Application of theory of planned behavior in measuring the behavior to reduce plastic consumption among students at Universiti Putra Malaysia, Malaysia

Sharifah Nur Munirah Syed Hasan\textsuperscript{a}, Rosta Haruna\textsuperscript{a*} and Lim Kuang Hock\textsuperscript{b}

\textsuperscript{a}Department of Environmental Management, Faculty of Environmental Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Malaysia
\textsuperscript{b}Institute of Public Health, Jalan Bangsar, 50595 Kuala Lumpur, Malaysia

Abstract

This study was conducted to identify the relationship between variables that affect behavioral intention among UPM students in reducing plastic consumption. A survey was done using validated questionnaire and distributed among 393 respondents of UPM students. The study revealed that perceived behavioral control (PCB) shows the highest relationship with behavior compared to other variables. There was statistically significant of behavior difference between genders. However, there was no statistically significant difference of behavior between level of education and stream of study (science and social science).

1. Introduction

Plastic waste is one of the major environmental issues over a decade as it affects the sustainability of the environment. Composition of plastic in 2005 are 24\% and considered as a second high percentage of waste generated after food waste which is 45\% [11]. Plastic waste is highly influenced by population and economic growth, climate and social behavior [5,13]. Among those factors, social behavior is the most important aspects which contribute to plastic waste generation because human is the consumer of plastic in everyday life [11].

\* Corresponding author. Tel: +6-019-2641944
E-mail address: rosta@upm.edu.my
Previous studies stated that positive attitude was highly depends on environmental knowledge obtained which results in favorable action towards nature [6]. Gender also had influences on the behavior in reducing plastic consumption among students. Previous research had proved that male students tend to be more concerned compare to female students which reflect their sustainable responsible behavior [13,20].

Theory of Planned Behavior (TPB) was utilized in this study to investigate the behavior of plastic consumption among university students at UPM. The theory consist of environmental knowledge, attitude, subjective norm (SN) and perceived behavioral control (PBC) that might influence student’s intention to perform specific behavior in reducing plastic consumption in daily life [3,11] (Fig. 1.).

It is pertinent to measure behavior toward plastic consumption among university students as they have prior knowledge and exposure towards subject related to sustainability. Lacking of studies in the country on such behavior becomes a major gap in order to know the impacts of knowledge on sustainable behavior among university graduates. They also will become a leader in the future and continue their consumption habits.

The objectives of this study are as to identify the relationship between environmental knowledge and attitude, SN, attitude and PBC with behavioral intention among UPM students in reducing plastic consumption using TPB and to compare behavior in reducing plastic consumption between stream of study (science or social science) and social demographic background among university students in UPM.

![Fig. 1. Theory of Planned Behavior [3,11]](image-url)

2. Methodology

2.1 Sampling

Stratified proportionate to size random sampling was employed to select the representative sample of UPM undergraduates and postgraduates students. The stratification was based on stream of study (science and social science). Following by selection of students from each faculty and number of sample selected was proportionate to students of each faculty. Sample size was determined using the formula and the equation were as below [10]:

\[ S = \frac{X^2 NP (1 - P)}{d^2 (N - 1)} \]  

where 0.5 is used which will provide the maximum size of the sample and 0.05 (d) is selected (d-degree of exactness). Based on the formula, the sample size needed was 378. To cater for non response rate of 5%, 400 of questionnaire were distributed and 393 (98.3%) respondent’s response to the study. The students from each faculty in UPM were selected proportionate to their population size. The selection of students employed is using simple random sampling based on random number generated from table of random numbers.

2.2 Measures

The respondents were informed about the purpose of the study and their participation was based on voluntary bases. Those consented will be given the questionnaire and instruction to answer the questions for each section.
available in the instrument.

2.3 Instrument

The survey instrument was an adapted questionnaire [6,11]. The content in questionnaire were validated by experts from UPM and pre-tested twice among the university students to establish its validity and reliability. The instrument consists of seven sections namely demographic information, environmental knowledge, attitude, SN, behavioral intention, PBC and behavior and the items were measured on both 4-point and 5-point Likert-type scale.

2.4 Reliability Tests

Questionnaire was pre-tested among 30 students from different faculties in UPM. They were asked to note down the items which are difficult to understand. After the feedback, the questionnaire was pre-tested again. The pre-test revealed the reliability of items for each section in the questionnaire which was evaluated using internal consistency approach (Cronbach’s Alpha). From the analysis, results show that reliability for each section was above 0.7 which indicated that the questionnaire were reliable [8,18].

2.5 Data Analysis

SPSS Version 16 software was used to analyze the data. Descriptive statistics were used to illustrate demographic information of the respondents. Independent sample T-test was used to compare means score of behavior in reducing plastic consumption between streams of study (science and social science), level of education and gender. A path analysis was used to determine the linear relationship between environmental knowledge, attitude, SN with behavior intent and PBC with behavioral intent and actual behavior. All statistically analysis was carried out at 95% confidence interval.

3. Results and discussion

3.1 Demographic information of the respondents

Of 393 respondents mostly are undergraduate students (66.9%). The majority of the participants are within the age group between 18 to 25 years old (81.4%), almost two third are female (76.1%) and the remaining (23.9%) are male students.

3.2 Mean difference of behavior towards reducing plastic between social demographic variables

3.2.1 Level of education

Results indicated that there was no statistically significant difference on mean of behavior between undergraduates (M = 31.84, SD = 5.38) and postgraduates students (M = 30.57, SD = 5.22); t (388) = 2.20, p = 0.687) (Table 1). However, these findings were contradicts with previous studies which revealed that high level of education provided a chance for students to have a better learning in understanding the adverse impact from the use of plastic towards the environment [4]. Present findings indicated that although more educated person have massive knowledge, it does not essentially increased their positive behavior towards environmental issues [9].

3.2.2 Gender

Independent sample T-test shows that there was statistically significant difference on mean of behavior between male (M = 29.54, SD = 5.39) and female respondents (M = 32.06, SD = 5.21); t (391) = - 4.05, p = 0.001) (Table 1). Results indicated that the mean score of behavior for female students was higher when compared to male which indicated female have high positive behaviors than male in reducing the use of plastic. The finding contradicted other studies which revealed there were no significant differences between genders regarding environmental issues [2,4]. While other study denoted that male students shows higher concern on environment compare to female
students which promote sustainable responsible behaviour [13,20]. These finding was in line with several literatures which posit that women have higher pro-environmental behavior than men due to vary in pattern of socialization among women and men [6,19]. Thus, it might be the plausible explanation for current findings.

3.3 Student’s behavior towards plastic consumption across stream of study in UPM

There was no statistically significant difference in the mean of behavior between science courses (M = 31.35, SD = 5.04) and social science courses (M = 31.61, SD = 5.83); t (391) = - 0.47, p = 0.639 (Table 1). The finding contradicted the previous research which revealed that students from science programs tend to have positive behavior in environmental issues compared to social science programs due to science students tend to have higher environmental knowledge through the subjects they learned in class reflecting their favorable behavior towards environmental aspect compared to social science students [4,19]. However, current findings show similarity in student’s behavior towards plastic consumption which is in line with study of environmental literacy among university students [7]. Plausible reason for the finding was that current knowledge on environment-related subjects among students affect their positive behaviour [19]. Although environmental education are not taught as a subject among social science students, it had been taught indirectly by teachers and lecturers through the implementation of environmental values in the course outline in Malaysia [22].

| Variables          | Categories       | N   | Mean  | Score   | Standard deviation | T value | P value |
|--------------------|------------------|-----|-------|---------|--------------------|---------|---------|
| Behavior           | Level of education |     |       |         |                    |         |         |
|                    | Undergraduates   | 263 | 31.84 | 5.38    |                    | 2.20    | 0.687   |
|                    | Postgraduates    | 127 | 30.57 | 5.22    |                    |         |         |
| Gender             | Male             | 94  | 29.54 | 5.39    |                    | -4.05   | <0.001* |
|                    | Female           | 299 | 32.06 | 5.21    |                    |         |         |
| Stream of study    | Science          | 240 | 31.35 | 5.04    |                    | -0.47   | 0.639   |
|                    | Social science   | 153 | 31.61 | 5.83    |                    |         |         |

3.4 The factor associated with behavior of reduction of plastic consumption

There was a significant positive relationship among all variables (environmental knowledge, attitude, SN and PBC) in reducing the use of plastic among UPM students (p < 0.001). Analysis shows that student’s behavioral intention towards plastic consumption was influenced directly by attitude, SN and PBC, whilst environmental knowledge also show stronger positive relationship with attitude (r = 0.569).

Result show PBC have the highest correlation with behavioral intention (r = 0.607), followed by SN (r = 0.391) whilst attitude show very weak relationship (r = 0.184). Study also revealed the moderate relationship between intention (r = 0.479) and PBC (r = 0.403) with actual behavior (Fig. 2.).

![Fig. 2. Path analysis in application of TPB framework in reducing plastic consumption among UPM students](image-url)
3.4.1 Relationship between knowledge and attitude

The relationship between environmental knowledge and attitude among UPM students showed significant positive correlation towards the use of plastic. Environmental knowledge taught in class during a lecture provided extensive information to the students about the consequential effect of the use of plastic towards the environment. Some studies indicated that implementation of knowledge and communication on environmental issues through formal education in university has in some way nurture positive attitude among students to conserve the environment [4,11]. Since environmental knowledge is an additional aspect in TPB framework, its significant relationship with attitude indicated that knowledge can highly influence the student’s attitude in reducing plastic consumption. Future studies might integrate this element to strengthen the predictive value of TPB.

3.4.2 Factors associated with intention to reduce plastic consumption

PBC shows the highest relationship compared to other variables. The outcome of the relationship with PBC establishes as the strongest predictor which substantiated the intention among students in reducing plastic consumption [21]. In addition, some author suggested that PBC is fundamentally related to control belief resulting favorable behaviors among individuals [11].

SN indicated weaker impact with student’s intention in reducing plastic consumption. Previous researches revealed the weaker impact of SN in application of TPB was due to respondents do not demonstrate their exact self-nature [21]. However, the finding contradicted the previous study who reported high relationship between SN and student’s intention towards environmental issues [11].

Study show that attitude was positive associated with behavior intention for plastic consumption [8,16]. However, the strength of relationship was very weak in current study. This denied the notion that attitude is the best predictor of behavior intent as it is more related to behavioral belief and outcome evaluations of behavior among people [3,21].

3.4.3 Factors associated with actual behavior to reduce plastic consumption

The study indicated there were positive relationship between intention and PBC with actual behavior in our study. Previous study revealed that in performing responsible environmental behavior among people, they are highly influenced by their level of confidence to perform behavioral attempt [3]. Therefore, apparently stronger intention together with PBC reflects student’s belief in showing their effort in reducing plastic consumption.

4. Conclusion

In conclusion, study show that TPB is a theory which can be utilized to study the reduction of plastic usage behavior among university students. An effective measures should be applied the findings from current study such as additional attention to male to increase their positive behavior to reduce the use of plastic in campus. This study also provides significant implication in measuring the behavior among UPM students to reduce plastic consumption which encourage their involvement towards sustainable practice in protecting the environment.

References

1. Abramson R. Plastic recycling awareness among students at UC Berkeley. Plastic Recycling Awareness 2008;1-20.
2. Adejoke OC, Mji A, Mukhola MS. Student’s and teacher’s awareness of and attitude towards environmental pollution: a multivariate analysis using biographical variables. Journal of Human Ecology 2014;45(2):167-175.
3. Ajzen I. The theory of planned behavior. Organizational Behaviour and Human Decision Processes 1991;50:179-211.
4. Aminrad Z, Azizi M, Wahab M, Haron R, Nawawi M. Environmental awareness and attitude among Iranian students in Malaysia universities. Environment Asia 2010;3(1):1-10.
5. Ayuba KA, Latifah AM, Abdullah SH, Sulaiman WNA. Current status of municipal solid waste management practice in FCT Abuja. Research Journal of Environmental and Earth Science 2013;5(6):295-304.
6. Hutcherson JD. Community college student’s pro-environmental behaviors and their relationship to awareness of college sustainability strategy implementation. Degree of Doctor of Education thesis 2013. Western Carolina University.
7. Jannah M, Halim L, Meera TSM, Fairuz M. Impact of environmental education kit on student’s environmental literacy. Asian Social Science 2013;9(12):1-12.
8. Karim Ghani WAWA, Rusli IF, Awang Biak DR, Idris A. An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. *Waste Management* 2013;33:1276-1281.

9. Kollmuss A, Agyeman J. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 2002;8(3):240-259.

10. Krejcie RV, Morgan DW. Determining sample size for research activities. *Educational and Psychological Measurement* 1970;30:607-610.

11. Kumar B. Theory of planned behaviour approach to understand the purchasing behaviour for environmentally sustainable products. Doctoral thesis 2012. Indian Institute of Management, Ahmedabad.

12. National Solid Waste Management Department of Malaysia. 2005. Retrieved on 10th May 2014 from http://www.kpkt.gov.my/jpspn_en_2013/main.php?Content=articles&ArticleID=43&IID.

13. Pakpour AH, Zeidi IM, Emamjomeh MM, Asedzadeh S, Pearson H. Household waste behaviours among a community sample in Iran: an application of the theory of planned behavior. *Waste Management* 2014;34:980-986.

14. Samah MAA, Abd Manaf L, Ahsan A, Sulaiman WNA, Agamuthu P, D'Silva, JL. Household solid waste composition in Balakong City, Malaysia: trend and management. *Journal of Environmental Studies* 2013;22(6):1807-1816.

15. Tesfay G. Assessment of differences on students' awareness and attitude towards deforestation and soil erosion in Shire area high schools. Degree of Master of Education thesis 2011. Addis Ababa University.

16. Tih S, Zainol Z. Minimizing waste and encouraging green practices. *Journal of Economic Malaysia* 2012;46(1):157-164.

17. Tonglet M, Phillips PS, Read AD. Using the theory of planned behaviour to investigate the determinants of recycling behaviour: a case study from Brixworth, UK. *Resources, Conservation and Recycling* 2004;41:191-214.

18. Truong Y. An evaluation of the theory of planned behaviour in consumer acceptance of online video and television services. *Electronic Journal Information Systems Evaluation* 2009;12(2):177-186.

19. Vicente-Molina MA, Fernández-Sáinz A, Izagirre-Olaizola J. Environmental knowledge and other variables affecting pro-environmental behaviour: comparison of university students from emerging and advanced countries. *Journal of Cleaner Production* 2013;61:130-138.

20. Wang P, Liu Q, Qi Y. Factor's influencing sustainable consumption behaviors: a survey of the rural residents in China. *Journal of Cleaner Production* 2014;63:152-165.

21. White KM, Smith JK, Terry DJ, Greenslade JH, McKimmie BM. Social influence in the theory of planned behavior: the role of descriptive, injunctive, and ingroup norms. *British Journal of Social Psychology* 2009;48(1):135-158.

22. Zakaria SZS, Ibrahim Z. Environment and social science perspectives in Malaysia. *Akademika* 2009;76:43-66.