

Pro-Environmental Behavior Model among University Students

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Abstract. Environmental behavior is essential for maintaining environmental quality and human life. According to the rational perspective from Theory of Planned Behavior (TPB), belief, personal norm, and perceived behavioral control (PBC) affect actions through behavioral intention. In the past two decades, TPB has become the most extensively discussed concept in explaining pro-environmental behavior (PEB) but still needs re-examination in the Indonesian context. Therefore, this research aimed to investigate how subjective norm (SN), attitude (ATT) towards PEB, and PBC influenced PEB through pro-environmental behavior intention (PEBI). An explanatory quantitative method was used including 264 students from Malang State University with the data analysis conducted and structural equation modeling path analysis. The results showed that attitude, SN, and PBC significantly and positively influenced PEB, primarily through behavior intention.

Keywords: Pro-environmental behavior intention, attitude, subjective norm, perceived behavioral control

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Introduction

The development of environmental behavior is crucial in maintaining the quality of life for humans and other creatures on Earth (Bronfman et al., 2015). As an essential part of society, university students also play a significant role in fostering pro-environmental behavior (PEB). This recognition has prompted many universities to focus on enhancing the behavior of students (Janmaimool & Khajohnmanee, 2019). Therefore, understanding the factors that influence PEB is necessary, particularly in waste management among university students. Differing opinions also exist on the factors influencing PEB, specifically between rational and moral perspectives.

The rational perspective of Theory of Planned Behavior (TPB) by Ajzen (2005) explained that PEB was influenced by attitude (ATT), personal norm, and the perception of control through behavioral intentions. However, Nicolai et al. (2022) argued that the strongest predictor of environmentally friendly behavior was moral decision orientation. The moral perspective from the theory of norm activation posits that personal norm activates individuals to accept the consequences and responsibility of behavior (Schwartz, 1977). Savari et

al. (2023) examined the integrated normative and rational model by combining norm activation concept with TPB, providing insights into prosocial and egocentric motivations for pro-environmental behavior intention (PEBI) among farmers. This model explained 77% of the total variance, expressing a strong explanatory power. A different perspective from Irawan et al. (2022) concluded that there was an interactive effect of cultural values such as collectivism, femininity, uncertainty avoidance, and future orientation on PEB in Indonesia.

Relevant publications from Bentler et al. (2023) examined the relationship between attitude, intention, and PEB using an experimental research design, different from the survey-based research. Miller et al. (2022) further suggested that environmental attitude was stronger predictor of PEB compared to efficacy, both globally and in the eleven countries surveyed including Indonesia. The publications found minimal or absent effects of environmental efficacy as a moderating factor. Research by Friska and Novianty (2023) regarding PEB among Indonesian students did not place intention as a mediator between attitude and behavior. Siregar et al. (2022) did not explore how

behavioral intention affected PEB but concluded that strengthening the locus of control was essential. The publication found that attitude toward PEB did not significantly mediate between the locus of control and PEB of students. [Rahmawati et al. \(2023\)](#) further found that waste sorting was influenced by attitude, norm, perceived control, moral obligations, and facility support but did not explore the direct impact of behavioral intention on pro-environmental actions.

The publication applied TPB to investigate PEB among students in Malang, a relatively underexplored context. It offers fresh insights into the social-psychological factors affecting PEB, emphasizing the significance of fostering behavioral intentions and the underlying influencers. The publication also underscores strategies to promote PEB among university students.

TPB further provides a structured framework for understanding the cognitive factors influencing individuals' intentions and behaviors toward the environment. The theory's limitation lies in the inability to fully consider non-cognitive factors such as emotions and strong social influences. However, various research adopts TPB due to the relevance, ease of use, predictive capability, and flexibility in development to incorporate additional factors relevant to specific contexts. This emphasizes the gap that needs to be examined on how the rational view of TPB can explain PEB in university students. The logical reasoning perspective of TPB has been established in elucidating PEB, the applicability requires re-evaluation in the specific context of Indonesian students. Significantly, empirical evidence suggests

that 17% of students in Malang show low levels of environmental concern ([Rahmawati et al., 2020](#)).

Attitude towards the environment represents the perception of the relationship between humans and the environment. A positive attitude can determine how certain behaviors negatively impact the environment ([Janmaimool & Khajohnmanee, 2019](#)). Additionally, subjective norm (SN) contributes to PEB by influencing an individual's intentions to act sensitively toward the environment. Environmental concern and awareness of the negative impacts can lead to more pro-environmental SN and high values ([Onel, 2017](#)).

Perceived behavioral control (PBC) is another variable currently being investigated for predicting pro-environmental conduct. It reflects how easy or difficult an individual perceives performing a behavior to be ([Ajzen, 1991](#)). Several publications suggest that potential determinants of behavioral intention can include attitude and PBC ([Lin et al., 2021](#)). Attitude and SN show a positive effect on behavioral intention, further confirming that attitude is a key factor ([Chin et al., 2018](#)).

Attitude (agreement or disagreement with an action), SN (expectations of others), and PBC (evaluation of ability) are three variables predicting behavioral intentions ([Gatersleben et al. 2014](#)). Statistical significance exists in attitude and perceived control, correlating with 79% of the deviation in behavioral intentions ([Yuriev et al., 2020](#)).

In other relevant research, analysis of SN, attitude, and PBC significantly impacts environmentally friendly behavioral intentions and actual behaviors. Specifically, the intention to select environmentally

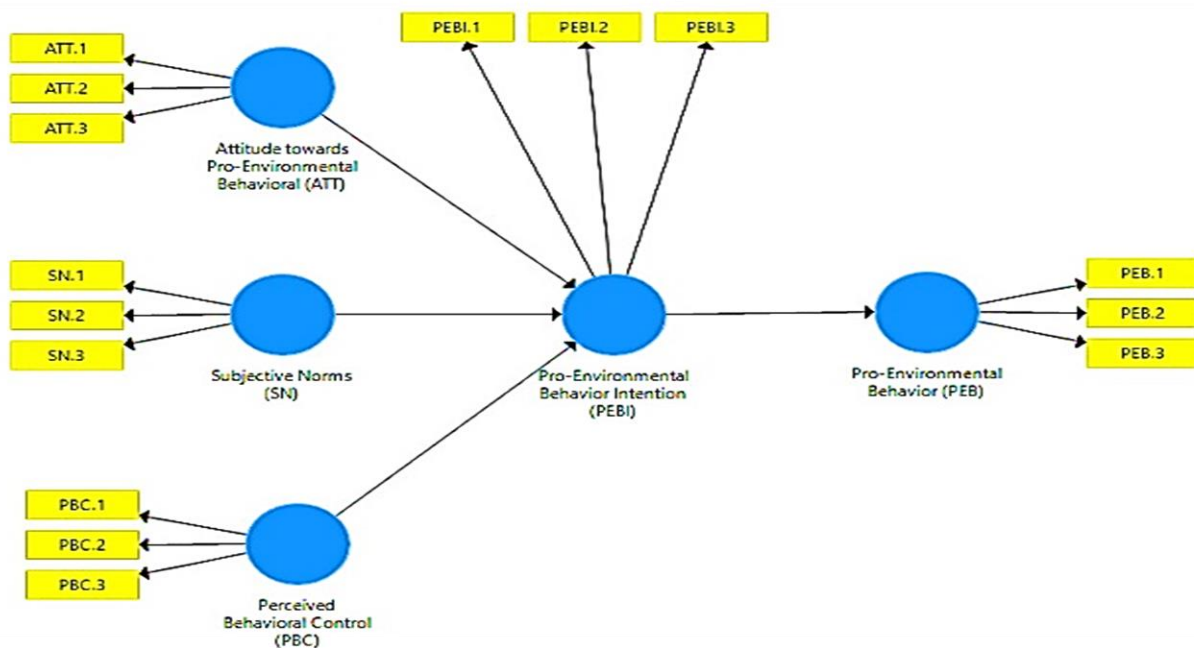


Figure 1. Research Objective

friendly food packaging accounts for 36% of PEB as an actual form of action (Dalila et al., 2020).

Recent publications by De Gregorio et al. (2022) emphasized responsible marine environmental behavior and the complex interconnection among attitude, perceived ability to act, and environmentally responsible behavior in the context of marine resources. Sugiarto et al. (2022) also explored the impact of employees' education levels and pro-environmental intentions on behavior. However, Sturm and Kasari (2023) underscored the importance of evidence-based interventions in environmentally friendly behavior in an educational context. Sulaeman et al. (2023) further contributed to the understanding of factors influencing PEB among students through the research on the behavior and values of prospective science teachers.

Haryono (2021) examined Generation Z's environmental knowledge, attitude, and PEB resonated with the influence of SN and attitude. Finally, Wijaya and Kokchang (2023) emphasized environmentally friendly conduct exhibited by Generation Z in Jakarta's energy transition correlating with the exploration of personal norm, attitude, and perceived control as influential factors in shaping environmental behavior. Based on previous publications, this research aimed to investigate how SN, Attitude (ATT) Towards PEB, and PBC influenced PEB through PEBI.

Methods

This research adopted a rigorous quantitative correlational method to investigate the relationships among the variables. The characteristics of students were identified in the age range of 20-24 years, comprising both males and females actively enrolled in the first, second, or third year of undergraduate academic. Students originated from diverse academic backgrounds across eight faculties including engineering, literature, psychology, economics and business, education, social sciences, mathematics and natural sciences, as well as health and sport sciences.

The sample of 264 students was obtained through cluster random sampling by dividing the population into groups or "clusters" based on similar characteristics with several of these clusters randomly selected. Furthermore, all students in the selected clusters were included in the research sample. This method ensured that each cluster had an equal chance of being selected, representing the total population. The sampling method included students from the eight faculties as the population. Each faculty was divided into three academic years namely the first, second, and third. Subsequently, a draw was conducted for each academic year with the class names written on pieces of paper. A piece of paper was randomly selected from

each academic year and the class name written on the obtained paper became the sample or subject of the research. Cluster random sampling allowed a good representation of the population with efficient costs and time.

Ethical approval was further obtained from the Faculty of Psychology's Ethics Committee at Universitas Negeri Malang with reference number: 5.6.17/UN32.8.1/LT/2023. This suggested that this research experienced evaluation to ensure compliance with ethical standards.

Instruments

The research scale's validity and reliability test results suggested that the scales were fit for data collection based on Confirmatory Factor Analysis (CFA) outcomes. The following instruments were used in ascertaining the influence of the variables.

Pro-Environmental Behavior (PEB) Scale

The scale was based on the theory proposed by Kaiser et al. (2003) which emphasized the actions of individuals aimed at protecting the health and quality of the environment. This protection included actions such as waste management, recycling, and reuse behaviors.

Pro-Environmental Behavior Intention (PEBI) Scale

Constructed on Ajzen's (2005) TPB, the scale described behavioral intention as an individual's tendency to engage in specific behaviors. In this research, the focus was placed on PEBI which was defined as the intent to engage in actions contributing to environmental protection efforts. These actions included the intentions regarding waste management, recycling, and reuse behaviors.

Attitude (ATT) Towards Pro-Environmental Behavior Scale

The scale was formulated on Ajzen's (2005) definitions, characterizing attitude towards PEB as an individual's cognitive and affective assessments of actions aimed at preserving the environment. Examples of these cognitive actions included waste management, recycling, and reuse behaviors.

Subjective Norm (SN)

Based on Ajzen (2005), this scale defined SN as perceptions of expectations from close others regarding waste management, recycling, and reuse behaviors. The expectations were also evident in the conservation and other environmentally friendly decisions.

Perceived Behavioral Control (PBC)

Constructed on Ajzen's (2005) definitions, PBC was characterized by beliefs about the presence or absence of factors facilitating or hindering behavior. In this research, behavior referred to a series of actions in

managing waste, such as segregation, recycling, and reuse.

The mentioned five scales used four options in ascertaining the influence namely very inappropriate denoting 1 score, inappropriate signifying 2 scores, appropriate representing 3 scores, and very appropriate suggesting 4 scores with three items each. *The sample items included the following examples.*

Garbage has been consistently recycled in the environment. (PEB 2)

Engaging in recycling is considered a matter of personal awareness. (ATT 2)

In table 1, the latent construct predicted indicators in the designated block more effectively than elements in different blocks. Based on the factor analysis results where factor loadings were greater than .7 and average variance error (AVE) cut-off exceeded .5, all items on the total scales were considered valid (Ghozali & Latan, 2015).

The outer part of the model tests composite reliability, evaluating the reliability values between the indicator blocks of the constructs. According to Ghozali and Latan (2015), composite reliability (CR) value with a minimum of .70 was generally considered satisfactory. Therefore, the commonly accepted minimum standard for CR value was .70. Based on table 2, the established criteria were met which suggested good reliability for ATT, PBC, SN, PEBI, and PEB.

Data Analysis

In assessing the theories and the model's applicability, a structural equation model analysis was performed using Partial Least Square (PLS). This analysis helped determine the relationships between the latent constructs and the indicators, ensuring the model's robustness and validity.

Table 1
Discriminant Validity Test (cross-loading)

AVE	ITEM	ATT	PBC	PEB	PEBI	SN
.744	ATT.1	.815	.070	.247	.424	.163
	ATT.2	.877	.176	.247	.435	.184
	ATT.3	.894	.149	.234	.405	.078
.758	PBC.1	.155	.893	.199	.214	.404
	PBC.2	.176	.909	.192	.238	.338
	PBC.3	.063	.806	.080	.211	.327
.791	PEB.1	.227	.209	.894	.346	.142
	PEB.2	.266	.168	.899	.401	.056
	PEB.3	.257	.110	.875	.361	.196
.795	PEBI.1	.401	.182	.337	.889	.192
	PEBI.2	.470	.247	.412	.897	.248
	PEBI.3	.433	.246	.359	.888	.239
.790	SN.1	.131	.386	.144	.212	.884
	SN.2	.110	.354	.095	.214	.890
	SN.3	.192	.351	.144	.252	.893

Table 2
Composite Reliability

Factor	Composite Reliability
ATT	.897
PBC	.903
PEB	.919
PEBI	.921
SN	.918

Results and Discussion

The result of the data analysis depicted in figure 2, tables 3 and 4, showed that the proposed model of PEB among university students correlated with the data. This correlation suggested that students' attitude, the influence of important individuals, and the perceived control significantly contributed to pro-environmental actions.

Table 4 presented R-square value of .174 for PEB variable. This suggested that 17.4% of PEB was influenced by ATT, PBC, SN, and PEBI, while the remaining 82.6% was influenced by other factors. R-square value of PEBI variable was .286 signifying that 28.6% of the components were influenced by ATT, PBC, and SN, then 71.4% were influenced by other factors. The variables ATT, PBC, and SN were exogenous elements affecting the endogenous factors which was the cause of not having an R-square value.

In this research, the Q-square value generated in the full model equation was 40.99%. This implied that the structural model had a fairly good predictive context and was feasible for forecasting environmentally friendly actions as suggested by the planned behavior theory.

PEBI was observed to be a variable closely related to PEB. All predictors from TPB influenced PEB through PEBI. This suggested a unanimous intention and plan to sort waste, recycle, and reuse items, supported by SN, attitude, and PBC of the individual.

A limitation of this research pertained to the restricted focus on PEB of students in a single campus located in a city, with a sample size of 264 participants. The limited scope did not adequately reflect the broader populace, impeding the generalizability of the outcomes beyond the specific campus and urban setting. Consequently, this constrains the broader applicability of the research outcomes.

An understanding of this model of PEB could be developed from TPB which explained the gap between behavior and attitude by providing a bridge of "intentions". Behavioral intentions were directly related to behavior and the assumption that PBC was also associated with the intentions remained acceptable in the structure of the model. The attitude towards behavior was a function of behavioral beliefs, representing the perception that carrying out a behavior would produce certain consequences.

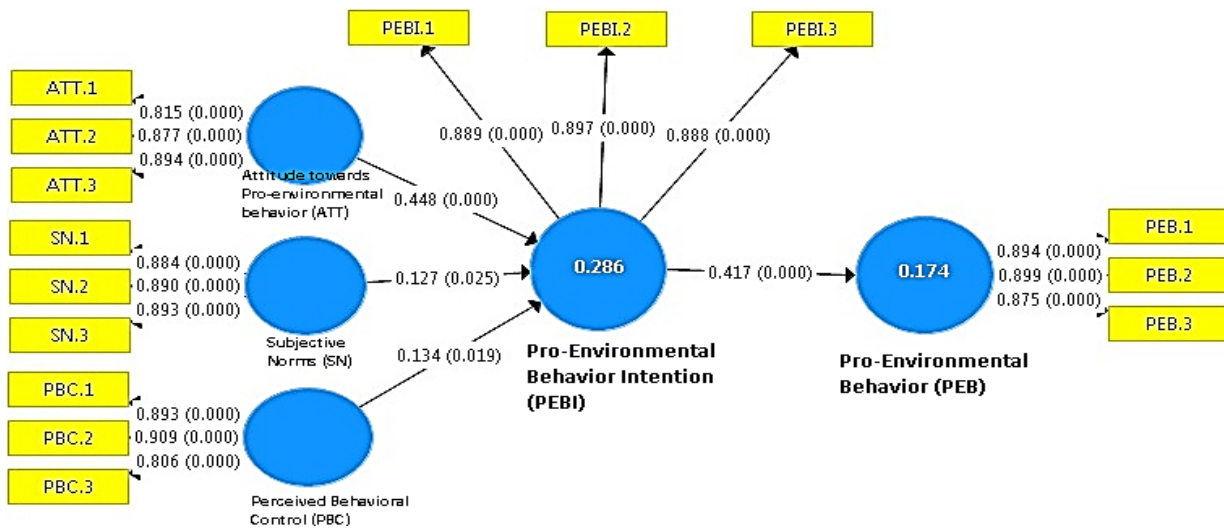


Figure 2. Results of Structural Model Analysis

Table 3

Results of Path Analysis on the Proposed Structural Model

Direct effect	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	t-Statistics (O/STDEV)	p-value
ATT -> PEBI	.448	.450	.044	10.291	.000
PBC -> PEBI	.134	.135	.057	2.347	.019
PEBI -> PEB	.417	.419	.050	8.268	.000
SN -> PEBI	.127	.126	.057	2.242	.025
Specific indirect effect	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	p-value
ATT -> PEBI -> PEB	.187	.189	.030	6.182	.000
PBC -> PEBI -> PEB	.056	.057	.025	2.230	.026
SN -> PEBI -> PEB	.053	.053	.026	2.043	.042

Table 4

Value of the Coefficient of Determinant

Construct	R2	Q2
PEB (Pro-Environmental Behavior)	0.174	40.99%
PEBI (Pro-Environmental Behavior Intention)	0.286	

Structural model analysis

Pro-Environmental Behavior (PEB)

PEB 1: Waste Management

PEB 2: Recycle

PEB 3: Reuse

Pro-Environmental Behavior Intention (PEBI)

PEBI 1: Sorting trash.

PEBI 2: Planning to recycle in the future.

PEBI 3: Trying to reuse items that can be used.

Attitude Towards Pro-Environmental Behavior (ATT)

ATT 1: Values sorting trash due to the positive impact.

ATT 2: Prefers cycling over using motorized vehicles for the improved feeling provided.

ATT 3: Enjoys reusing food containers and packaging repeatedly.

Subjective Norm (SN)

SN 1: An influential individual motivates sorting waste.

SN 2: Significant individuals promote recycling.

SN 3: A key individual models the practice of reusing containers.

Perceived Behavioral Control (PBC)

PBC 1: Believes in possessing the resources, time, ability, and opportunity to categorize waste.

PBC 2: Feels equipped with the necessary resources for recycling.

PBC 3: Exhibits confidence and trust in the ability to reuse containers and other items effectively.

SN was further used as predictors in TPB, stating that subjective standards originated from normative views representing judgments of important others' preferences concerning the behavior to be performed (Ajzen, 1991). The term "subjective norm" described the feelings about the influence of society on either or not to engage in a specific action.

SN reaffirmed the influence on others' judgments about behavior and how individuals perceived the effect. It further provided an overview of the possibility of individuals behaving in accordance with social

expectations to exhibit environmentally conscious behavior. This was consistent with the investigations of Stikvoort and Juslin (2022), showing that individuals were more inclined to act sustainably when under social pressure. The publication emphasized the potential effectiveness of interventions using positive pro-environmental SN to stimulate environmentally friendly behaviors.

PBC was observed through the concept of planned behavior which relied on control beliefs. This variable represented an individual's self-perception of confidence in the abilities and resources to manage factors supporting or complicating behavior implementation (control belief strength). The research correlated with previous publications, suggesting that motivating positive attitude, social impact, and PBC toward renewable power technology could increase purchase intentions. It eventually translated into renewable energy technology adoption behavior (Gangakhedkar & Karthik, 2022).

Previous publications on altruistic behavior included systematic review and meta-analysis in Iran, contributing to knowledge about TPB by providing empirical evidence and examining factors affecting environmental behavior in Ajzen's theoretical framework (Karami et al., 2021). The outcomes of meta-analysis by van Valkengoed et al. (2022) also explained PEB using determinants from TPB.

According to Sugiarto et al. (2022), a favorable connection was observed between the desire to engage in environmental preservation action and the actual conduct. This suggested that a higher interest in pro-environmental activities led to an increased probability of individuals adopting and practicing environmentally friendly behaviors at work. The publication by Desnita et al. (2023) stated that environmental behavior intention was mediated between knowledge of environmental physics and environmentally friendly behavior in the Indonesian context. Therefore, these results correlated with previous Indonesian research, reinforcing TPB.

TPB mentioned above remained highly relevant for further publications as the theory was actively developed across diverse fields of psychology and other scientific disciplines. This theory had significant potential to provide contextual explanations about PEB in waste management among students in Indonesia. The model of PEB was based on rational considerations in making decisions. Therefore, the factors of beliefs, subjective standards, and PBC played roles in explaining PEBI. These three factors influenced individuals' behavioral intentions which served as the main determinant of the behavior (Ajzen, 2005). Using PEBI concerning waste management, recycling, and reuse, the results showed a substantial direct relationship between attitude, SN, and PBC. This

suggested that individuals with strong intentions to behave sustainably were more inclined to follow through with the behavior (van Valkengoed et al., 2022). Consequently, interventions targeting individuals' intent to participate in pro-environmental actions may effectively promote actual behavior change. The results validated the publication by Dinurrohmah et al. (2022), suggesting that the rational framework effectively accounted for PEB among students.

Conclusion

In conclusion, individuals performed a certain behavior when perceiving a strong intention to act. This intention was strengthened by positive evaluations of the behavior, social pressure from influential individuals, and increased confidence in the ability and opportunity to act. Furthermore, the dynamics of TPB dynamics which explained PEB were observed in Figure 2. Understanding the model explaining the determinants of altruistic behavior was essential, based on research correlating various theoretical perspectives on PEB with TPB.

The research provided insights into how SN, attitude, and PBC influenced individuals' environmental care behaviors through the intentions to care for the environment. The results were expected to provide a solid basis for constructing a pro-environmental conduct model. Additionally, the research had the potential to strengthen the factors influencing PEB in Indonesian students, which was beneficial for stakeholders and environmental practitioners.

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