

Revolutionizing Green Minds: Unveiling Environmental Literacy of University Students in Oman

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Abstract

Students need to be environmentally literate to understand the complex interactions between humans and the natural world and how human activity affects ecosystems. The importance of environmental literacy (EL) is growing, and without this understanding, students may have limited career options in sustainability, renewable energy, and conservation. Moreover, lacking EL, students can find it more difficult to contribute to creating eco-friendly technology and regulations. Hence, this study aims to explore the various dimensions of EL among university students in Oman. This study gathered a sample of 238 students from universities in Oman to investigate the multidimensionality of EL. Following that, this study has employed structural equation modeling (SEM-PLS 4.0) software to analyze the collected data. The result showed that the environmental knowledge attributes have a significant relationship with the actual participation in environmental activities. Likewise, the results also confirmed that Interest in environmental activities has a significant relationship with actual participation in environmental activities.

1. Introduction

Environmental theories should be revised to reflect the rapid changes in the world to safeguard natural life. This research aims to update the idea of Environmental literacy (EL) by utilizing a broad perspective of opinions from various countries worldwide. As a result of these updates, educational modifications are required. Environmental education and learning are crucial and can influence people's environmental actions (Zareie et al., 2016). The sparse literature and citations indicate that the field of EA is still in its early stages (Thottoli, 2022a).

Promoting sustainable behavior and environmental protection depends heavily on environmental understanding and interests. According to research, people who are knowledgeable about the environment and demonstrate an interest in environmental issues are more likely to adopt pro-environmental habits and take steps to lessen their adverse effects on the environment. (Tam, 2013; Schultz & Zelezny, 1998).

Additionally, environmental education and interests can encourage more informed decision-making and advocacy for environmental policies at the individual and societal levels. (Suldoovsky, 2016; Kollmuss & Agyeman, 2002). The atmosphere of environmental illiteracy has evolved. Science and other academic fields should emphasize environmental knowledge because it encourages the preservation of the natural world. But over time, the idea of environmental knowledge has changed. In 1969, the idea of EL was first outlined. Then, in 1972, environmental education achieved global recognition with the Stockholm Declaration. Environmental education continued through organized meetings until 1976. The Tbilisi Declaration, which stressed the

prominence of environmental education in preserving the environment, was influenced by the first intergovernmental conference on environmental education that UNESCO hosted in 1977. In the same year, the World Commission for Environment and Development published "Our Common Future" on sustainable development (Kaya & Elster, 2019).

In the 1990s, environmental education also increased in rigor with the goal of producing ecologically literate citizens. Moreover, environmental education programs have been established to nurture and support the development of EL throughout an individual's entire. The Agenda 21 Action Program for Sustainable Development was adopted by more than 178 governments worldwide in 1992. Then, in 1993, the National Project for Excellence in Environmental Education was a piecemeal effort to address the prescribing EL need to address the education reform agenda in the United States (Syahmani et al., 2021). Hence, the members of the International Conference on Environmental Education suggested that environmental education be referred to as Environmental Education and Sustainability in Thessaloniki in 1997. European participants assessed the accomplishments made in Rio de Janeiro between 1992 and 2002 at the World Summit on Sustainable Development in Johannesburg in 2002. They also discussed a new global accord on sustainable development. The Guidelines for Excellence in Environmental Education Project made a set of general and optional guidelines for environmental education accessible to students, homeschoolers, parents, administrators, teachers, policymakers, and the general public in 2000. (2000-2010). Even though parents are the children's first educators and can play a crucial role in promoting their children's possibilities for environmental learning, they encounter several obstacles (Spiteri et al., 2023).

The issue of household waste has been a persistent problem. Waste accumulation and scattering cause unpleasant odors and spread diseases and harm to humans, the environment, and soil through air and water pollution (Suryawati et al., 2020). Environmental waste can harm the environment as well, resulting in the loss of water catchment areas, harm to farms and landscapes, an increase in erosion, river siltation, and salinity, as well as large pools of chemically contaminated water that are harmful to living things (Suryawati et al., 2020). Additionally, the level of social and economic development in the area has recently sparked reactions and concerns worldwide. (Akpafun et al., 2020). However, in Gulf Cooperation Council (GCC) mainly studied the role of crowdfunding (Thottoli, 2022b) and computerized accounting education (Thottoli, 2023), and there is a dearth of studies on EL.

It is possible to reduce the emergence of devastating environmental problems in societies if their citizens can benefit from the development of ecological literacy. Also, suppose we assume that environmentally educated citizens will show more responsible behavior (REB) in protecting the environment, through educational institutions, for example, universities and colleges. In that case, society can enhance the sense of citizenship in several ways. There are many methods, and one of these methods is the use of environmental citizenship as a political goal and sustainability policies and plans. Universities and colleges serve as ideal sustainable models, such as educational laboratories for communities, and provide places where students can develop new habits. Building English learning among students is crucial. This is to address emerging and current environmental challenges and facilitate the transition to a greener society (Veisi et al., 2019).

Hence the research questions are summarized below:

1. How do students' environmental knowledge attributes affect participation in environmental activities?
2. How does the Interest in environmental activities of students affect actual participation in environmental activities?

The basic form of this study is stated in terms of variables such as independent variables, Environmental knowledge attributes, and Interest in environmental activities. Actual participation in environmental activities is considered a dependent variable. Therefore, this study tests the determinants of the EL of undergraduate students. Figure 1 shows the research framework with independent and dependent variables.

2. Literature Review

2.1 The Link Between Environmental Knowledge Attributes and Actual Participation in Environmental Activities

The study focused on how broad environmental information influenced environmental arrogances, behavior intentions, and pro-environmental actions in the larger environmental context. The researchers utilized organizational balance modeling (SEM) with bootstrapping estimates to determine the fundamental environmental knowledge and pro-environmental conduct are related. The environmental expertise did not directly influence pro-environmental behaviors but was a significant proximal variable mediated by environmental attitudes and behavioral intents. Additionally, demographic variables such as gender, urban or rural residence, educational attainment, and region had varying effects on the environmental, behavioral

intentions and pro-environmental actions are correlated, and the moderating effect of external context on this relationship also went in the model (Liu et al., 2020). Hence it is hypothesized that:

H_1 : Environmental knowledge attributes positively affect actual participation in environmental activities.

2.2 The Link Between Interest in Environmental Activities and Actual Participation in Environmental Activities

It argues that the capacity for service innovation mediates the connection between environmental innovation and sustained organizational performance (Fernando et al., 2019).

Customers are increasingly asking for environmentally friendly products and services. Hotel management is working harder than ever to adopt sustainable practices to meet this demand, improve the appearance of their hotels, and create brand equity. (Moise et al., 2019).

The findings revealed that pro-environmental behavior was favorably influenced by environmental obligation, environmental awareness, a green life, and green self-value, adding new information to the existing literature on environmental sustainability (Yusliza et al., 2020).

Hence it is hypothesized that:

H_2 : Interest in environmental activities positively affects actual participation in environmental activities.

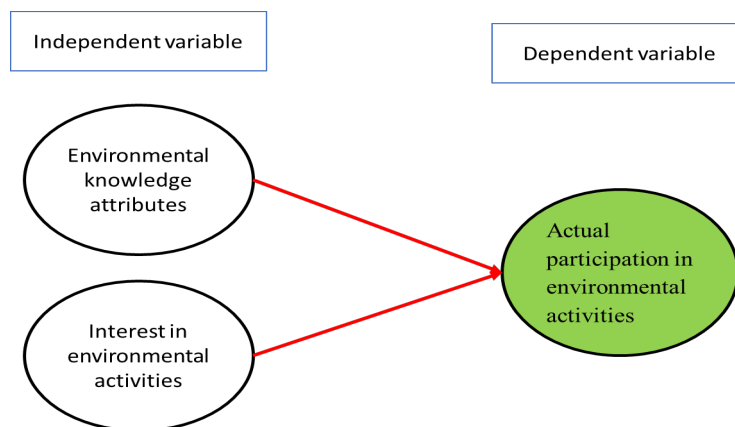


Fig.1 Research framework

3. Methodology

To analyze the data, the researchers employed a methodology that involved utilizing structural equation modeling (SEM) with smoothing estimates. This approach established a causal relationship between environmental information and environmentally friendly behavior. The researchers aimed to determine the dependent variable, the actual participation in environmental activities while considering the independent variables of environmental knowledge and Interest in environmental activities.

The data for this study was collected online using a Google Form questionnaire. The questionnaire was adapted from Owusu et al. (2017). The population of Interest consisted of university and college students residing in Oman, with a sample size of 238 respondents. To analyze and investigate environmental knowledge and interests, the study focused on business students from the University of Nizwa. The researchers utilized a quantitative method and employed the PLS-SEM software to analyze the data, using partial least squares and structural equation modeling techniques.

3.1 Reliability and Validity

Table 1 shows the reliability and validity of the variables. Cronbach's alpha assumes that all indicators have the same level of reliability; it undervalues the internal consistency dependability in PLS-SEM (Nitzl, 2016). Thus, in the context of SEM-PLS, composite dependability provides a more appropriate metric (Bravi et al., 2019). Therefore, a more appropriate way to assess discriminant reliability in SEM-PLS is to use the heterotrait-monotrait ratio of correlations (HTMT), (Table 2), as suggested by Henseler et al. (2015). In the event that the HTMT value exceeds 0.85, for example, discriminant validity is absent. Going forward, interdisciplinary research evaluating discriminant validity must make use of the more dependable HTMT (Nitzl, 2016).

Table 1 Construct reliability and validity

Variables	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AP_EA	0.791	0.812	0.843	0.383
EKA	0.868	0.874	0.897	0.523
IEA	0.825	0.854	0.868	0.487

Table 2 HTMT (Heterotrait-monotrait ratio)

Variables	AP_EA	EKA	IEA
AP_EA			
EKA	0.624		
IEA	0.591	0.769	

The multicollinearity problem in the suggested model has been evaluated by the author by looking at the variance inflation factor (VIF), Table 3, for each link between the independent variables. There is no multicollinearity problem in this study, as evidenced by the results, which demonstrate that the VIF values vary between 1.00 and 2.189, which are far below the cut-off value of 10 (Joseph et al., 1992).

Table 3 VIF (Variance inflation factor)

Variables	VIF	Variables	VIF	Variables	VIF
AP_EA_1	1.213	IEA_1	1.519	EKA_1	1.792
AP_EA_2	1.114	IEA_2	1.942	EKA_2	1.987
AP_EA_3	1.426	IEA_3	1.756	EKA_3	2.165
AP_EA_4	2.162	IEA_4	1.940	EKA_4	2.189
AP_EA_5	2.054	IEA_5	1.633	EKA_5	1.881
AP_EA_6	1.852	IEA_6	1.632	EKA_6	1.507
AP_EA_7	1.564	IEA_7	1.706	EKA_7	2.028
AP_EA_8	1.862			EKA_8	1.644
AP_EA_9	1.345				

4. Analysis and Findings

4.1 Demographic Characteristics

Below, Table 4 shows demographic information.

Table 4 Demographic information

Details	No.	%
Gender		
Male	59	24.79
Female	179	75.21
Total	238	100
Age		
<20	97	40.76

21-40	132	55.46
>40	9	3.781513
Total	238	100
Nationality		
Omani	235	98.74
Non-Omani	3	1.26
Total	238	100
Academic degree		
Accounting	35	14.71
Business administration	37	15.55
Economics	5	2.10
Information system	21	8.82
Other	140	58.82
Total	238	100

4.2 Descriptive Statistics

Table 5 below shows descriptive statistics results and mean value of the dependent variable (Actual participation in environmental activities), as shown in the first item mean, which ranges from 2.647 to 4.094, the median is 4.000, the minimum is 2, the maximum is 5, and the standard deviation ranges from 0.788 to 1.195. Also related to the Environmental knowledge attributes, the mean ranges from 3.774 to 4.230, the median is 4.000, and the standard deviation ranges from 0.800 to 1.164. For Interest in environmental activities, the means range from 3.770 to 3.923, the median is 4.000, and the standard deviation ranges from 0.484 to 1.045.

Table 5 *Descriptive statistics*

Items	Mean	Median	Observed min	Observed max	Standard deviation
AP_EA_1	4.094	4.000	2.000	5.000	0.788
AP_EA_2	3.838	4.000	1.000	5.000	0.949
AP_EA_3	2.796	3.000	1.000	5.000	1.076
AP_EA_4	3.132	3.000	1.000	5.000	1.093
AP_EA_5	3.251	3.000	1.000	5.000	1.040
AP_EA_6	3.574	4.000	1.000	5.000	1.059
AP_EA_7	4.230	4.000	1.000	5.000	0.926
AP_EA_8	2.647	3.000	1.000	5.000	1.195
AP_EA_9	3.906	4.000	1.000	5.000	1.044
EKA_1	3.898	4.000	1.000	5.000	0.971
EKA_2	3.774	4.000	1.000	5.000	0.952
EKA_3	3.932	4.000	1.000	5.000	0.892
EKA_4	4.085	4.000	1.000	5.000	0.800
EKA_5	4.230	4.000	1.000	5.000	0.803
EKA_6	3.455	4.000	1.000	5.000	1.164
EKA_7	3.766	4.000	1.000	5.000	1.019
EKA_8	4.140	4.000	1.000	5.000	0.900
IEA_1	3.762	4.000	1.000	5.000	0.872
IEA_2	3.770	4.000	1.000	5.000	0.958
IEA_3	3.834	4.000	1.000	5.000	1.045
IEA_4	3.923	4.000	1.000	5.000	0.951
IEA_5	3.723	4.000	1.000	4.000	0.629

IEA_6	3.817	4.000	1.000	4.000	0.484
IEA_7	3.787	4.000	1.000	4.000	0.603

4.3 Discriminant Validity Construct

In order to calculate the shared variance of a given construct and all other variables reflectively measured in a structured model, Fornell and Larcker (1981) presented a conventional metric in which each construct's AVE must be compared to the squared inter-construct relationship

Table 6 Discriminant validity

	AP_EA	EKA	IEA
AP_EA	0.619		
EKA	0.543	0.724	
IEA	0.514	0.657	0.698

Based on Table 7, the R-squared value for the model is 0.338, which indicates that roughly 33.8% of the variation in the dependent variable can be explained by the model's independent variable(s). The number of predictor variables in the model is considered in the adjusted R-squared value, which is 0.332.

Table 7 Explanation of the variance

	R Square	R Square Adjusted
Exogenous Variables -> Endogenous (Actual participation in environmental activities)	0.338	0.332

4.4 Hypothesis Testing

The hypothesis testing results are depicted in Table 8 (path coefficients), and both the hypotheses are supported. The result showed that the environmental knowledge attributes have a significant relationship with the actual participation in environmental activities where $p < 0.001$, $t = 4.771$. This result indicates that levels of environmental knowledge attributes substantially impact actual participation in environmental activities. In addition, the results showed that Interest in environmental activities has a significant relationship with actual participation in environmental activities where $p < 0.001$, $t = 3.625$. This indicates that Interest in environmental activities significantly impacts actual participation in environmental activities, which means that both of the study hypotheses were supported.

Table 8 Path coefficients

Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Supported/Not supported
EKA -> AP_EA	0.361	0.363	0.076	4.771	0.000	Supported***
IEA -> AP_EA	0.277	0.292	0.076	3.625	0.000	Supported***

Note: Significance levels: *** $P < 0.001$ ($t > 3.33$), ** $p < 0.01$ ($t > 2.33$), * $p < 0.05$ ($t > 1.605$)

SEM-PLS results are shown in Figure 2, the results of testing hypotheses.

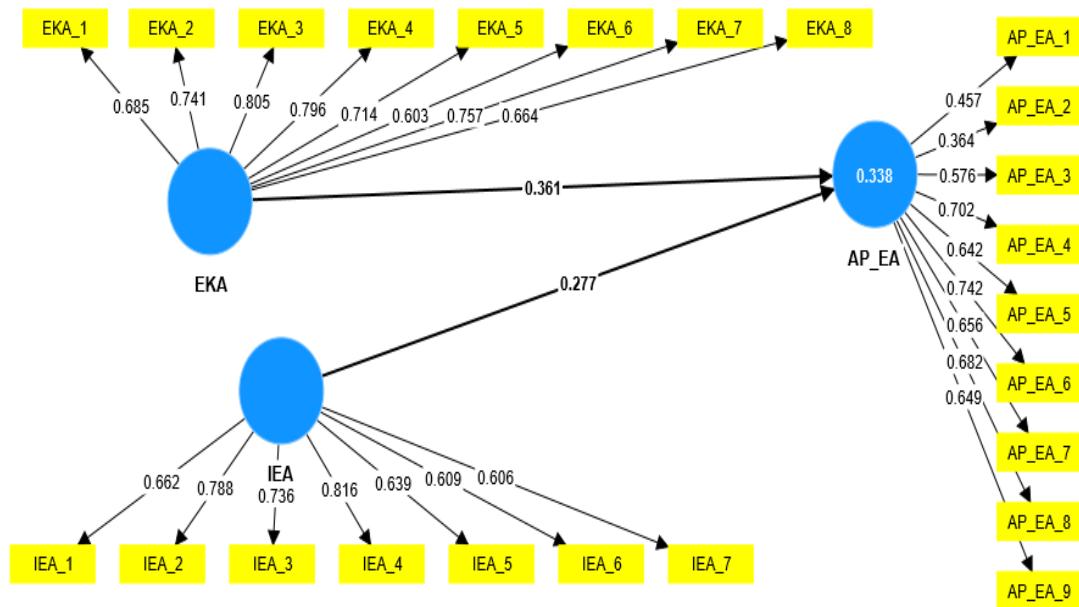


Fig.2 Demonstrate the results of testing hypotheses

5. Discussion

5.1 The impact of Environmental Knowledge Attributes on Actual Participation in Environmental Activities

Knowledge of the environment is now crucial for educating and increasing public awareness. Methods for sharing environmental knowledge are frequently promoted for their ability to improve the legitimacy and standard of decision-making processes, particularly in ambiguous situations. Environmental information, environmental behavioral intents, and environmental behavioral intentions have a strong positive impact on pro-environmental attitudes and pro-environmental behaviors, according to Liu et al. (2020) research. Thus, the current study's result revealed that the levels of environmental knowledge attributes significantly impact actual participation in environmental activities, which supports the first hypothesis of this study, "H1: Environmental knowledge attributes have a positive effect on actual participation in environmental activities". Likewise, the findings showed that participants' environmental knowledge had significantly increased following the training. Additionally, demographic factors like participants' age, occupation, and salary are strongly linked to improvements in knowledge and pro-environmental attitudes and behaviors (Cheung & Fok, 2014). There were discrepancies in the data on environmental attitudes and behaviors (Ardoin et al., 2015).

5.2 The Impact of Interest in Environmental Activities on Actual Participation in Environmental Activities

The main issue facing many countries, including Oman, is environmental conservation. People can better comprehend the topic and effectively solve it if they understand these problems. Additionally, people's attitudes and behaviors toward the environment play a role in resolving the stated issue. The exploitation of environmental resources by people living in GCC countries has received little attention in the literature. The findings revealed that pro-environmental behavior was favorably influenced by environmental obligation, environmental awareness, a green life, and green self-efficacy, adding new information to the existing literature on environmental sustainability (Yusliza et al., 2020). Thus, the current study's result revealed that Interest in environmental activities has a significant impact on actual participation in environmental activities, which supports the second hypothesis of this study, "H2: Interest in environmental activities has a positive effect on actual participation in environmental activities". In addition, customers are increasingly looking for goods and services that are environmentally friendly.

6. Conclusion

The main objective of this research is to explore the different dimensions of EL among business students in Oman universities. It examines the link between students' environmental interests and their stages of knowledge and how these factors shape their overall environmental behavior and actions.

Data for this study has been collected from university and college students in Oman. Sample size 238 The study used students from the University of Nizwa as a sample and used the quantitative approach to analyze and survey environmental knowledge and concerns.

The research questionnaire was distributed via a Google form to students who are undergoing accounting courses in various higher educational institutions in Oman. This study contains assumptions and positive results in results that show the impact of EL among university students in Oman, and the results in this study showed that EL plays a beneficial role in the connection between students' environmental interests and their levels of knowledge, which means that it has a significant impact on their future.

The result showed that the environmental knowledge attributes have a significant relationship with the actual participation in environmental activities where $p < 0.001$, $t = 4.771$. This result indicates that levels of environmental knowledge attributes significantly impact actual participation in environmental activities. In addition, the results showed that Interest in environmental activities has a significant relationship with actual participation in environmental activities where $p < 0.001$, $t = 3.625$. This result indicates that Interest in environmental activities significantly impacts actual participation in environmental activities, which means that both of the study hypotheses were supported.

6.1 Implications

The findings of this study indicate the need for additional research based on more recent data. Given that this study serves as a pioneering effort in Oman, evaluating EL components across the domains of knowledge and Interest and assessing students on multiple EL factors, it highlights the importance of conducting future studies in this area.

This research can serve as a foundation and guide for future studies on EL in Oman. The study's unique contributions and comprehensive approach provide valuable insights and understanding of the current state of EL among students. Therefore, it is recommended that teachers and curriculum creators consider these findings and prioritize the teaching and learning of environmental concepts in the National Curriculum. The study's identification of areas where students demonstrated limited understanding calls for increased attention and enhancement of educational approaches in those specific areas.

Moreover, conducting this study with a more extensive and diverse sample would benefit. Including participants from different cities or regions in Oman would provide a broader perspective on EL and potentially uncover regional variations or specific challenges. By expanding the sample size, future research could further explore the relationships between environmental knowledge, Interest, and behavior and offer more robust insights into promoting environmentally friendly conduct.

6.2 Limitations and Future Research Directions

The study's sample size was limited to 238 respondents from the University of Nizwa, which may not fully represent the entire population of university and college students in Oman. A more extensive and diverse sample would enhance the generalizability of the findings. The data collection method relied on an online mode using a Google Form questionnaire. This approach may introduce self-selection bias, as only individuals with internet access and willingness to participate online were included. It could impact the representation of specific demographics or segments of the population, potentially affecting the study's findings. Conducting a larger-scale study involving a more diverse sample of students from different universities and colleges across Oman would increase the study's external validity and allow for a more comprehensive analysis of EL. Furthermore, exploring the impact of various interventions or educational programs on improving EL among students could be a valuable direction for future research.

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