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E-B Environment - Behaviour Proceedings Journal

AicE-Bs2025London

e-IPH e-International Publishing House Ltd., United Kingdom

https://www.amerabra.org/

13th Asia-Pacific International Conference on Environment-Behaviour Studies
University of Westminster, London, UK, 29-31 Aug 2025

Influence of Self-Efficacy, Environmental Attitude, and Knowledge on Behaviour among University Students: Evidence from SEGi University, Malaysia

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Abstract
This study explores the direct effects of environmental self-efficacy, environmental attitude, and environmental knowledge on environmental behaviour among SEGi University undergraduates in Malaysia. Using a quantitative approach, 312 valid responses were analyzed through PLS-SEM. Results show all three factors significantly and positively influence students' pro-environmental behaviour. The study confirms the applicability of Social Cognitive Theory. It emphasizes the need for universities to enhance environmental education by promoting self-efficacy, positive attitudes, and sustainability values, thereby cultivating environmentally responsible individuals who contribute to long-term global sustainability goals.

Keywords: Self-Efficacy; Environmental Attitude;Environmental Knowledge;Environmental Behaviour

DOI:

1.0 Introduction

Over the past few decades, escalating environmental problems—ranging from climate shifts and pollution to the loss of biodiversity and dwindling natural reserves—have emerged as critical global concerns. These ecological crises have threatened planetary health and posed significant risks to human well-being and sustainable development(Nepras et al., 2023). As a result, promoting environmentally responsible behaviour has become an essential strategy for addressing these global concerns and ensuring a sustainable future.
As future leaders, professionals, and decision-makers, university students play a pivotal role in the transition toward a more environmentally conscious society. Their attitudes, knowledge, and behaviours concerning environmental issues affect their lifestyles and have a far-reaching influence on the norms and practices adopted within wider

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DOI:

communities. Cultivating environmental behaviour among university students is thus a critical priority for both educational institutions and policy-makers aiming to foster sustainable development.

Despite growing awareness of environmental issues, there remains a gap between environmental concerns and actual behavioural practices. This gap highlights the need to explore the underlying psychological and cognitive factors that drive environmental behaviour. Among these, environmental self-efficacy, environmental attitude, and environmental knowledge have been identified as key determinants. An individual's confidence in their capacity to carry out environmentally beneficial actions is known as environmental self-efficacy. Environmental attitude reflects one's overall evaluation and emotional stance toward environmental protection. Awareness and insight into environmental concerns and corresponding remedies are key components of environmental knowledge.

Grounded in Bandura's SCT, which emphasises the interaction between personal, behavioural, and environmental influences, this study investigates how these three constructs affect environmental behaviour among university students. By focusing on undergraduates at SEGi University in Malaysia, the research provides a context-specific analysis of how these psychological variables interact to influence pro-environmental actions.

This study adopts a quantitative methodology using PLS-SEM to empirically test the relationships among the variables. The findings contribute to both theory and practice by enhancing the understanding of motivational factors behind students' environmental behaviour and offering actionable recommendations for environmental education and engagement strategies within higher education institutions.

2.0 Literature review

2.1 Environmental Behaviour

As global environmental issues become increasingly severe, EB has become a central topic in environmental psychology and sustainable development research. Scholars have approached the definition and scope of ecological behaviour from multiple theoretical perspectives. Broadly, EB can be understood as purposeful practices undertaken by individuals or communities to mitigate environmental harm caused by anthropogenic activities, improve ecological conditions, or promote sustainable development (Sawitri et al., 2015). These behaviours encompass not only private-sphere actions such as energy conservation, waste sorting, and the use of eco-friendly products but also public-sphere engagement such as participating in environmental organisations or advocating for environmental policy (Homburg & Stolberg, 2006). This definition emphasises the intentionality and constructive nature of such behaviours, highlighting their goal of enhancing environmental quality and reducing ecological harm.

2.2 Environmental Self-Efficacy

ESE reflects an individual's confidence in their capacity to perform actions that contribute positively to the environment. Building upon Bandura's (1997) Social Cognitive Theory, Moeller and Stahlmann (2019) describe ESE as a context-specific type of self-efficacy, which refers to one's perception of being capable of generating positive environmental outcomes through their behaviour." This construct encompasses not only the perceived ability to perform pro-environmental behaviours (PEB) but also the confidence to overcome psychological barriers such as conflicting personal goals, insufficient knowledge, or the belief that individual actions are inconsequential (Lacroix et al., 2019).

Similarly, Ojedokun and Balogun (2010) describe environmental self-efficacy as individuals' perceived competence and effectiveness in executing environmentally responsible behaviours. This includes the belief that one has the necessary knowledge and skills to act in alignment with one's environmental values and attitudes.

Prior research further suggests that self-efficacy significantly influences not only individuals' choice to engage in environmental actions but also their persistence in sustaining such behaviours despite obstacles. Individuals with high ESE are thus more likely to view themselves as capable agents of environmental change and demonstrate a greater tendency to engage in responsible environmental behaviours, such as waste reduction, recycling, and environmental advocacy.

2.3 Environmental Attitude

EA has been widely studied across disciplines, including psychology, management, education, and environmental science, yet there is no singularly agreed-upon definition. Generally, EA is conceptualized as a combination of beliefs, affective responses, and behavioural intentions toward the natural environment and environmentally relevant issues (DeVille et al., 2021).

Ajzen's (1991) Theory of Planned Behaviour offers a key theoretical basis, suggesting that attitude reflects how positively or negatively an individual assesses a specific behaviour. Within this framework, a positive EA reflects a subjective disposition that favours environmental protection, grounded in thoughts and emotions about the environment (Cosma et al., 2021).

More specifically, EA encompasses a variety of constructs such as ecological beliefs, biocentric values, connectedness to nature, and willingness to engage in EB (DeVille et al., 2021). These constructs reflect an individual's orientation towards the environment and serve as precursors to EB. Research indicates that individuals who spend more time in nature tend to exhibit stronger EA, often mediated by feelings of connectedness and appreciation for natural settings.

2.4 Environmental Knowledge

EK is widely regarded as a foundational component in shaping individuals'environmental behaviours. It is typically conceptualized as a multidimensional construct encompassing awareness, understanding, and cognitive competencies related to environmental systems and issues.

EK, as explained by Liu et al. (2020), encompasses an individual's awareness of environmental problems and their grasp of essential facts, principles, and ecological relationships within major natural systems."This definition emphasizes a cognitive dimension, covering not only knowledge of environmental problems but also their causes, consequences, and potential solutions. The authors further categorize EK into general daily knowledge (e.g., causes of pollution) and general professional knowledge (e.g., ecological relationships), highlighting its relevance for both laypersons and experts.

Moreover, the role of EK is not limited to direct behavioural outcomes. Instead, it often operates through mediating and moderating pathways. For instance, Liu et al. (2020) argue that EK by itself may not necessarily result in environmentally responsible behaviour. Rather, it exerts its influence indirectly by shaping environmental attitudes and behavioural intentions, which in turn drive environmentally responsible actions. This supports the notion that while knowledge is necessary, it must activate affective and motivational systems to be effective.

2.5 Environmental Self-Efficacy and Environmental Behaviour

Evidence from empirical studies consistently indicates that ESE is closely related to the likelihood of engaging in EB. Miller et al. (2022) reported that environmental self-efficacy significantly predicts pro-environmental actions across diverse cultural contexts in 11 countries, underscoring its global applicability. Environmental self-efficacy empowers individuals by increasing their confidence to overcome challenges and reinforcing their belief that their actions can lead to meaningful environmental outcomes (Lacroix et al., 2019).

Furthermore, evidence suggests that environmental self-efficacy functions as a critical mediator between environmental education and behavioural outcomes (Zhang & Cao, 2025). This highlights the importance of developing efficacy beliefs to maximise the effectiveness of educational programs. The role of self-efficacy is particularly important for university students, who are considered a key population in advancing environmental sustainability (Vrselja & Pandžić, 2024). Unlike general self-efficacy, environmental self-efficacy is domain-specific and directly reflects individuals' perceived ability to engage in environmental behaviours, making it a more accurate predictor of such actions (Ojedokun & Balogun, 2010). Additionally, longitudinal studies have shown that individuals with higher ESE are not only more likely to adopt EB but also to maintain them over time (Bandura, 2006). As such, we developed the following hypotheses:

H1: ESE has a positive and significant effect on EB among university students.

2.6 Environmental Attitude and Environmental Behaviour

It has been widely observed in empirical research that individuals with strong ecological values are more inclined to adopt environmentally friendly actions, such as recycling, energy conservation, and responsible consumption. For example, Miller et al. (2022) conducted a cross-national study, finding that EA was a strong and consistent predictor of EB in 11 different nations. Similarly, Chan (1996) reported a high positive correlation (r=0.52) between environmental attitudes and behavioural intentions among secondary school students in Hong Kong.

In their study on ecotourism in China, Zheng et al. (2018) validated a strong positive link between EA and environmentally friendly behaviours. Their findings also emphasized the important mediating function of EA in the relationship between EK and behavioural intention. Hurst et al. (2013) also provided additional support, showing that individuals with stronger altruistic and universalistic values (which are closely tied to EA) are more likely to engage in environmentally responsible actions. Therefore, we developed the following hypothesis:

H2: EA has a positive and significant effect on EB among university students.

2.7 Environmental Knowledge and Environmental Behaviour

Vicente-Molina et al. (2013) found that both subjective and objective EK significantly influenced students' EB such as recycling and green purchasing, particularly when coupled with motivational factors and perceived behavioural effectiveness.

Similarly, Sousa et al. (2021) observed that students with higher EK reported more environmentally responsible actions, particularly in areas like energy conservation and recycling, although the authors also highlighted the mediating role of attitudes and the institutional context.

In the context of developing countries, Amoah and Addoah (2021) provided robust evidence that EK significantly predicts household EB in Ghana. They further noted that such knowledge interacts with socioeconomic conditions to either facilitate or hinder environmentally responsible actions.

However, some studies have challenged the direct linearity of this relationship. Tamar et al. (2021) argued that while knowledge is important, its influence on EB may be moderated by other psychosocial factors such as values, cognitive dissonance, and attitudes. Their moderated mediation analysis indicated that EK alone might not guarantee behavioural change unless aligned with prosocial values and environmental concerns.

While the literature presents some distinctions, it consistently suggests that increased environmental knowledge is associated with a higher likelihood of engaging in environmental behaviour. Consequently, the hypothesis below was proposed:

H3: EK has a positive and significant effect on EB among university students.

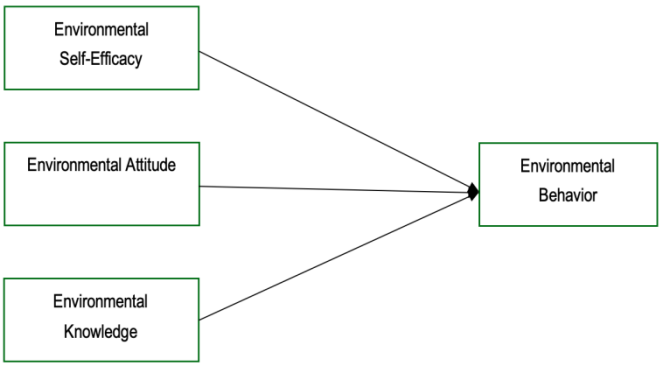

Fig. 1: Research framework

(1)

3.0 Methodology

3.1 Participants and procedure

This research involved participants from SEGi University, Malaysia, who were selected through a simple random sampling strategy, ensuring unbiased selection and contributing to the broader applicability of the findings. A total of 600 questionnaires were distributed using both email invitations and an online QR code linked to the survey platform. The data collection process was conducted over a defined period, ensuring voluntary participation and strict confidentiality of responses.

An effective response rate of 52% was achieved, with 312 valid questionnaires collected out of the 600 distributed. The gender distribution included 173 male and 139 female participants. The majority of participants (63.8%) were aged between 26 and 35 years. In terms of academic level, undergraduate students accounted for 64.7% of the sample, while postgraduate students comprised the remaining 35.3%.

This sampling approach ensured a diverse and representative group of university students, providing a reliable basis for examining the relationships among ESE, EA, EK, and EB within the higher education context.

3.2 Measures

To ensure both reliability and validity, this study utilised modified versions of established measurement scales drawn from prior research. All questionnaire items were rated on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Environmental Self-Efficacy (ESE). ESE scale questions were measured using a 10-item scale adapted from Moeller and Stahlmann (2019). The items assessed students' beliefs in their capabilities to undertake environmentally responsible behaviours and overcome

barriers to environmental action. A sample item includes, "I can control my impact on the environment." With a

Cronbach's alpha value of 0.825, the scale met the generally accepted threshold for internal reliability in social science research.

Environmental Attitude (EA). EA was measured with an 8-item scale adapted from Dunlap et al. (2000). This scale reflected students' overall evaluations and emotional responses toward environmental protection and sustainability. An illustrative statement used in the scale is: "Human population growth is nearing the planet's carrying capacity."The reliability of the scale was supported by a Cronbach's alpha score of 0.83.

Environmental Knowledge (EK). A total of 9 items, adapted from Gatersleben, Steg, and Vlek (2002), were used to measure EK. The items captured respondents' awareness and understanding of key environmental issues and solutions. A representative item is, "I am aware of climate change." The reliability of the scale was supported by a Cronbach's alpha coefficient of 0.89, which denotes excellent reliability.

Environmental Behaviour (EB) was assessed using an 8-item instrument adapted from prior studies by Kaiser, Oerke, and Bogner (2007), Robertson and Barling (2013), and Kim et al. (2016). The scale focused on students' self-assessed participation in eco-friendly behaviours in everyday situations. One example item is: "I challenge environmentally harmful practices in my workplace."The scale demonstrated satisfactory reliability, with a Cronbach's alpha of 0.82.

4.0 Findings

4.1 Measurement Model

Environmental Self-Efficacy is measured by 10 indicators (ESE1 – ESE10), with factor loadings ranging from 0.549 to 0.767. Although ESE10 (0.549) is slightly lower, it is still acceptable. The construct's AVE is 0.583, CR is 0.902, and Cronbach's Alpha is 0.878, indicating good internal consistency and convergent validity.

Environmental Attitude includes 8 indicators (EA1 – EA8), with loadings ranging from 0.714 to 0.793. The AVE is 0.571, CR is 0.914, and Cronbach's Alpha is 0.892, all of which exceed the recommended thresholds and demonstrate strong reliability and validity.

Environmental Knowledge consists of 9 indicators (EK1 – EK9), with loadings between 0.748 and 0.814. The AVE is 0.606, CR is 0.933, and Cronbach's Alpha is 0.919. These results suggest excellent construct reliability and convergent validity.

Environmental Behaviour has 8 indicators (EB1 – EB8). All loadings exceed 0.5, with the lowest being EB5 (0.672) and the highest EB3 (0.744). The AVE is 0.513, CR is 0.894, and Cronbach's Alpha is 0.864. Although the AVE is slightly above the threshold, the high CR and Alpha confirm acceptable measurement quality.

All measurement constructs satisfied the required thresholds, with outer loadings exceeding 0.5 (Maria et al., 2019), average variance extracted (AVE) values above 0.5, and composite reliability (CR) surpassing 0.7. Additionally, Cronbach's alpha values were greater than 0.7 (Hair et al., 2021). These findings indicate that the measurement model demonstrates adequate internal consistency and convergent validity, thereby justifying the inclusion of these constructs in the subsequent structural model analysis.

Table 1. Results for the Assessment of Reflective Measurement

Variable	Indicator	Factor Loadings	AVE	CR	Cronbach’s alpha
Environmental Self-Efficacy	ESE1	0.767	0.583	0.902	0.878
	ESE2	0.734			
	ESE3	0.70			
	ESE4	0.723			
	ESE5	0.737			
	ESE6	0.761			
	ESE7	0.722			
	ESE8	0.706			
	ESE9	0.695			
	ESE10	0.549			
Environmental Attitude	EA1	0.725	0.571	0.914	0.892
	EA2	0.768			
	EA3	0.785			
	EA4	0.753			
	EA5	0.724			
	EA6	0.717			
	EA7	0.774			
	EA8	0.793			
Environmental Knowledge	EK1	0.772	0.606	0.933	0.919

	EK2	0.788			
	EK3	0.788			
	EK4	0.748			
	EK5	0.771			
	EK6	0.766			
	EK7	0.793			
	EK8	0.814			
	EK9	0.764			
Environmental Behaviour	EB1	0.722	0.513	0.894	0.864
	EB2	0.737			
	EB3	0.740			
	EB3	0.744			
	EB4	0.707			
	EB5	0.672			
	EB6	0.735			
	EB7	0.725			
	EB8	0.688			

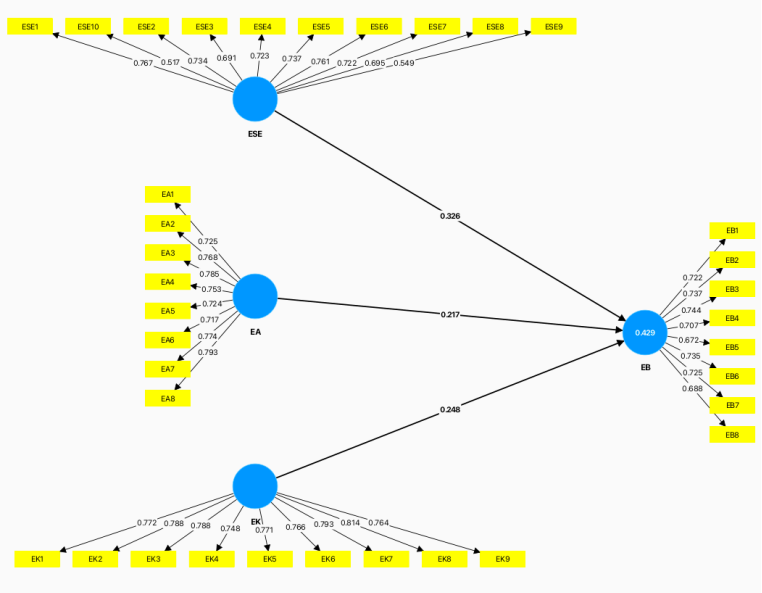

Fig. 2: Measurement Model

Table 2 shows the HTMT values for all construct pairs are below the threshold of 0.85. For example, the HTMT values between ESE and EB are 0.656, between EA and EK, are 0.526, and all others are similarly within acceptable limits.

As shown in Table 3, the Fornell-Larcker criterion was satisfied, with each construct's AVE square root being higher than its highest correlation with any other construct, supporting acceptable discriminant validity (Hair et al., 2021).

Table 2. Discriminant Validity(HTMT)

	EA	EB	EK
EB	0.586		
EK	0.526	0.581	
ESE	0.63	0.656	0.569

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

	EA	EB	EK	ESE
EA	0.755			
EB	0.519	0.717		
EK	0.48	0.52	0.779	
ESE	0.56	0.575	0.512	0.695

4.2 Structural Model

In the structural model assessment stage of this study, multicollinearity among latent variable indicators was examined using the VIF as the criterion for evaluation. The Table 4 results show that all VIF values for the measurement items range from 1.47 to 2.383, which are well below the critical threshold of 5 and do not exceed the recommended limit of 3.0(Hair et al.,2021).

Table 4. Collinearity Statistics

	VIF
EA1	1.784
EA2	1.946
EA3	1.93
EA4	1.826
EA5	1.681
EA6	1.74
EA7	1.944
EA8	2.116
EB1	1.64
EB2	1.731
EB3	1.759
EB4	1.663
EB5	1.475
EB6	1.672
EB7	1.68
EB8	1.541
EK1	2.039
EK2	2.153
EK3	2.105
EK4	1.866
EK5	2.008
EK6	1.918
EK7	2.218
EK8	2.383
EK9	2.006
ESE1	1.974
ESE10	1.68
ESE2	1.794
ESE3	1.836
ESE4	1.838
ESE5	1.857
ESE6	1.97
ESE7	1.758
ESE8	1.783
ESE9	1.766

Based on the results presented in Table 5, the structural model was further evaluated in terms of its explanatory power and predictive relevance using R^2 and Q^2. The R^2 value for Environmental Behaviour (EB) is 0.429, with an adjusted R^2 of 0.424, indicating a moderate level of explanatory power of the independent variables for EB. Additionally, the predictive relevance (Q^2) is 0.411, indicating that the model possesses strong predictive capability. According to Hair et al. (2021), a Q^2 value $>$ 10% indicates predictive relevance, and the value obtained in this study exceeds that threshold, thereby supporting the model' s predictive validity.

Table 5. R^2 and Q^2

	R-square	R-square adjusted	Predictive Relevance Q^2
EB	0.429	0.424	0.411

Based on the results in Table 6, all three independent variables significantly and positively influence EB. EA, EK, and ESE have path coefficients of 0.217, 0.248, and 0.326. Respectively, with T-values above 1.96 and P-values $<$0.01, confirming strong statistical significance(Sanfilippo et al., 2023). Among them, ESE shows the strongest effect. These findings support all proposed hypotheses. All three independent variables have a significant positive impact on environmental behaviour, thus supporting the proposed hypotheses.

Table 6. Hypothesis testing results

	Original sample (O)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
EA -> EB	0.217	0.053	4.095	0
EK -> EB	0.248	0.05	4.986	0
ESE -> EB	0.326	0.051	6.459	0

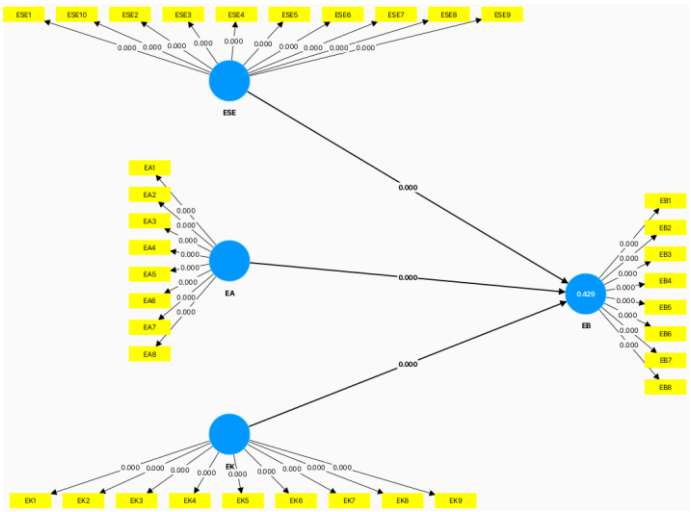

Fig. 3: Structural Model

5.0 Discussion

H1 showed the strongest effect on EB (β =0.326, p<0.01), indicating that students with higher self-efficacy are more likely to engage in sustainable actions. This supports Bandura' s (1997) Social Cognitive Theory and aligns with recent cross-cultural studies emphasizing self-efficacy as a key driver of EB (Miller et al., 2022).
H2 also had a significant positive influence (β =0.217, p<0.01), reinforcing the Theory of Planned Behaviour (Ajzen, 1991). Students with stronger EA to environmental issues tend to adopt greener lifestyles (Cosma et al., 2025).
H3 demonstrated a moderate but significant effect on EB (β =0.248, p<0.01), indicating that students with greater EK are more inclined to engage in EB. This is consistent with the findings of Sousa et al. (2021), who emphasized that EK enhances individuals' cognitive understanding of environmental issues, thereby strengthening their awareness and willingness to act.

6.0 Conclusion& Recommendations

This study concludes that environmental self-efficacy, environmental attitude, and environmental knowledge all have significant and positive effects on university students' environmental behaviour. Among them, self-efficacy demonstrated the strongest influence, highlighting the importance of internal belief and perceived behavioural control. The findings validate the application of Social Cognitive Theory in the context of environmental behaviour and underscore the need to integrate psychological factors into environmental education strategies.
Recommendations:
Enhance self-efficacy through experiential learning, student-led projects, and role modelling to build confidence in personal environmental impact.
Foster positive attitudes by embedding environmental values into curricula, promoting emotional connection to nature, and encouraging reflective thinking.
Improve knowledge with engaging, accessible, and context-specific environmental content that links theory with practical action.
Universities should adopt a holistic approach that combines knowledge, belief, and attitude development to effectively cultivate environmentally responsible future leaders.

Acknowledgements

We would like to extend our heartfelt thanks to AP DR. LIM BOON HOOI for his invaluable support and guidance throughout this process. His assistance has been crucial in advancing our work.

Paper Contribution to Related Field of Study

This paper contributes to the field of environmental psychology and education by empirically validating the influence of environmental self-efficacy, attitude, and knowledge on pro-environmental behaviour among university students.

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