not be universally applicable. For instance, significant differences may exist in how students at UPM perceived their microplastic-related behaviors compared to students or other groups in different parts of the world. Therefore, future study should focus on younger populations and educational settings to explore how early attitudes and environmental concerns are formed. Additionally, research should investigate how educational interventions can shape these factors to promote sustainable behavior from a young age.

The study focuses only on three variables, attitudes, subjective norms, and environmental concerns which potentially overlook other influential factors such as knowledge or perceived behavioral control. Future research should include these additional variables to provide a more comprehensive understanding of microplastic-related behaviors. Given the dominant influence of attitude, theoretical models of behavior change might benefit from a greater emphasis on attitudinal change mechanisms. This includes understanding how attitudes are formed, how they can be changed. Additionally, this study only examines a direct influence of attitude and other factors on intention-behavior, highlighting the need for future research to explore the mediating roles of attitudes or environmental concerns in shaping intentions toward microplastic behavior. Moreover, while subjective norms were not found to be significant, their positive relationship with intentions indicates that social influences and perceived social pressure remain relevant areas for further investigation. This finding implies that the influence of subjective norms may be more complex and context-dependent than the TRA framework initially proposed. It opens up avenues for further research to explore under what conditions subjective norms become significant. The study also measures intentions rather than actual behaviors. There is often a gap between what people intend to do and what they actually do. Future research should explore the translation of intentions into real-world actions.

Conclusion

In conclusion, this study underscores the importance of attitude and environmental concern in shaping intentions to reduce microplastic pollution within the TRA framework. The dominant influence of attitude highlights the need for targeted interventions that foster positive evaluations of pro-environmental behaviors. While subjective norms were not significant, their good relationship suggests potential areas for further exploration. These findings offer valuable insights for designing effective interventions, policies, and future research aimed at promoting sustainable consumer behavior and mitigating microplastic pollution.

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