Environmental Literacy of Students in Iranian Eco-Villages

A. H. Alibaygi[1*], and M. Taghibaygi[1]

ABSTRACT

Environmental Literacy (EL) is recognized as a fundamental component in directing individuals' environmental preservation behavior. This descriptive-correlation research was conducted with the main objective of explaining the environmental literacy of eco-villages' students. Data were collected from 175 high school students, selected through census, living in eco-villages in western Iran (n= 175). Findings showed that students' EL was moderate. Three dimensions of EL, including knowledge, attitude, and behavior, were higher in students living in developed Eco-villages than in developing and less developed Eco-villages. Gender, father's job, field of study, and level of Eco-village development had a significant effect on students' EL. However, the effect of educational level and participation in environmental training courses was insignificant. The results of stepwise regressions revealed that the number of years of parents' education religiosity, study hours per week, and satisfaction with living in rural areas explain 49% of the variance of students' environmental literacy.

Keywords: Environmental behavior, Environmental education, Parents' education, Preserving the environment.

INTRODUCTION

Rapid industrialization and technological development, population and urbanization growth, and overexploitation of natural resources have led to severe environmental degradation and imbalances among biosphere components (Kuruppuarachchi *et al*., 2021). Therefore, environmental issues are taken into account as a global threat (Suryawati *et al*., 2020) and the intensity of environmental crises, including droughts, deforestation, soil erosion, habitat degradation, biodiversity loss, flooding, and global warming continues to increase (Wu *et al*., 2020).

In order to balance the relationship between humans and natural environment and to end the above-mentioned crises, scientists and pro-environmental groups have proposed different perspectives, among which eco-villages are more acceptable (Khorasani and Sadi, 2020). Eco-villages have appeared as possible solutions to environmental problems by creating self-sufficient communities to diminish the negative effects of globalization (Acclolydias and Chevitarese, 2017). Gilman (1991) defines the eco-village as a human-scale settlement with full properties that harmlessly integrates human activities into the natural environment, supports healthy development, and can be indefinitely sustained in the future. Eco-villages can potentially be positive role models for other villagers in environmental preservation (Moravcikova and Furjeszova, 2018).

Given the importance of eco-villages in preserving the environment since its official presentation in 1991 by Robert Gilman, many countries, including Germany, Ireland, Scotland, Hungary, Slovakia, India, Canada, Japan, Africa, Brazil and so forth, have brought up the development of eco-villages

[1] Department of Agricultural Extension and Education, Faculty of Agriculture, Razi University, Kermanshah, Islamic Republic of Iran.
*Corresponding author; e-mail: baygi1@gmail.com

as a solution to environmental problems (Mahdavi and Hatami, 2020; Bocco *et al*., 2019). Eco-villages, however, are an unknown subject in Iran. Yet, few studies have been done in this regard, despite the fact that Iran's environment is deteriorating and there are many environmental problems in the country, such as land subsidence, being among the top ten countries in the world in terms of wetland destruction and desertification, soil erosion rate, which is six times the world standard (Mahdavi and hatami, 2020). One of the few studies on Iranian Eco-villages is a study performed by Barani *et al*. (2018). In their study, the eco-villages of Kermanshah Province, in western Iran, were identified based on three ecological, social and spiritual-cultural dimensions and the required solutions for their development were presented. In the study by Barani *et al*. (2018), 44 villages of Kermanshah Province, which would be closer to the eco-village concept, and its general characteristics were spotted, of which 15 were much closer to this concept. These villages were then categorized into three clusters in terms of sustainable development: developed, developing and less developed. Barani *et al*. (2017) pointed out that some of these eco-villages would be declining in terms of environmental sustainability, thereby emphasizing on promoting the EL of the eco-villages inhabitants. Due to the effect of eco-villages in solving environmental problems and the need to improve the EL of their inhabitants, in this study, the EL of high school students living in these eco-villages has been evaluated in order to plan environmental training to promote the EL of the future and present generations living in them based on the variables affecting EL (Kaya and Elster, 2018; Durmus and Kinaci, 2021; Orbanic and Kovac, 2021; Iwaniec and Curdt-christiansen, 2020; Goulgouti *et al*., 2019). Furthermore, improvement of the EL of young people living in eco-villages can important. Because EL is far beyond basic literacy and, in addition to the sustainable use of natural resources and the ability to understand an environmental problem, it also includes environmental knowledge, attitudes and behaviors (Maurer and Bogner, 2020 ; Eren, 2020)

According to Roth (1992), it would be of great importance to analyze the EL of eco-village residents: When environmental problems arise, an EL citizen would recognize them, evaluate environmental issues before taking action, bring up long-term benefits, become a lifelong learner to solve environmental problems, feel responsible for public and private property, distinguish the needs of future generations, and try to preserve the diversity of the environment. This person can have a positive effect on the earth and critical thoughts about his/her surroundings; as a result, his/her attitude towards the earth's ecology is sensitive and accompanied by sustainable behavior.

Strengthening the EL in high school students living in eco-villages would be extremely important to deal with current and emerging environmental challenges and sustainable development of eco-villages (Stevenson, 2013）.

This group would join the workforce in the future and make decisions about community and environmental issues, their education should be emphasized as a top priority (Shamuganathan and Karpudewan, 2015) and conducting empirical research examining their EL stimuli has been considered important (Stevenson *et al*., 2013). Therefore, many scholars are concerned about the EL of high school students (Azadkhani *et al*., 2018; Heidari Sareban and Saeb, 2019; Shamuganathan and Karpudewan, 2015; Stevenson *et al*., 2013).

Considering the fact that strengthening Environment Literacy (EL) in students is actually significant to face environmental challenges, it would be fundamental to carry out empirical studies that comprehensively assess the components of EL (Stevenson *et al*., 2013). In this research, the level of EL of high school students living in eco-villages was investigated in order to plan

environmental education courses for the next generation living in these areas.

Given the geographical, social, economic and environmental situation of eco-villages in western Iran, the improved EL of young people living in eco-villages as the future cultural leaders of the society could contribute to the sustainable development of communities through strengthening the adaptability spirit, preserving natural resources, and sense of responsibility (Barani *et al*., 2017).

A common assumption in this field would be that people who are more informed about the environment might have a better attitude toward it and would be more likely to behave in an environmentally responsible manner (Yilmaz, 2021). Many studies, on the other hand, have associated behavior with the variables such as knowledge and attitude (Geiger *et al*., 2018). In the current study, therefore, three dimensions of EL defined by Maurer and Bogner (2020) including knowledge, attitude, and behavior were inquired.

Frick *et al*. (2004) have subdivided knowledge into three categories: Factual knowledge, Action-related knowledge, and Effectiveness knowledge. Factual knowledge refers to basic knowledge about exploring the causes of environmental problems. Action-related knowledge implies the human ability to take extra-environmental action based on environmental knowledge. Factual and action-related knowledge form the basis of effectiveness knowledge, referring to the ability to analyze the potential of different behaviors of human in preserving the environment. Education level and socio-cultural factors can influence environmental knowledge (Kollmuss and Agyeman, 2002; Levy *et al*., 2016).

One of the most complete tools for measuring the environmental attitudes of adolescents has been developed by Bogner (2018). In this tool, three important components of environmental attitude, including preservation, utilization, and appreciation have been analyzed (Maurer

and Bogner, 2020). Environmental behavior means the behaviors of individuals at home, school and community that are done according to environmental considerations and along with the environment (Salimian Rizi *et al*., 2019). One of the most reliable tools to measure the environmental behavior of adolescents was developed by Frick *et al.* (2004) called "General Ecological Behavior (GEB)". This tool, in turn, consists of six sub-scales: Consumerism, Energy, Mobility and Transport, Recycling, Vicarious behavior, and Waste avoidance. EL and effective variables has been evaluated in various studies. Yilmaz (2021) concluded that Turkish teachers of social studies have moderate environmental knowledge and environmental behavior. In this study, the effect of gender on the EL of teachers was also investigated and it was found that this variable did not affect the level of EL of teachers.

The results of the Durmus and Kinaci (2021) study revealed that environmental education leads to the formation of environmental attitude and positive behavioral changes.

Kuruppuarachchi *et al*. (2021) determined a relationship between income and family education level with the students' environmental knowledge. According to Wu *et al* (2020), the average score of EL of Beijing citizens was 3.77 out of 5, indicating the necessity for environmental education for citizens. Also, based on the results, women and educated people had higher EL. According to Iwaniec and Curdt-Christiansen (2020), EL would be related to socio-economic status and age.

In the study of EL of rural women in western Iran, Pourghasem *et al.* (2020) came to the conclusion that their environmental knowledge was low. The level of EL of women in different townships of Kermanshah Province would differ according to the various degrees of development, such that rural women in more developed areas had higher environmental knowledge and skills. Mihanpour *et al*. (2020) found that there would be a

significant relationship between age, education, income, marital status, and employment status of citizens with their EL dimensions (i.e. knowledge, attitude, behavior). Valipour and Farrokhian (2020) upheld the improvement of knowledge level, attitude and environmental behavior of female students in southern Iran after environmental training.

The results from the study by Kaya and Elster (2018) suggested that the level of parents' education had a positive influence on students' EL. According to Hemayatkhah Jahromi *et al.* (2018), there was a significant relationship between the variables of age, field of study, education, and religiosity with students EL. Williams (2017) clarified that the behavioral dimension of EL would be higher among female students, but male students had higher environmental awareness. The study also demonstrated that EL was higher among rural students. Based on the research results of Asteria *et al.* (2016), women who have spiritual EL have higher management skills and commitment to solving environmental problems. According to Nelson (2009), the level of education of parents, including the father, is effective on students' literacy. In general, in most studies such as (Azadkhani *et al.*, 2018; Dolenc Orbanic and Kovac, 2021; Durmus and Kinaci, 2021; Goulgouti *et al.*, 2019; Heidari Sareban and Saeb, 2019; Hemayatkhah Jahromi *et al.*, 2018; Iwaniec and Curdt-Christiansen, 2020; Kollmuss and Agyeman, 2002; Kuruppuarachchi *et al.*, 2021; Maurer and Bogner, 2020; Mihanpour *et al.*, 2020; Rezaei *et al.*, 2015; Seraji and Ghamari vafa, 2016; Shamuganathan and Karpudewan, 2015; Teksoz *et al.*, 2012; Valipour and Farrokhian, 2020; Wu *et al.*, 2020; Yilmaz, 2021) The EL of urban students has been measured.

Few studies have been performed on EL of individuals who have more interaction with the natural environment, including villagers, and especially the inhabitants of eco-villages.

On the other hand, high school is one of the courses in which the necessity of environmental training for sustainable rural development is actually recognized (Salehi and Emam Gholi, 2012). In this course, society expects the school to prepare the next generation of society to play the role of "green citizenship". Thus, it should be noted that high school students can only play the role of green citizenship and help improve environmental conditions if they have environmental knowledge and awareness (Salehi and Emam Gholi, 2012). Therefore, among different social groups, high school students serve a crucial role in preserving the environment. Actually, they have a special position in relation to the environment for several reasons: First, their current behavior influences the environment in which they currently live and, as the next generation who will have the role of the educated in society, will occupy sensitive jobs that are important to environmental preservation (Azadkhani *et al.*, 2018; Heidari Sareban and Saeb, 2019; Jokar and Mirdamadi, 2011; Singh and Abdul Rahman, 2012; Stevenson *et al.*, 2013). As a result, the EL of high school students living in western Iran was examined in this study. Therefore, in this research, the EL of high school students living in the eco-villages of western Iran was investigated. Also, individual variables affecting the level of EL were identified.

MATERIALS AND METHODS

Statistical Population

The eco-villages of western Iran in Kermanshah Province were identified and classified based on ecological, social, and spiritual-cultural dimensions. Ecological aspects included transportation and physical infrastructure, sense of belonging to the place, environmentally friendly agricultural activities, waste management, production and access to organic food, and management of water, energy, and food resources. The social dimensions comprised social capital, health care, network development and

communication services, respect for differences, diversity and tolerance, conflict management, education, health care, sustainable local economy. Also, spiritual-cultural included cultural sustainability, art and leisure, social cohesion, resilience, a clear three-dimensional image of the future, peace and global awareness, preservation of common cultural heritage, intangible cultural heritage, familiarity with village history, and respect for customs (Barani *et al*., 2018).

The statistical population of this descriptive-correlation study, selected through census, consisted of 190 high school students living in these eco-villages (N= 190). A total of 175 questionnaires were completed (Return rate= 92.10%).

Study Area

Kermanshah Province in the west of Iran is the seventeenth province of Iran where fertile soil and suitable climate has made it one of the agricultural hubs of Iran. Barani *et al* (2018) spotted 15 eco-villages, namely, Zardouvi, Hajij, Satyari, Nasmeh, Darian, Parian, Gholi Gholi, Kondoleh, Zardeh, Patagh, Sherkan, Houri Abad, Choghagino, Totshami and Mazidi in this province (Figure 1).

Research Tool

The research tool was a four-part questionnaire. The first part was the Environmental Knowledge Measurement Scale with three components of factual knowledge (10 items), action-related knowledge (11 items), and effectiveness knowledge (9 items), with a total of 30 four-choice questions. A score of one was given for the correct answer and zero for the wrong answer. These questions were designed in consultation with five ecologists and environmentalists familiar with the concept of eco-village at the Razi University. An educational psychologist at the Razi University also inspected the questions in terms of difficulty and discrimination index. The mean scores of difficulty and discrimination indices of the questions were found to be 0.49 and 0.32, respectively. Indeed, 76.3% of the questions had appropriate discrimination index. The sum of the difficulty and the discrimination indices showed that 22 questions (73%) were ideal.

The second part consisted of Environmental Attitude Measurement Scale with three components: Preservation (6 items), Utilization (7 items), and Appreciation (7 items), and a total of 20 items with Likert scale (From 1= Strongly disagree to 5= Strongly agree). The third
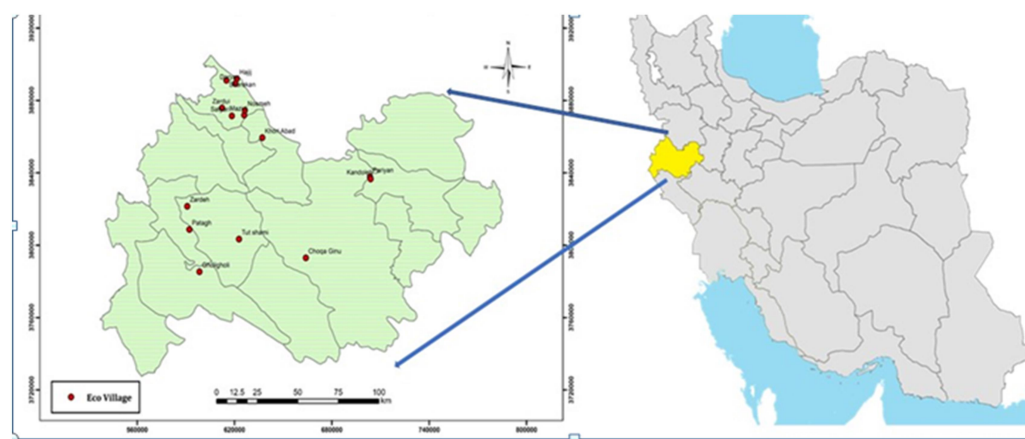

Figure 1. Location of the study area in Iran.

part of the scale was the Environmental Behavior Measurement Scale with 40 items: Energy component (6 items), Mobility and Transport (3 items), Avoidance Waste (8 items), Recycling (6 items), Consumerism (8 items), and Vicarious behaviors (9 items) in the format of a five-part Likert scale: 1= Never, 2= Seldom, 3= Sometimes, 4= Often, 5= Very often. Knowledge scores were converted to a range of zero to five. Therefore, the scores of all students were added up and divided by 6, and then added to the average score of environmental attitude and environmental behavior in order to calculate the level of EL.

Having designed the questions of the second and third parts, 9 experts in the field of rural management, rural sociology, and environment and rural development reviewed the questionnaire and confirmed its validity. While performing a pilot study in the same statistical population, Cronbach's Alpha coefficient was calculated to assess the reliability of the questionnaire; and the attitude (α= 0.86), behavior (α= 0.91), and overall (α= 0.89) sections were obtained.

Part 4 consisted of individual characteristics of students, including gender, participation in environmental training courses, field of study, hours of study per week, number of years of parents' education, father's job, level of eco-village development, religiosity, level of education, and satisfaction with life in the village. The questionnaires (without mentioning the names of the respondents) were completed by the individual interview method.

Data Analysis

The mean, standard deviation, and percentage were used to describe the personal characteristics and EL of students. Stepwise regression was used to determine the personal factors (satisfaction with living in the village, study hours in week, religiosity, and parents' number of years of education) affecting EL. Pearson's correlation coefficient was used to determine the correlation between environmental knowledge, attitude and behavior. ANOVA and t-test were used to determine the effect of personal variables (grade, field of study, father's job, gender, level of development of eco-village, and participation in an environmental training course) on EL. Data analysis was applied using SPSS$_{win22}$ software.

RESULTS

Of the 175 responsive students, 18 lived in developed, 37 in developing, and 120 in less-developed eco-villages: The number and population of less-developed eco-villages was more than the other eco-villages.

The majority of respondents were studying in vocational and technical fields (27.4%), their fathers were farmers (66.3%), and mostly did not participate in any environmental training courses (63.4%). Also, 35.4% of students were studying in the first grade of high school. The average study time of students per week was 12.32 hours (standard deviation 6.38) and the average years of parent's education were 7.97 years (standard deviation 3.90).

The students were asked to what extent they would consider themselves religious. They expressed their religiosity level above average (3.18 out of 5) and their satisfaction with life in rural areas below average (2.94 out of 5) (Table 1).

Based on the findings, students' environmental knowledge was moderate and their effectiveness knowledge was lower than that of the other two components. Average score of students' environmental knowledge living in developed eco-villages was higher than those living in the other eco-villages. Findings suggested that students in developing eco-villages scored lower in terms of environmental knowledge than the other two groups (Table 2).

Table 1. Individual characteristics of students.

Individual characteristics	Subgroups	Students living in developed eco-villages (n= 18)	Students living in developing Eco-villages (n= 37)	Students living in less-developed eco-villages (n= 120)	Total sample (n= 175)
Gender	Female	7* (4.0%**)	17 (9.7 %)	48 (27.4%)	72 (41.1%)
	Male	11 (6.3%)	20 (11.4%)	72 (41.1%)	103 (58.9%)
Field of Study	Mathematics and Physics	6 (3.4%)	4 (2.3%)	29 (16.6%)	39 (22.3%)
	Sciences-Experimental	5 (2.9%)	13 (7.4%)	29 (16.6%)	47 (26.9%)
	Sciences-Humanities	3 (1.7%)	14 (8.0%)	24 (13.7%)	41 (23.4%)
	Vocational and Technical Fields	4 (2.3%)	6 (3.4%)	38 (21.7%)	48 (27.4%)
Father's job	Non-farmer (Self-employed and public jobs)	5 (2.9%)	14 (8.0%)	40 (22.9%)	59 (33.7%)
	Farmer	13 (7.4%)	23 (13.1%)	80 (45.7%)	116 (66.3%)
Participation in an environmental training course	No courses	10 (5.7%)	29 (16.6%)	72 (20.0%)	111(63.4%)
	One course	6 (3.4%)	6 (3.4%)	41 (23.4%)	53 (30.3%)
	Two courses	2 (1.1%)	2 (1.1%)	3 (1.7%)	7 (4.0%)
	Three courses	0 (.0%)	0 (0%)	4 (2.3%)	4 (2.3%)
Level of education	1st Grade	5 (2.9%)	16 (9.1%)	41 (23.4%)	62 (35.4%)
	2nd Grade	5 (2.9%)	10 (5.7%)	44 (25.1%)	59 (33.7%)
	3rd Grade	8 (4.6%)	11 (6.3%)	35 (20.0%)	54 (30.9%)
		SD	SD	Mean	SD
		Mean			
Study hours per week	4.82	12.28	6.75	12.32	6.38
Number of years of parents' education	2.91	7.87	3.97	7.97	3.90
Religiosity	1.37	3.26	1.24	3.18	1.273
Satisfaction with living in the village	1.25	2.97	1.32	2.94	1.278

** and *: Means frequency and frequency percentage. (The number and population of less developed eco-villages was more than other eco-villages).

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Table 2. Environmental knowledge of students (Factual Knowledge, Action Related Knowledge, Effectiveness Knowledge).[a]

Dimensions	Students living in developed eco-villages (n= 18)		Students living in developing eco-villages (n= 37)		Students living in less-developed eco-villages (n = 120)		Total sample (n= 175)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Factual Knowledge	3.28	0.712	2.99	0.672	3.23	0.764	3.19	0.744
Action Related Knowledge	3.06	0.658	2.84	0.551	3.23	0.750	3.13	0.718
Effectiveness Knowledge	2.87	0.719	2.51	0.782	2.78	0.838	2.73	0.820
Environmental Knowledge	3.07	0.353	2.79	0.419	3.10	0.457	3.03	0.455

[a] (The number and population of less developed eco-villages was more than other eco-villages). Students have positive environmental attitudes (Mean= 3.74) (Table 3).

Table 3. Students' environmental attitude (Utilization, Preservation, Appreciation).[a]

Dimensions	Students living in developed eco-villages (n = 18)		Students living in developing eco-villages (n= 37)		Students living in less-developed eco-villages (n= 120)		Total sample (n= 175)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Utilization	4.17	0.347	3.83	0.727	3.84	0.763	3.87	0.727
Preservation	4.10	0.447	3.85	0.695	3.78	0.786	3.82	0.743
Appreciation	3.70	0.385	3.56	0.463	3.51	0.604	3.54	0.558
Environmental attitude	3.99	0.278	3.75	0.546	3.71	0.651	3.74	0.605

[a] (The number and population of less developed eco-villages was more than other eco-villages).

Students living in eco-village expressed moderate environmental behavior. According to Table 4, the environmental behavior of students in developed eco-villages was better than the others. Those in developed eco-villages scored higher in all cases, except consumerism compared to the other two eco-villages.

According to the findings of Table 5, EL of students living in developed eco-villages is higher than other students in the two dimensions of Environmental Behavior and Environmental Values. In general, the EL of students living in developed eco-villages was higher than other students.

ANOVA and t-tests were applied to compare the average of different groups in terms of significance (Levene's test was not significant as a prerequisite for performing parametric tests).

According to Table 6, there is a positive and meaningful correlation between the components of students' EL (knowledge, attitude and behavior).

According to Table 7, there is a significant difference between the amount of environmental knowledge, attitude and behavior in eco-villages with different levels of development.

Based on the results of t-test, there was a significant difference between the average EL of male and female students, and female students had higher EL. Moreover, there was a significant difference between the average EL of students whose fathers had agriculture and non-agriculture occupations. Students

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Table 4. Environmental behavior of students (Mobility and transport, Energy, Waste Avoidance, Recycling, Consumerism, Vicarious).[a]

Dimensions	Students living in developed eco-villages (n= 18)		Students living in developing eco-villages (n= 37)		Students living in less-developed eco-villages (n= 120)		Total sample (n= 175)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Mobility and transport	4.07	0.371	3.75	0.452	3.59	0.781	3.67	0.704
Energy	3.76	0.444	3.79	0.342	3.59	0.552	3.65	0.509
Waste Avoidance	3.24	0.680	3.33	0.515	3.28	0.594	3.28	0.585
Recycling	3.31	0.408	3.07	0.632	2.87	0.653	2.96	0.642
Consumerism	1.99	0.165	1.94	0.342	2.02	0.351	2.00	0.335
Vicarious	2.00	0.256	1.94	0.407	1.94	0.437	1.94	0.414
Environmental behavior	3.06	0.183	2.97	0.300	2.88	0.305	2.92	0.299

[a] (The number and population of less developed eco-villages was more than other eco-villages).

Table 5. EL of students (Environmental Behavior, Environmental Attitude, Environmental Knowledge).[a]

Dimensions	Students living in developed eco-villages (n= 18)		Students living in developing eco-villages (n= 37)		Students living in less-developed eco-villages (n= 120)		Total sample (n= 175)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Environmental Behavior	3.06	0.183	2.97	0.300	2.88	0.305	2.92	0.299
Environmental Attitude	3.99	0.278	3.75	0.546	3.71	0.651	3.74	0.605
Environmental Knowledge	3.07	0.353	2.79	0.419	3.10	0.457	3.03	0.455
Environmental literacy	3.37	0.173	3.17	0.305	3.23	0.299	3.23	0.294

[a] (The number and population of less developed Eco-villages was more than other Eco-villages).

Table 6. Correlations of students' EL components (Knowledge, Attitude and Behavior).

Dimensions	Environmental Knowledge	Environmental Values	Environmental Behavior
Environmental Knowledge	1	0.340*	0.427**
Environmental Values		1	0.441**
Environmental Behavior			1

** and *: Means significant at 1, and 5% significance levels, respectively. (The number and population of less developed eco-villages was more than other eco-villages).

Table 7. F values of EL dimensions based on the development level of Eco-villages.

Dimensions	Developed	Developing	Less-developed
Environmental Knowledge	3.495**	3.274*	3.375*
Environmental Values	3.474*	3.215*	2.037*
Environmental Behavior	3.425*	3.114*	2.025*

** and *: Means significant at 1, and 5% significance levels, respectively. (The number and population of less developed eco-villages was more than other eco-villages).

whose father's occupation was agriculture had higher EL.

According to the results from ANOVA test, individuals with various fields of study had different levels of EL. Also, the level of eco-village development had an impact on the level of EL of students, but no significant difference was observed between the EL of students with different educational levels (Table 8).

According to the results of ANOVA test (Table 8), expressing a significant difference between the level of development of students and their field of study with their EL, Tukey post hoc test (Table 9) was applied in order to specify the differences between groups in terms of EL. Based on the results, the EL of students living in developed eco-villages was significantly different with that of students in developing eco-villages at the 0.05 level. Students living in developed eco-villages had higher EL (Table 9).

The result of Tukey test also displayed that there is a significant difference between students of Sciences and Humanities with students of vocational and technical fields in terms of EL at the 0.05 level; so that vocational and technical fields' students have higher EL (Table 10).

Stepwise regression model was applied to evaluate the influence of the variables of satisfaction with living in rural areas, religiosity, study hours per week, and number of years of parents' education on EL. A summary of the findings is presented in Table 11. In the first step, the variable of life satisfaction in village (X1) entered the regression equation. The R^2 value is equal to 0.221. This means that this variable would anticipate 22% of students' EL. In the second step, the study hours per week (X2) entered the equation and anticipated 12% of EL. The third variable entered into the equation was the religiosity level (X3) and explained 8% of the variance of EL. Finally, the education years of the parents (X4) predicted 7% of the variance of students' EL. Overall, all four variables were able to explain 49% of the variance of students' EL. Accordingly, the regression equation was presented as follows.

$$Y = 2.836+0.46 \ (X1)+0.37 \ (X2)+0.41 \ (X3)+0.1.2 \ (X4)$$

According to the regression equation, satisfaction with living in the village, study hours in week, religiosity, and number of years of education of parents have a positive and significant effect on EL (Table 11).

DISCUSSION

Students living in eco-villages of the west of Iran have moderate environmental knowledge. Comparison of the environmental knowledge levels exhibits that Factual Knowledge and Effectiveness Knowledge is higher in students living in developed eco-villages than in other students (Table 2), illustrating that these students

Table 8. Differences between students' individual characteristics and their EL.

	Variables	t Test (P)	F test (P)	Mean
Gender	Female	2.361 (0.019)[*]	-	3.29
	Male			3.19
Father's job	Non-farmer	-2.123 (0.036)[*]	-	3.16
	Farmer			3.26
Level of education		-	0.020 (0.980)	
Field of study		-	3.415 (0.019)[*]	
Participation in an environmental training course		-	0.525(0.666)	
Level of development of eco-villages		-	3.079 (.049)[*]	

* Means significant at 5% significance levels, respectively. (The number and population of less developed eco-villages was more than other eco-villages).

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Table 9. Tukey post hoc test on students' EL based on level of development of eco-villages.

Level of bevelopment of eco-villages (I)	Level of bevelopment of eco-village (J)	Mean	Std. beviation	Mean bifference (I-J)	Std. error	Sig.	Lower bound	Upper bound
Developed	Developing	3.37	0.173	0.206*	0.083	0.038	0.01	0.40
	Less-developed			0.147	0.073	0.116	-0.03	0.32
Developing	Developed	3.17	0.305	-0.206*	0.083	0.038	-0.40	0.00
	Less-developed			-0.060	0.055	0.517	-0.19	0.07
Less-developed	Developed	3.23	0.299	-0.147	0.073	0.116	-0.32	0.03
	Developing			0.060	0.055	0.517	-0.07	0.19

* Means significant at 5% significance levels, respectively. (The number and population of less developed eco-villages was more than other eco-villages).

Table 10. Tukey post hoc test on students' EL based on field of study.

Field of study (I)	Field of study (J)	Mean	Std. deviation	Mean difference (I-J)	Std. error	sig	Lower bound	Upper bound
Mathematics & Physics	Sciences-Experimental	3.26	0.265	0.091	0.062	0.463	-0.07	0.25
	Sciences-Humanities			0.094	0.064	0.459	-0.07	0.26
	Vocational and Technical Fields			-0.069	0.062	0.685	-0.23	0.09
Sciences-Experimental	Mathematics & Physics	3.17	0.299	-0.091	0.062	0.463	-0.25	0.07
	Sciences-Humanities			0.003	0.061	1.000	-0.16	0.16
	Vocational and Technical Fields			-0.160*	0.059	0.037	-0.31	0.00
Sciences-Humanities	Mathematics & Physics	3.16	0.311	-0.094	0.064	0.459	-0.26	0.07
	Sciences-Experimental			-0.003	0.061	1.000	-0.16	0.16
	Vocational and Technical Fields			-0.163*	0.061	0.041	-0.32	0.00
Vocational and Technical Fields	Mathematics & Physics	3.33	0.272	0.069	0.062	0.685	-0.09	0.23
	Sciences-Experimental			0.160*	0.059	0.037	0.01	0.31
	Sciences-Humanities			0.163*	0.061	0.041	0.00	0.32

* Means significant at 5% significance levels, respectively. (The number and population of less developed eco-villages was more than other eco-villages).

have a more accurate perception of environmental issues and problems, and a better capability to potentially assess the environmental behaviors. However, students living in less-developed eco-villages had higher Action Related Knowledge, which demonstrates that they were more able to cope with environmental problems.

Attitude is regarded an important variable to influence behavior. Students' environmental attitudes were moderate to high and close to good, indicating that

Table 11. Predictors of students' EL based on linear regression results.[a]

Steps	Variables	R	R^2	Std.	b	Std. error	β	Sig.
1	Satisfaction with living in the village (X_1)	0.470	0.221	0.290	0. 46	0.017	0.167 (< 0.005)	0.047
2	Study hours in week (X_2)	0.584	0.342	0.028	0.37	0.003	0.154 (< 0.005)	0.026
3	Knowing yourself Religious (X_3)	0.649	0.421	0.028	0. 41	0.017	0.149 (< 0.005)	0.038
4	Number of years of education of parents (X_4)	0.700	0.490	0.028	0.1.2	0.006	0.146 (< 0.005)	0.045
	Constant	-	-	-	2.836	0.095	-	-

[a] The number and population of less developed eco-villages was more than the other Eco-villages.

students had a positive attitude towards nature, its value, and the need to preserve it. All three dimensions of environmental attitudes including Utilization, Preservation, and Appreciation, were also higher in students living in developed eco-villages than in other students.

Students' environmental behaviors, which depend on the way they treat the environment at school, community, and home, were not at the desired level (Table 4). Comparison of students in the three categories of Eco-villages represents that students in developed Eco-villages have more acceptable behaviors toward the environment. Despite the fact that the behavior of individuals can influence the severity of environmental crises and eco-villages have been taken into account as one of the solutions to environmental problems (Dias _et al._, 2017), students living in Eco-villages in Iran, who form the next generation of society, do not have good behavior toward the environment. This can spoil the environmental sustainability of eco-villages, as pointed out by Barani _et al._ (2017). Given that social capital contributes greatly to the sustainable development of eco-villages (Williams, 2006) and that there are treasured assets such as participation,

collective action, unity, security, etc. in the eco-villages of the study area, these resources can be used to promote the students' EL, especially in attitude and behavior.

Participatory and value-oriented activities have also been suggested to substitute for top-down thinking in Iran for sustainable planning and management of eco-villages and student participation to be the basis of these plans to strengthen the students' responsible behaviors towards the environment. For example, development of cultural and sporting activities such as cultural competitions (reading, writing stories, and painting), festivals and local sports with environmental issues, while raising student participation, will enhance their EL for the development of eco-villages.

Based on the positive environmental attitude of students, it can be concluded that educational institutions have been successful in creating a positive attitude towards the environment, but it has not changed the attitude of students towards environmental preservation. Thus, it would be necessary to study the reason for this. Also, it is proposed that the participation of students in environmental training activities and projects should be provided by changing

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environmental training methods in schools into modern methods. For example, by launching websites and educational publications in schools and through internships, and through this, to contribute to the development of EL of students. Use of reference groups can also be effective in preserving the environment, because students are very willing to emulate these groups. Providing training videos on environmental preservation can make it a value and norm among students.

Female students, and students whose father is farmer, have higher EL. Given that rural women and girls in Iran have more contact with the environment and nature, the high EL of female students compared to male students can be due to this issue. The result of Williams' study (2017) showed that the environmental behaviors of female students were better than male students. On the other hand, male students had higher environmental knowledge. However, according to the results of Yilmaz (2021), no difference was observed between the gender of teachers and their EL, which could be due to the difference in the statistical population.

As women are the main factor in transmitting the culture of environmental preservation to future generations, it is possible to foster the culture and behavior of environmental preservation in female students and give girls more priority in preserving the environment for the next generations. On the other hand, due to the role of rural women in agricultural development, prioritizing their training can contribute to the reduced use of pesticides and optimal use of inputs for the environmental preservation.

Students whose father's job is farming would be in regular contact with nature and be more interested in learning about the environment than others, given that one of the most important features of eco-villages is eco-friendly farming activities and sustainable agricultural development (Khorasani and Sadi, 2020). This can be the reason for the high EL of these students

compared to students whose father's job is different.

Students studying in vocational and technical fields had higher EL. In Iran, these students are more practically taught various topics than other fields of study, while one of the main branches of vocational and technical fields for rural students is agriculture, which is related to the environment and environmental issues. These cases could be the reason for the high EL of these students. Furthermore, presence of students in natural areas, having an expert teacher in the field of environment in schools, holding festivals on environmental preservation in schools, and monitoring environmental actions in the family and community would be taken into account as good measurements. Overall, besides learning through formal curricula, it is important to elevate students' EL through non-formal education (for example, learning through social networks, studying environment-related websites, membership in relevant non-governmental organizations) to extend personal environmental responsibility. Hemayatkhah Jahromi *et al.* (2018) also showed that the field of study of students is effective on EL.

Due to the fact that developed Eco-villages pay more attention to environmental preservation, (Based on the classification of Eco-villages by Barani *et al.* (2018)) students living there also have higher EL. This result was also confirmed in the study of Pourghasem *et al.* (2020). They emphasized that rural women in more developed areas have higher environmental knowledge and skills.

Participation rate in environmental training courses and students' level of education did not influence EL. The reason for this could be the limited number environmental training courses for students, as well as the lack of differences in the provision of environmental training materials for different levels of education in schools, which stress the necessity for further study.

Students who are more satisfied with living in the village would have higher EL. More satisfaction with living in the village would raise the sense of belonging to the village, which in turn helps to improve EL. According to Pourghasem *et al*. (2020), belonging to the village has a positive effect on the EL of rural women.

The positive effect of study hours per week on EL could be concluded that students also study in the field of environmental preservation. Therefore, it'd be possible to help elevate the EL of students living in Eco-villages by holding book reading competitions about the environment.

Angela, a South African environmental scientist, studied Eco-villages from a cultural point of view, declaring that Eco-villages establish cultural and even religious connections by evoking strong and deep feelings in the hearts of inhabitants (Jackson, 2000). In Islam, on the other hand, the environmental preservation has been highly Attitude. Thus, more religious people who adhere to the teachings of Islam would have higher EL (Nabavi and Shahriyari, 2015; Hj.Daud *et al*., 2015). Based on the results of this study, religiousness has a positive influence on EL. Asteria*et al*. (2016) and Hemayatkhah Jahromi *et al*. (2018) have emphasized the existence of this effect in their studies.

Parents' education also has an impact on EL. Parents that are more literate usually place higher value on the environment, thus being more committed to the environment than others. Consequently, their children have higher EL, following their parents. This result is also confirmed by Kaya and Elster (2018), Kuruppuarachchi *et al*. (2021), and Nelson (2009).

CONCLUSIONS

This study aimed to define the EL of students living in eco-villages in western Iran, as the only eco-villages known in Iran, and a basis for appraising the EL of rural students, while paying attention to the eco-villages and their preservation and sustainability, as the Iranian treasures. No research has been performed on the EL of eco-villages inhabitants, especially students living in Iranian eco-villages. Therefore, in some ways, this study could overcome the limits to the study on EL among eco-villages inhabitants, following the claim that the study of EL of such inhabitants would be necessary to ensure their environmental sustainability (Barani *et al*., 2018). It is important to carry out a survey of the EL of these students because they are the next generation of eco-villages and can influence the sustainability or *unsustainability* of villages by their behavior. As they will join the workforce in the future, they need to make decisions about community and environmental issues (Shamuganathan and Karpudewan, 2015). In this study, some variables have been identified that make an impact on the EL of students living in eco-villages, which could improve their EL. Due to the fact that eco-villages in Iran are not in a good environmental condition (Barani *et al*., 2017), plans can be made based on this study results and known variables to develop EL of their inhabitants. The findings also highlight the need to improve environmental training programs in schools by covering a wider range of topics about the lessons by which we can preserve the environment in our daily lives. However, generalization of results to eco-villages of other countries should be made with caution. Finally, more studies are suggested to recognize other variables affecting the EL of eco-villages inhabitants.

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سواد زیست محیطی دانش‌آموزان در اکوویلیج‌های ایران

ا. ح. علی بیگی، و م. تقی بیگی

چکیده

سواد زیست‌محیطی به عنوان مؤلفه‌ای بنیادین در هدایت رفتارهای حفاظت زیست‌محیطی افراد شناخته شده است. این تحقیق توصیفی- همبستگی با هدف تبیین سواد زیست محیطی دانش آموزان ساکن اکوویلیج‌ها

انجام شد. داده‌ها از ۱۷۵ تن از دانش‌آموزان دبیرستانی ساکن اکوویلیج های غرب ایران در استان کرمانشاه به روش تمام شماری گردآوری شد (n=175). یافته‌ها نشان داد که سواد زیست محیطی دانش‌آموزان در حد متوسط است. هر سه بعد سواد زیست محیطی یعنی دانش، نگرش و رفتار در دانش‌آموزان ساکن در اکوویلیج‌های توسعه یافته نسبت به دانش‌آموزان در اکوویلیج‌های در حال توسعه و کمترتوسعه یافته بالاتر بود. جنسیت، شغل پدر، رشته تحصیلی و سطح توسعه یافتگی اکوویلیج بر سواد زیست محیطی دانش‌آموزان تأثیر معنی‌دار داشت. تأثیر پایه تحصیلی و شرکت در دوره‌های آموزشی زیست محیطی معنی‌دار نشد که نشان می‌دهد توجه چندانی به آموزش محیط زیست برای دانش‌آموزان صورت نگرفته است. بر اساس نتایج رگرسیون گام به گام، چهار متغیرتعداد سال‌های تحصیل والدین، مذهبی بودن، ساعت مطالعه در هفته و رضایت از زندگی در روستا ۴۹ درصد از واریانس سواد زیست محیطی دانش‌آموزان را تبیین نمودند.