



Assessment of Environmental Knowledge and Attitudes of Undergraduate Students at Malla Reddy University: A Study on Environmental Ethics

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 01 Dec 2023	<p><i>Educating University students at the initial levels can improve their knowledge of environmental issues. A relevant study was conducted at the School of Allied Healthcare Sciences, Malla Reddy University, Hyderabad, India, based on a cross-sectional design. A self-administered questionnaire focused on the socio-demographics, knowledge, and attitudes of 380 students toward environmental ethics was used to collect the data and analyzed by SPSS. The findings include about 50% (N=200) of the students were found to have low knowledge scores; on the other hand, 49.2% (N = 187) of students showed a pro attitude towards environmental issues. Chi² analysis showed that place of birth and courses undergoing (clinical/nonclinical) resulted in a notable relationship with knowledge scores. Pearson's correlation analysis showed that the place of birth (POB) ($r=0.143$; $p=0.05$) and clinical/nonclinical courses ($r=0.206$; $p=0.05$) had weak relation to knowledge score; a negative, weak correlation was found between attitude score and education levels ($r= -0.105$; $p=0.01$) of the students. The present study showed that University students had a moderate level of knowledge of the environment, and about 20% showed a negative attitude toward environmental practices. The present study suggests the need to include environmental awareness programs in corresponding curricula to improve awareness of the environment.</i></p>
CC License CC-BY-NC-SA 4.0	Keywords: Attitude, Environment, Knowledge, Socio-demographics, University students.

1. Introduction

In the last few decades, the public's environmental consciousness has increased due to the growth of science and environmental issues [Thapa, 2001]. The UN World Conference on Environment in Stockholm (1972), the Earth Summit held in Rio de Janeiro (1992), the Global Forum (1992), and the activities initiated by International NGOs and other Forums help illustrate that the preservation of the environment is the international community's top priority [Caroline, 2017]. Proper use of natural resources and the necessity of people recognizing themselves as part of nature are crucial to solving these problems and hence are emphasized repeatedly [Vining et al. 2008].

Environmental ethics based on the moral relationship between humans and nature developed into a philosophical subject. Environmental ethics asserts an ecological conscience that reflects a commitment and responsibility of humans toward the environment in present times and extends to the next generations. Environmental ethics is primarily human based on social justice, regardless of race, gender, religion, philosophy, caste, location, or country. Most current environmental issues result from human activity and attitudes toward the socio-cultural and natural environment.

Awareness, knowledge, and attitude (AKA) on environmental education are the primary objectives to be incorporated into the curricula of the Universities. Even though numerous studies have shown that the public has a positive attitude toward environmental issues [Bulent et al. 2009], there is still a disconnect between environmental conceptual knowledge and the motivation to participate in environmental protection. In addition to imparting environmental knowledge, the primary objective of education is to instill in students the attitudes and behaviors necessary to protect the environment. Exploring students' environmental knowledge and attitudes is necessary. They are significantly

susceptible to new perspectives and will carry new environmental awareness into their forthcoming communities and workplaces [Lozano et al. 2013]. Proper inputs to the students may make them protectors, planners, representatives, and future educators interrelated to environmental issues [Shafiei & Maleksaeidi, 2020].

The present study has been undertaken to investigate 1) student's knowledge and 2) attitudes toward environmental ethics along with 3) the relationship among these factors and 4) to determine the correlation between knowledge of the environment and the attitudes among first-year undergraduate students.

2. Materials And Methods

Study area, design & Sample size

An institutional-based cross-sectional study design was conducted at the School of Allied Healthcare Sciences, Malla Reddy University, Hyderabad, India, between July to December 2022. All first-year and second-year undergraduate students studying in various programs offered by the University who showed interest and provided written consent to participate in the study were considered. A finite population equation sample size was used and calculated through an online available software (<https://www.surveysystem.com/sscalc.htm>).

The sample size was calculated by taking a confidence level of 95% at a confidence interval of 4.5. The finite population size was 1500 (the total number of students enrolled in six courses was 476), and the required sample was 361. We have added a 5% nonresponsive rate (18). The final sample size required was 379 (361+18). However, we received 380 responses, and data analysis was performed.

Sampling procedure and sampling technique

- i) **Data collection tool and procedure:** A self-administered close-ended questionnaire along with an observational checklist was developed to collect the data. The questionnaire was classified into three parts: 1. socio-demographic data (seven questions) (Table 1). The knowledge part had ten questions (Table 3), and the attitude part had 15 questions (Table 5). Data quality management was done by pretesting a questionnaire (2%).
- ii) **Data processing and analysis:** The collected data was edited, coded, cleaned up in MS Excel, and imported into SPSS (version 25) for analysis. Knowledge and understanding of environmental fundamentals were assessed through ten questions, including basic environmental concepts. All the questions had five responses; correct answers to each knowledge statement received a score of one, while incorrect answers received a score of zero. Finally, the overall knowledge score for each student was calculated by adding the correct answers to the ten knowledge statements. The students' attitudes towards environmental issues were assessed through ten more questions. Using a 6-point Likert Scale, respondents were asked to indicate their level of agreement/disagreement with each of 15 broad ecological statements (1 – strongly agree; 5 – strongly disagree; 6 – no opinion). For attitude questions, a pro-ecological statement received a score of 1, and a less favorable ecological statement received a score of 5, with a low overall score indicating a more pro-ecological viewpoint. Before total individual scores were calculated, 'no opinion' responses were removed from the data set. The possible scores ranged from 15 to 75. As a result, a score of 15 indicated a pro-environmental attitude, while a score of 75 indicated a less favorable environmental attitude. Knowledge assessment scores taken were in the range of 0-4 (low), 5-7 (moderate) and 8-10 (high). Attitude assessment scores taken were in the range of ≤ 28 (Pro attitude), 29-35 (Moderately positive), and >35 (Negative attitude). Descriptive statistics were used to summarize the results. The χ^2 test of independence was used to understand the impact of independent variables on knowledge and attitude. Pearson's correlation was done to see the association of socio-demographics, knowledge, and attitude scores at $p \leq 0.05$ significance level.

Ethical considerations: The present study does not require ethical clearance.

3. Results and Discussion

Socio-demographic profile of students

Out of three hundred and eighty students who participated in the survey, the mean age (\pm SD) of respondents was 18.65 (\pm 1.16) years (Table 1). Among them, 73.7% were female students (N = 280), and 47.6% (N=181) of the students were from urban areas.

The students' mean percentage of marks obtained in the last academic program studied (12th) was 83.6 (\pm SD 10.64). About 78.4% (N=298) of students' families had a family size of 4-5 members, and nearly half (48.9 %) of the students' families' average income was below 35 thousand INR (N=186).

Table 1: Socio-demographic of study participants

Demographics inquired		N=380	Percentage (%)
Gender	Female	280	73.7
	Male	100	26.3
*Age	18 to 19	329	86.6
	20 to 21	39	10.3
	>21 Years	12	3.2
Place of Birth	Rural	147	38.7
	Semi-Urban	52	13.7
	Urban	181	47.6
Education Level	UG First year	97	25.5
	UG Second year	258	67.9
	Others	25	6.6
BOS	AOTT	70	18.4
	BMB	65	17.1
	CVT	86	22.6
	EMCCT	41	10.8
	MBT	98	25.8
	MLT	20	5.3
**Percentage (%)	>80	266	70.0
	66-79	84	22.1
	<66	30	7.9
Program	Clinical	196	51.6
	Nonclinical	184	48.4
***Family Income(INR) in thousands	\leq 35	186	48.9
	36-75	90	23.7
	75-100	69	18.2
	>100	35	9.2

*Mean age: 18.65 (\pm 1.163 SD); Mean Percentage (%): 83.6 (\pm 10.64);

*** Mean family income: 64975 (\pm 96979) INR.

3.2. Students' Knowledge of Environmental Ethics

Based on students' responses to the knowledge assessment questions, the knowledge assessment test yielded scores ranging from 0 to 10 on a scale of 10. The analysis demonstrated that about 11.8% of students were found to have high knowledge assessment scores, and more than half of the students

(52.6%) who participated in the survey had a lower knowledge assessment score (0-4) (Table 2), including 35 (9.21%) students with a nil knowledge score.

Table 2: Frequency table of knowledge assessment scores

Assessment Score	Ranged values	N=380	Percent (%)
Knowledge assessment score	0-4 (Low)	200	52.6
	5-7 (Moderate)	135	35.5
	8-10 (High)	45	11.8

The level of knowledge on environmental ethics was calculated by using a ten-question rating, and responses were summarized in Table 3. Among the inquired questions, students responded to a great extent (60.8%) to the question "Ecology is the study of the relationship between what?" with a high knowledge assessment score (0.61 ± 0.48). On the other hand, students who participated in the survey had modest to low knowledge assessment scores for the other inquired questions.

Table 3: Mean and SD of Knowledge Assessment Scores.

s.no.	Knowledge Questions inquired	N	%	Mean	SD
1	Ecology is the study of the relationship between what?	231	60.8	0.61	0.48
2	Which of the following has the most significant impact on the Earth's environment?	160	42.1	0.42	0.49
3	What does precycling mean?	175	46.1	0.46	0.49
4	Animals alive today are most likely to become extinct because of-	198	52.1	0.52	0.5
5	Building a dam on a river can be harmful because it causes	182	47.9	0.48	0.5
6	The burning of fossil fuels has increased atmospheric CO2 content. What is the most immediate effect that this increasing amount of CO2 is likely?	122	32.1	0.32	0.46
7	Most elephants are killed every year to provide people with-	145	38.2	0.38	0.48
8	Burning coal for energy is a problem because it-	197	51.8	0.52	0.5
9	Phosphates are harmful in seawater because they-	107	28.2	0.28	0.45
10	The primary source of pollution of our surface water is by-	122	32.1	0.32	0.46

Students' Attitudes on Environmental Ethics

Students' scores on the attitude assessment test ranged from 15 to 75 (Table 4). 49.2% (N=187) of the students were found to have a pro-attitude for environmental protection and maintenance, with assessment values ranging from ≤ 28 . Only 20.5% of students were observed to have a negative attitude towards environmental ethics, with assessment values >35 .

Table 4: Frequency Table of Attitude Assessment Scores

Assessment Score	Ranged values	N=380	Percent (%)
Attitude score	≤ 28 (Pro attitude)	187	49.2
	29-35 (Moderately positive)	115	30.3
	>35 (Negative attitude)	78	20.5

The students' attitudes toward environmental ethics were analyzed using fifteen questions related to environmental issues (Table 5). About 49.3% of students strongly agree that plants and animals have as much right as humans to exist. Also, 41.6% of students strongly agree that if we learn how to develop, the Earth will have plenty of natural resources. 40.2% of students strongly agree that humans severely abuse the environment, and 8.2% have no opinion of the statement. Only 7.3% of students strongly disagreed with the inquired statement, "Humans have the right to modify the natural environment to

suit their needs". Most of the students who participated in the survey had mildly agreed or were unsure about the questions.

Table 5: Frequency Table of Attitude Assessment Scores, N=380.

Attitude Questions inquired	Strongly agree		Mildly agree		Unsure		Mildly disagree		Strongly disagree		No opinion	
	N	%	N	%	N	%	N	%	N	%	N	%
We are approaching the limit of the number of people the Earth can support.	161	42.4	108	28.4	60	15.8	9	2.4	4	1.1	38	10
Humans have the right to modify the natural environment to suit their needs.	97	25.5	121	31.8	64	16.8	33	8.7	36	9.5	29	7.6
When humans interfere with nature, it often produces disastrous consequences.	150	39.5	91	23.9	82	21.6	16	4.2	10	2.6	31	8.2
Human ingenuity will ensure that we do NOT make the Earth unlivable.	91	23.9	105	27.6	101	26.6	30	7.9	11	2.9	42	11.1
Humans are severely abusing the environment.	157	41.3	112	29.5	51	13.4	12	3.2	14	3.7	34	8.9
The Earth has plenty of natural resources if we learn how to develop them.	172	45.3	93	24.5	56	14.7	15	3.9	8	2.1	36	9.5
Plants and animals have as much right as humans to exist.	199	52.4	79	20.8	46	12.1	11	2.9	17	4.5	28	7.4
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	108	28.4	112	29.5	82	21.6	27	7.1	13	3.4	38	10
Despite our special abilities, humans are still subject to the laws of nature.	138	36.3	105	27.6	75	19.7	12	3.2	8	2.1	42	11.1
The Earth is like a spaceship with minimal room and resources.	119	31.3	126	33.2	65	17.1	14	3.7	16	4.2	40	10.5
Humans were meant to rule over the rest of nature.	84	22.1	98	25.8	78	20.5	36	9.5	50	13.2	34	8.9
The balance of nature is very delicate and easily upset.	122	32.1	121	31.8	74	19.5	14	3.7	11	2.9	38	10.0
Humans will eventually learn enough about how nature works to be able to control it.	130	34.2	112	29.5	70	18.4	14	3.7	13	3.4	41	10.8
If things continue on their present course, we will soon experience a major ecological catastrophe.	155	40.8	103	27.1	58	15.3	18	4.7	8	2.1	38	10.0
The so-called 'ecological crisis' facing humankind has been greatly exaggerated.	133	35	101	26.6	69	18.2	20	5.3	20	5.3	37	9.7

3.4. Relationship among students' socio-demographics, knowledge, and attitudes on

Environmental ethics

The Chi² test of independence was used to determine the impact of various socio-demographic characteristics on students' environmental knowledge and attitudes (Table 6). The findings of the Chi² independence test revealed the association between respondents' demographic and knowledge levels. There was no significant association of students' attitudes toward environmental issues. The independent variables, such as place of birth and type of program, significantly impacted knowledge (p= 0.05).

Table 6: Chi² test' of Independent variables and relationship with Knowledge and Attitude Scores

	Independent variable	Knowledge score		Attitude score	
		Chi2 value	p-value	**Chi2 value	p-value
	BOS	26.72*	0.008	-	-
	Clinical/Nonclinical	19.51*	0.001	-	-

* Statistically significant at p=0.01 level; **NS

As a student's place of birth and clinical/nonclinical courses had a substantial impact on knowledge scores, Pearson's correlation was calculated, and it revealed the place of birth (r=0.143) and type of program (r=0.206) had a weak correlation on knowledge scores (p=0.01) (Table 7). A negative, weak correlation with r=-0.105 was observed between the attitude and level of education at a p=0.05 significance level (Table 8).

Table 7: Correlation of knowledge score and place of birth & clinical/nonclinical, p=0.05 (Two-tailed)

Parameter	Mean	SD	Pearson's r	
			POB	Clinical/Nonclinical
Knowledge score	4.31	2.578	0.143	0.206

Table 8: Correlation of attitude score and Education level, p=0.05 (Two-tailed)

Parameter	Mean	SD	Pearson's r
Attitude score	27.9	11.13	-0.105

Discussion

The present-day challenges of environmental issues are of utmost significance for humanity as a whole. These issues stem from various factors such as industrialization, overcrowding, advancements in science and technology, escalating demands, and the process of globalization [Davis, 1998]. Human beings are widely regarded as the primary catalysts of environmental issues due to their cognitive processes and actions [Negev, 2010]. Therefore, environmental education is increasingly essential for a sustainable, habitable environment. Also, it aims to extend a world population with knowledge, skills, and attitudes to contribute to solutions to present environmental problems [Kim, 2003]. The keystone of environmental responsiveness lies behind raising environmental awareness among people [Sward, 1999] and requires individuals with environmental knowledge [DiEnno & Hilton, 2005].

By using a survey model, the present study assessed the knowledge and attitude on the environment among Undergraduate students. The current survey indicates a higher female preponderance observed over male students in active participation, and students from urban areas enthusiastically participated than those from the countryside. Numerous research studies have indicated that women exhibit a greater inclination towards environmental concerns compared to men, displaying a higher propensity for endorsing conservation efforts and engaging in environmentally friendly behaviors [Duman-Yuksel & Ozkazanc, 2015; Zelezny et al., 2000].

Among the socio-demographics, students' place of birth, family size, and family income significantly impacted environmental knowledge scores. Another socio-demographic determinant of environmental attitudes researched worldwide is socio-economic status and income [Beiser-McGrath & Huber, 2018].

Several research studies revealed that the factor of the higher monthly income group has positively correlated with more concern towards environmental protection [Evert et al. 2022].

Although some research studies have suggested that there is no significant association between socio-demographic characteristics and environmental attitudes, knowledge, and pro-environmental behavior, recent investigations have presented compelling evidence that socio-demographic characteristics, particularly in developing countries, do play a substantial role in influencing the relationship between environmental attitudes and pro-environmental behavior [Patel et al., 2017; Amoah & Addoah, 2020; Okumah, 2020].

Environmental knowledge can be defined as a person's capability to discover or define several ecologically related symbols, concepts, and behaviors [Laroche et al. 2001]. The present study confirmed that about (50.2%) of students who participated in the survey had a lower knowledge assessment score, and only 14.2% had high knowledge assessment scores. This confirms students' environmental knowledge levels range from modest to low.

Milfont and Duckitt (20) define environmental attitudes as a psychological inclination held by individuals, encompassing the assessment of the natural world with variable levels of preference or aversion. In the current study, only 5% of students had a positive attitude toward environmental ethics, whereas 82.6% had a negative attitude towards environmental ethics. Any socio-demographic features did not show a noteworthy relationship with the attitude scores of students in the University. Furthermore, students did not consider the environmental conditions threatened by humans, which is reflected in their relatively low knowledge and attitude scores on environmental fragility and eco-centric concern. Therefore, it is imperative to cultivate awareness and foster ecological consciousness among pupils. The findings of this research make a valuable contribution to the development of more effective approaches aimed at promoting environmental conservation, with a specific focus on the engagement of young students.

4. Conclusion

The findings indicate that interventions might be needed to temper environmental attitudes for anthropogenic purposes. Furthermore, the findings revealed that demographic factors like place of birth, family size, and income significantly correlated with the student's knowledge. However, less percentage has impacted students' attitudes towards environmental ethics. Therefore, suitable curricular and co-curricular activities must be organized at all levels of education, especially at the highest level, to promote students' awareness of environmental issues. Recurrent workshops, seminars, conferences, symposiums, exhibitions, field visits, etc., need to be organized in educational institutions to involve the student community in practicing all the skills that they have learned concerning the environment.

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Conflict of Interest: The Authors declare no conflict of interest.

References:

1. Thapa, B. 2001. Environmental concern: a comparative analysis between students in recreation and park management and other departments. *Environ. Educ. Res.*, 7, 39-53.
2. Caroline, M.M. 2017. Environmental ethics among Higher secondary students. *Int. j. adv. res. innov. ideas educ.* 3(1), 506-511.
3. Vining, J., M.S. Merrick & EA Price, 2008. The distinction between humans and nature: Human perceptions of connectedness to nature and elements of the natural and unnatural. *Hum. Ecol. Rev.*, 1-11.
4. Bulent, C., C. Pinar, , T. Ceren, , C. Jale & K. Teoman, 2009. Turkish Students' Views on Environmental Challenges with respect to Gender: An Analysis of ROSE Data. *Sci. Educ. Int.*, 20(1/2), 69-78.
5. Lozano, R., R. Lukman, F.J. Lozano, D. Huisinigh & W. Lambrechts, 2013. Declarations forsustainability in higher education: Becoming betterleaders, through addressing the university system. *J. Clean. Prod.*, 48, 10-19.
6. Shafiei, A. & H. Maleksaeidi, 2020, Proenvironmental behavior of university students: Application of protection motivation theory. *Glob. Ecol. Conserv.*, 22, 1- 10.
7. Davis, J. 1998. Young children, environmental education, and the future. *Early Child. Educ. J.*, 26 (2): 117-123.
8. Negev, M., Y. Garb, R. Biller, G. Sagy & A. Tal, 2010. Environmental problems, causes, and solutions: an open question. *J Environ Educ.*, 4 (2): 101-115.
9. Kim, K.O. 2003. An inventory for assessing environmental education curricula. *The J Environ Educ.*, 34 (2), 12-18, 2003.

10. Sward, L. 1999. Significant life experiences affecting the environmental sensitivity of El Salvadoran environmental professionals. *Environ. Educ. Res.*, 5 (2): 201-206.
11. DiEnno, C.M. & S.C. Hilton, 2005. High school students' knowledge, attitudes, and levels of enjoyment of an environmental education unit on nonnative plants. *J Environ Educ.*, 37(1): 13 – 25.
12. Duman-Yuksel, U. & S. Ozkazanc, 2015. Investigation of the environmental attitudes and approaches of university students'. *Procedia Soc Behav Sci*, 197, 2191-2200.
13. Zelezny, L.C., P. Chua & C. Aldrich, 2000. Elaborating on gender differences in environmentalism. *J Soc Issues*, 56, 443-457.
14. Beiser-McGrath, L.F. & R.A. Huber, 2018. Assessing the relative importance of psychological and demographic factors for predicting climate and environmental attitudes. *Clim. Change*, 149(3): 335-347.
15. Evert, M., H. Coetzee & N. Werner, 2022. Environmental Attitudes Among Undergraduate Students at a South African University. *Interdiscip. j. environ. sci. educ.* 18(1): e2260, 1-13.
16. Patel, J., A. Modi & J. Paul, 2017. Pro-environmental behavior and socio-demographic factors in an emerging market. *Asian J. Bus. Ethics*, 6(2): 189-214, 2017.
17. Amoah, A. & T. Adoah, 2020. Does environmental knowledge drive pro-environmental behaviour in developing countries? Evidence from households in Ghana. *Environ. Dev. Sustain.*, 23, 2719-2738.
18. Okumah, M., P. Ankomah-Hackman & A.S. Yeboah, 2020. Do socio-demographic groups report different attitudes towards water resource management? Evidence from a Ghanaian case study. *GeoJournal*, 1-10.
19. Laroche, M., J. Bergeron & G. Barbaro-Forleo G, 2001. Targeting consumers who are willing to pay more for environmentally friendly products. *J Consum Mark*, 18(6): 503–520.
20. Milfont, T.L., J. Duckitt & C. Wagner, 2010. The higher order structure of environmental attitudes: A cross-cultural examination. *Interam J Psychol*, 44(2): 263-273.