

Assessment Level of Environmental Literacy among Applied Science Private University (ASU) Students

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Abstract:- Environmental literacy EL is a significant aspect that must be implanted in education; to continuously protect environment systems, communities, and future generations. Students should understand skills and motivation to make responsible decisions for a sustainable environment. This research aimed to assess student EL and evaluate the influence of demographic factors on the EL level among students at Applied Science Private University in Jordan.

A total of 323 students; 53.6% male, and 46.4% females- took the EL test. The test had three parts: student's demographic profile, environmental knowledge, and attitude.

The findings indicated that students had high environmental knowledge of energy, pollution, and recycling. The results also showed that students had a moderate level of environmental knowledge on issues such as environmental concerns, ecology, water scarcity, global warming, and ozone layer depletion. The lower mean scores were determined for items on time of gardens irrigation and flue gas. It also revealed no differences between Gender, faculty, cumulative average, and income levels affect EL.

Multimedia alongside books and school environmental experience served as the key source of environmental information. It concluded that environmental knowledge does not always influence the behavioral intentions, so a national strategy is needed to improve current curricula in higher education institution

Key-words:- Environmental Literacy, Environmental Knowledge, Environmental Behaviors and Attitudes, Applied Science Private University (ASU).

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1 Introduction

Environmental literacy is a way to promote individual behavioral changes towards a more sustainable lifestyle to interact consciously with environmental challenges[1, 2]. Fostering knowledge, attitudes, and behaviors provides a sound basis for setting up positive communities[2]. All segments of society, primarily the youth, participate in this change[3]. Environmental problems are currently the main threat to the ecosystem. Overpopulation, economic development, industrialization, pollution, urbanization, and resource depletion worldwide are significant environmental challenges [4]. Moreover, recognition of the impact of humankind on the environment is

becoming more and more important nowadays [5]. Anthropogenic influences on nature have produced and will produce major consequences for societies. Therefore, it is necessary to foster appropriate environmental education and raise individual awareness of the consequences of human activities. In addition, highlighted select positive behavior, the heightened relevance of environmental education efforts that aims to enhance knowledge, promote attitudes toward nature, and ultimately positively influence environmental behavior as the main objectives that influence our societies [6]. The importance of raising environmentally educated people is increasing. Educational institutions play a

critical role in raising awareness about environmental literacy, attitudes, and behavior towards the environment [7]. The more persistent requirement of environmental education is an understanding of the relationship between attitudes, behaviors, and the value of the ecosystem [3]. Therefore, Higher education institutes focus their efforts on understanding students' this relationship, and the need to change both attitudes and behaviors, argued from a range of perspectives and positions on what IE is [8].

ASU is an ideal model for sustainability through EL among students, which is critical to addressing current and emerging environmental challenges and facilitating the transition to a safer society. ASU also contributes to increasing the strategic EL among students by activating curricula related to the environment, learning from experience, and building new insights regarding critical conditions to accelerate the transition to a sustainable society [9].

The goal is to empower students to become different; to overcome all these challenges. Since the assumption is that environmentally educated people will exhibit more responsible behavior towards environmental protection. Herein lies the significance of this study, which aims to gain more insights into EL for ASU students. In addition to evaluating the role of the university in increasing the energy efficiency necessary to build a conscious generation capable of protecting the environment [6]. Therefore, the purpose of this study is to reveal the environmental consciousness levels of undergrad university students based on evaluating the attitudes and behavior they exert. It also focuses on the determination of the effect of the socio-economic demographic factors like gender, age, class, faculty, cumulative average, educational status of their parents, and the income level of their families contributing the environmental awareness, knowledge about its significance, the attitude and sensitivity and vulnerability toward current environmental issues. [10].

2 Materials and Methods

This cross-sectional survey was conducted during the second semester of the 2020/2021 academic year as a campus-wide sample of undergraduate students across all faculties at ASU. It was comprised of 323 students: 150 females (46.4%) and 173 males (53.6%). The sample included students with

humanities or science backgrounds. The students with a humanities background comprise 164 students (50.8%). The students with a science background comprise 159 students (49.2%). An E-questionnaire was distributed using the Google Form, and shared through the Microsoft Teams platform. Participants were recruited randomly and volunteered in this study. A 3-part survey was implemented, used by Şahin et al. [11]. The first part of the survey comprised variables aimed at defining the student profiles (gender, faculty, class, cumulative average, age educational level of the father, educational level of the mother, and income level). The second part included 20 subjects to test the environmental knowledge of students. In the third stage, the students were administered a different evaluation scale comprising 20 elements to evaluate environmental behavior [12]. Five Likert-type gradings were applied to both scales, and the students' opinions on the scale were graded as “strongly disagree=1”, “disagree=2”, “neither agree nor disagree =3”, and “agree=4”, “Strongly agree=5”. The components on the behavior scale were graded as “never=1”, “rarely=2”, “sometimes=3”, “often=4”, and “always=5”. Statistical analysis was carried out using the Statistical Package for Social Sciences (version 22.0, SPSS, Inc.) software. Analysis of variance ANOVA test was used to determine the result independent variables have on the dependent variable amid a regression study. Results were expressed as means \pm SD (standard deviation). Parametric variables were analyzed using students' t-test, while chi-squared analyses were conducted for non-parametric variables. The reliability coefficient (Cronbach's Alpha) of the study is 0.886. The statistical significance level was set at $p < 0.05$ (two-sided). A Cronbach's alpha test on a sample of 112 respondents was used to validate the reliability of the research instrument.

3 Results

3.1 Profile of the Respondents

A wide variety of academic majors were represented in the sample of 323 students. The majority of respondents fell within the age range of 20 to 22 years (50.8%), gender distribution was approximately even (53.6% male and 46.4% female). The ASU student population constituted undergraduate students, and among these, 21.1% of respondents

were 1st-year students, 28.5 2nd-year students, 21.7% 3rd-year students, 16.81.6% 4th-year students, and 10.2% 5th-year students. About 36.8% of the total sample were students with a cumulative average greater than or equal to 84. According to the findings in Table 01, 68.4% of the fathers and 44.3% of the

mothers were university graduates holding a BS degree. The income levels of 32.5% of them were in the interval from 500 to 999 JOD per month. As for the source of environmental information, 28.8% were from Multi-Media sources. Meanwhile, only 5.00% were from seminars

Table 1. Individual Features of the Students

Variable	Group	Number n=232	Percentage (%)
Gender	Male	173	53.6
	Female	150	46.4
Faculty	Humanities	164	50.8
	Scientific	159	49.2
Class	1 st year	68	21.1
	2 nd year	92	28.5
	3 rd year	70	21.7
	4 th year	60	18.6
	5 th year	33	10.2
Cumulative Average	60-67.9	60	18.6
	68-75.9	73	22.6
	76-83.9	71	22.0
	≥ 84	119	36.8
Age	17-19 yrs.	67	20.7
	20-22 yrs.	164	50.8
	23-25 yrs.	65	20.1
	>26 yrs.	27	8.4
Educational Level of the father	None	9	2.8
	Primary Education	5	2.5
	Secondary Education	43	13.3
	Bachelor Degree	221	68.4
	Graduate Studies (MS & PhD)	42	13.0
Educational Level of the mother	None	29	9.0
	Primary Education	19	5.9
	Secondary Education	90	27.9
	Bachelor Degree	143	44.3
	Graduate Studies (MS & PhD)	42	13.0
Income Level	< 500 JOD	45	13.9
	500-1000 JOD	105	32.5
	1000 -1500 JOD	75	23.2
	> 1500 JOD	98	30.3
Environmental Information Source	School	63	19.5
	TV	35	10.8
	Multi-Media	93	28.8
	Seminars	16	5.0
	Books	28	8.7
	University Courses	62	19.2
	From Parents	26	8.0

3.2 Environmental Knowledge

Students responded to an environmental knowledge scale consisting of 20 items. Table 02 presents the results obtained from the student response to each item on the scale.

Measurement of the environment knowledge ranged from 0 to 2.48 as low-level knowledge, 2.49 – 3.49 as mid-level knowledge, and 3.50 – 5.00 as high-level knowledge. According to the findings, the general environmental knowledge level of the

students was found to be above average at 3.63. Results showed that students had a high level of knowledge about “broken mirrors, pieces of bottles and returnable glass bottles should be deposited in the glass recycling bin” and “buying a recyclable paper is important in terms of protecting the environment” This indicated that students were well-

informed about major waste pollution and disposal problem. The results also showed that students had a moderate level of environmental knowledge on issues such as environmental concerns, ecology, water scarcity, global warming, and ozone layer depletion. The lower mean scores were determined for items on time of gardens irrigation and flue gas.

Table 2. Analysis of the Environmental Knowledge Levels of the Students

Items	Mean	Std. Dev.	Cronbach's Alpha
W1. Noise irritates humans, not diseases	1.73	0.84	0.860
W2. Keep batteries and small equipment until the end of the emergency period and deliver them to stores.	3.76	1.30	
W3. Taking a shower rather than a bath causes less damage to the environment.	3.91	1.00	
W4. Carbon dioxide gas is the only gas responsible for ozone layer depletion.	3.70	1.09	
W5. Flue gas harms trees, not humans.	3.67	1.31	
W6. There are alternative energy sources such as the sun and the wind that can be used to produce electrical energy, apart from the ones that are harmful to the environment.	3.89	1.15	
W7. In order to ensure radiators use less energy, windows should be kept wide open for a short time, rather than keeping them slightly open for longer periods.	3.64	1.39	
W8. Recycling means making some wastes reusable.	3.86	1.22	
W9. Buying our beverages in returnable bottles, instead of single-use cans, is more beneficial in terms of protecting the environment.	3.87	1.11	
W10. Buying recyclable paper is important in terms of protecting the environment.	3.86	1.14	
W11. Not to conduct sanitary extermination of mosquitoes, ants and rodents at home while family members are present.	4.07	1.06	
W12. Products have labels on their packages indicating whether they are environmentally friendly.	4.03	1.14	
W13. It is claimed that the reason why some regions on earth will be submerged is ozone layer depletion.	3.95	1.19	
W14. Waste should be collected separately as glass, plastic, paper, special waste and other waste.	3.14	1.49	
W15. Broken mirrors, pieces of bottles and returnable glass bottles should be deposited in the glass recycling bin.	3.44	1.40	
W16. Placing furniture such as wardrobes in front of radiators in houses or schools causes energy waste.	3.68	1.24	
W17. The sharp reduction in the movement of people during the pandemic has led to a decrease in carbon emissions and thus a decrease in the level of air pollution.	3.44	1.38	
W18. Low levels of nitrogen oxides during a pandemic.	3.91	1.17	
W19. In summer, the best time to irrigate gardens at noon time with the highest temperature of the day.	3.32	1.38	
W20. The economic repercussions of the Corona pandemic will slow down the development of technology used in green energy.	3.25	1.40	
GENERAL	3.61	0.62	

Scale: (1). strongly disagree. (2). disagree. (3). neither agree nor disagree. (4). agree. (5). strongly agree

3.3 Attitude and Sensitivity TOWARD the Environment

Table 03 shows the results of student responses to an environmental attitude scale consisting of 20 items. The environmental attitude scale for students was divided into three, ranging from 0 to 2.49 as a

negative attitude, to 2.50 to 3.49 as a moderate level attitude to 3.50 to 5.00 as a positive attitude using means of responses. The results show that students had no negative attitudes toward any of the items. They had a moderate level attitude to statements on environmental protection measures, convenient

recycling wastes methods, water conservation actions, and the disastrous consequences of human activities. Students, however, showed a positive attitude toward items related to energy conservation, plastic waste disposal, and eco-friendly measures.

Table 3. Analysis of the Environmental Attitude and Behavior of the Students

Items	Mean	Std. Dev.	Cronbach's Alpha
V1. Don't waste water when washing hands.	4.46	0.78	0.73
V2. When buying laundry powders/liquids or washing up liquid, I consider whether they are harmful to the environment.	3.93	1.07	
V3. I separate unused paper in the house and inform the collectors or deliver the paper to them.	3.85	1.10	
V4. We make sure to wear a cloth mask instead of a medical mask to reduce waste.	3.62	1.19	
V5. I pay attention to whether notebooks and papers are made out of recyclable paper.	4.45	0.71	
V6. Keep batteries and small equipment until the end of the emergency period and deliver them to stores.	3.81	0.98	
V7. I deposit used bottles in glass recycling bins.	4.03	1.06	
V8. Use electronic files instead of printing more than once.	4.36	0.86	
V9. My family and I give our old things and books to people in need or to organizations collecting them.	3.91	1.12	
V10. I don't keep doors and windows open while the radiator is working.	3.83	1.19	
V11. I pay attention not to leave the lights, radio and television on unnecessarily.	3.86	0.98	
V12. I discuss environmental pollution with my friends.	3.42	1.24	
V13. I buy new cell-phones and computer s when I have enough money.	4.34	0.99	
V14. We are careful not to throw masks and gloves in public places.	3.71	1.12	
V15. I participate in conferences or other meetings regarding the protection of the environment.	2.43	1.30	
V16. I inform a journal or journalist or politician or any responsible authority of problems to prevent environmental pollution.	3.39	1.46	
GENERAL	3.84	0.49	

Scale: (1). never. (2). rarely. (3). sometimes. (4). often. (5). always.

3.4 Scales Reliability

The Cronbach's Alpha values of scales were measured as 0.860 for the knowledge scale and as 0.73 for the behavior scale once the reliability coefficients in Table 02 and Table 03 were tested. Such values indicate a high degree of reliability for the utilized scales.

3.5 Evaluation of the Variables Affecting EL

Quantitative variance analysis was carried out to identify variables that affected EL among the participants. Dependent variables were the two environmental scales (knowledge and behavior), with demographic variables of gender, faculty, class,

cumulative average, age, parent's education, income levels, and EE experience as predictors. The results are summarized in Table 04. According to Table 04, it was contemplated that four variables had a significant influence on EL (p-value < 0.05). Gender, faculty, cumulative average, and income level were related to EL. Furthermore, results showed a statistically significant effect of family income level on the students' environmental knowledge. Similarly, consistent with [20] work, results indicated a statistically significant effect of gender, and faculty on attitude and sensitivity toward the environment.

Table 4. The Relation of the Environmental Knowledge and Behaviors of Students with their Individual Characteristics

Variable	Group	Knowledge			Behavior		
		Mean	S.D	P value	Mean	S.D	P value
Gender	Male	3.64	0.62	0.266	3.84	0.53	0.915
	Female	3.56	0.62		3.83	0.45	
Faculty	Humanities	3.64	0.68	0.327	3.88	0.53	0.128
	Scientific	3.57	0.56		3.79	0.46	
Class	1 st year	3.54	0.54	0.021	3.79	0.35	0.000
	2 nd year	3.72	0.67		3.87	0.56	
	3 rd year	3.59	0.58		3.95	0.41	
	4 th year	3.68	0.66		3.90	0.53	
	5 th year	3.32	0.59		3.48	0.48	
Cumulative Average	60-67.9	3.64	0.62	0.032	3.79	0.58	0.642
	68-75.9	3.78	0.57		3.89	0.52	
	76-83.9	3.56	0.65		3.86	0.42	
	≥ 84	3.51	0.62		3.81	0.47	
Age	17-19 yrs.	3.50	0.52	0.056	3.73	0.37	0.173
	20-22 yrs.	3.69	0.66		3.89	0.53	
	23-25 yrs.	3.49	0.61		3.83	0.48	
	>26 yrs.	3.63	0.59		3.83	0.56	
Educational Level of the father	None	3.21	0.37	0.143	3.72	0.22	0.117
	Primary Education	3.71	0.70		3.44	0.58	
	Secondary Education	3.76	0.60		3.92	0.49	
	Bachelor Degree	3.60	0.63		3.85	0.49	
	Graduate Studies	3.56	0.61		3.79	0.49	
Educational Level of the mother	None	3.72	0.58	0.223	3.76	0.38	0.176
	Primary Education	3.81	0.47		4.00	0.42	
	Secondary Education	3.50	0.60		3.78	0.50	
	Bachelor Degree	3.63	0.67		3.89	0.51	
	Graduate Studies	3.57	0.57		3.78	0.48	
Income Level	< 500 JOD	3.73	0.49	0.002	3.88	0.46	0.004
	500-1000 JOD	3.75	0.66		3.96	0.51	
	1000 -1500 JOD	3.54	0.62		3.76	0.48	
	> 1500 JOD	3.44	0.60		3.74	0.47	
Environmental Information Source	School	3.63	0.68	0.766	3.84	0.49	0.099
	TV	3.57	0.64		3.81	0.40	
	Multi-Media	3.61	0.62		3.91	0.49	
	Seminars	3.55	0.59		3.72	0.44	
	Books	3.74	0.63		3.80	0.59	
	University Courses	3.62	0.59		3.90	0.47	
From Parents	3.45	0.57	3.59	0.55			

3.6 Correlations among Components of EL

Consistent with other work [13], the results shown in table 05 demonstrate that environmental knowledge and attitude had a moderate level correlation $r = 0.552$. Meanwhile, the linear regression model, where the environmental knowledge (EK) was considered as an independent variable and the environmental behavior (EB) was the dependent variable, was found to be statistically significant and

positive $F=140.734$; $p\text{-value} < 0.05$, and the formula was as follows;

$$EB = 2.256 + 0.438EK$$

This means that a 1 unit increase in the level of environmental knowledge results in a 0.438 unit increase in the level of environmental behavior.

Table 5. The Relationship between Environmental Knowledge and Environmental Behavior

Model	Coefficients β_i	Std. Error	t	P value	R	R ²	ANOVA
(Constant)	2.256	0.135	16.66	0.000*			
Environmental Knowledge	0.438	0.037	11.863	0.000*	0.552	0.305	F = 140.734 P = 0.000*

4 Discussion

Attracting attention to the growing environmental crisis and the increasing focus on youth education, particularly in colleges and universities, is crucial to protecting the ecosystem from human activity that does not observe environmental balance [6, 8]. This study highlights the awareness of building environmental knowledge among undergraduates to improve sustainable environment management. Accordingly, in this research, EL levels have been assessed in university students to explore the interaction between EL components and sociodemographic indicators. It provided further empirical data about the validity of the EL structure. This study explored EL among ASU students in Jordan. However, according to other researchers [14] and based on the principle of predictable behavior, the impact of gender, level of parental education, ambient educational experiences, and age on students' EL, as well as relations between endogenous variables were examined (EL components). We, therefore, consider various strategies and conclude with suggestions for a detailed classification system of participants in transitions to sustainability.

Descriptive results of the EL test indicated that the students had higher mean scores on knowledge, while they had relatively moderate scores on attitude and behavior. According to the results of this study, it was established that students were well-informed about major waste pollution and disposal problems and had a high level of environmental knowledge. Also, it pointed out that the students had transformed the knowledge they had acquired about recycling waste and other eco-friendly measures into action, but despite having high levels of knowledge about water scarcity and climate change, they could not reflect that in their behaviors. Similarly, [6, 7, 15] found a positive but moderate correlation between knowledge and attitude. Since the direction of the relationship was significant, regardless of its size, students with adequate environmental knowledge may often maintain a more

ambivalent attitude. Interestingly, students with higher attitudes may be asserted for being able to develop environmental knowledge. In this context, previous studies have indicated that recognition of an ultimate objective would intensify attitudes relevant to that objective [6, 8].

Results also statistically revealed a good relationship between the level of environmental literacy and the attitude of both male and female students that will help in instilling environmentally friendly behaviors in the long term. These results confirm the extent to which males are aware of environmental issues and are contrary to many studies that implicitly indicate that females And students of health majors showed higher positive environmental attitudes and behaviors than male students in humanities or sciences. Similarly, Bord and O'connor suggest that gender differences in environmental attitudes stem from gender differences in the perceived vulnerability to risk from the environment, rather than differences in ecological sensibility between women and men [16]. The results also revealed the effect of faculty, GPA, and income levels similar to Yilmaz and Erka [13]; Mudrisoglu and Altanlar research studies on positive responses at the level of environmental literacy and environmental protection [17]. According to the arguments in Roth [1], EL is equivalent to developing REB. In addition, after evaluating variance assessment results for several or more semesters, it was noted that the levels of environmental knowledge and behavior of students with educated parents were higher than those of those with a college degree and that students with incomes of 500-1000 dinars were higher than other income levels. Similarly, the results of this study are similar to Çelik et al. [18] that parents, especially the mother, have a positive influence on students' sensitivity to the environment and their actions. Parents of college graduates are more environmentally conscious than students with primary school students and have more advantages [19, 20].

The results of this study revealed that the majority of ASU students recognized that "school education" is the primary provider of information for their environmental awareness [21] in addition to the role

of parents [18]. While university courses, media, seminars, and books were sources of environmental information without giving preference to any other source of less influence. We conducted this study to find out the extent of the role of higher education institutions in raising awareness of environmental issues and defining their real role in increasing EE. The results also indicated the importance of the role of multimedia in raising the attention to environmental issues to the public and assessing environmental problems. The results also show that higher media coverage is closely related to higher environmental knowledge and greater environmental responsibility.

5 Conclusion

Environmental problems today have been a major concern in the country, so educating individuals is the best solution to reduce environmental challenges by raising environmental consciousness and sensitivity. Environmental education successfully affects the mindset and actions of students in the community. Education is a long-term cycle, and it is necessary to educate society at all levels, from preschool to university education. The future leaders ought to be university graduates of today. Those might be engineers at major facilities or management staff in public and private regions in the future or senior policymakers who may put leverage on environmental issues to lessen. Therefore, universities should include a course covering environmental sciences for all disciplines to improve the awareness and consciousness of students towards the environment, which is currently found at ASU as an elective university course within the student's study plan of all majors. As a result, it has been observed that generally, the level of environmental literacy of the students of ASU Campus is "knowledgeable". Females have an edge over the males, scientific disciplines over humanities, older over younger, those with a moderated cumulative average in the university over others, those with well-educated family members and moderate-income levels shown by their higher means. This shows that students hold a pro-environmental literacy toward global issues.

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