

DETERMINATION OF ECOLOGICAL FOOTPRINT AWARENESS OF PRESCHOOL TEACHER CANDIDATES

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ABSTRACT

Ecological footprint is biologically the fertile soil and water area needed to produce the resources that an individual, community or activity consumes and to dispose of the waste created with current technology and resource management. Ecological footprint also refers to the association of sustainability between the rate of human consumption of earth resources and health of the ecosystem. Knowledge of the meaning and components of ecological footprint, as well as, what needs to be done to reduce it would enable students to more readily convert this information into a positive attitude and behavior. Therefore, this study was planned and conducted in order to investigate ecological footprint awareness in preschool teacher candidates with respect to their demographic characteristics. The study group comprised 170 teacher candidates who attended Kırıkkale University, Faculty of Education, Department of Primary Education, Division of Preschool Education. The "Ecological Footprint Awareness Scale" developed by Coşkun and Sarıkaya in 2013 was used as the data collection instrument. T test for two groups and ANOVA for more groups were used in data analysis. The study results revealed significant differences with respect to age, gender, monthly income, parental education level, source of environmental education and environmental perspective ($p < 0.05$).

Keywords: Environment, ecological footprint, teacher candidates.

INTRODUCTION

Ecology is the science of studying and exploring the interactions and relationships between living things and the environment (Çepel, 1992: 12). Inattentive and insensitive treatment of technological progress and industrialization has disrupted earth's ecological balance leading to pollution, extinction of species, depletion of energy resources, depletion of available agricultural land, degradation of tropical forests, reduction of biological diversity, massive radioactive pollution and environmental problems such as nuclear dangers, acid rain, erosion and desertification, toxic wastes, DDT pollution, marine pollution, mercury pollution and rapid population growth (Borden, 1985: 18; Sam et al., 2010: 1).

An important concept emerging with ecological pollution in recent years is the ecological footprint. Mathis Wackernagel and William Rees suggested the concept of ecological footprint in association with sustainable life in the 1990s. Ecological footprint is biologically fertile soil and water area needed to produce the resources that an individual, community or activity consumes and to eliminate the waste created with current technology and resource management. Ecological footprint determines the surface area of the earth needed to obtain nutrients, generate resources, generate energy, eliminate wastes and reduce the amount of carbon dioxide generated by the use of fossil fuels through photosynthesis (Karakas et al., 2016: 1365; Wackernagel and Rees, 1998: 23). Ecological footprint is calculated using the formula given below: Ecological footprint = Consumption x Necessary production area.

As a concept that indicates how much area people use in nature with their current consumption habits and how much area they are going to require in maintaining these habits, ecological footprint provides data that would enable current habits to be adjusted to the benefit of the environment (Öztürk, 2010: 4).

Knowledge, attitude, awareness and consciousness levels of the university students are critical to environmental preservation (Özdemir and Arik, 2013: 641). Research has identified education as the most crucial factor for preventing environmental damage and developing solutions to environmental issues (Oweini and Hourri, 2006: 95; Pearson et al., 2005: 173; Ravindranath, 2007: 191; Taşkın, 2005: 78; Tuncer et al., 2005: 215). The study by Erten (2005) carried out to investigate environmentally friendly behavior in preschool teacher candidates showed that none of the teacher candidates engaged in environmental activities in their spare time, and that they were not worried about current environmental issues and did not have adequate awareness of environmental protection. The study by Çabuk and Karacaoğlu (2003), aimed at examining the opinions of the students attending the Faculty of Education at Ankara University on environmental awareness, revealed that the teacher candidates were not adequately informed about air, water and soil pollution during their formal education and indicated differences in the environmental awareness of the students by various personal characteristics.

The provision of an effective environmental education to promote environmental consciousness is a lifelong endeavor that begins in the preschool period. The impact of the environmental attitude of preschool teachers

on the development of environmental consciousness, as well as, favorable environmental attitude and behavior is undeniable. Characterizing the ecological footprint awareness of preschool teachers and taking necessary measures to promote this awareness is critical to raising environmentally-conscious future generations. Therefore, this study was conducted to investigate the awareness of preschool teacher candidates about ecological footprint by various demographic characteristics.

METHODS

Study Group

The study group of this study comprised 170 teacher candidates who attended Kırıkkale University, Faculty of Education, Department of Primary Education, Division of Preschool Education.

Data Collection Instruments

This study adopted the "Ecological Footprint Awareness Scale" developed by Coşkun and Sarıkaya (2014) as the data collection tool. The scale is a 5-point Likert-type measure consisting of five subscales and 40 items. In addition, there is the question of control that not evaluated in the scale. In the study by Coşkun and Sarıkaya (2014), the reliability results for the Ecological Footprint Awareness Scale items and subscales (food: 0.70, transportation and housing: 0.76, energy: 0.86, waste: 0.81 and water consumption: 0.86) were adequately reliable. The Kaiser Meyer Olkin (KMO) value of the Ecological Footprint Awareness Scale was computed as 0.86 and Bartlett's Test of Sphericity results (χ^2 : 4330.74, sd: 780 $p < 0.05$) were found to be significant.

Data Collection

The study data were gathered by the researchers through face-to-face interviews with the teacher candidates. The teacher candidates were informed about the objective of the study prior to the administration of the questionnaire and those who agreed to participate voluntarily were included in the study. The necessary permits were obtained from the Faculty of Education, Department of Primary Education, Division of Preschool Education prior to the study.

Data Analysis

In the study, the demographic characteristics of the respondents were presented as frequency and percentage distributions. Each item in the Ecological Footprint Awareness Scale of the university students was characterized with percentage distribution, as well as, arithmetic average and standard deviation. As the measurements had a normal distribution in both groups, a t-test was used for two groups and an ANOVA was conducted for more than two groups in the comparison of scale items by respondent characteristics. The t-test is tests hypotheses about the mean of a small sample from a normally distributed population when the

population standard deviation is unknown and examines whether the differences between the samples is statistically significant and whether these differences occurred by chance. On the other hand, an analysis of variance is a method to test if there is a significant difference between the means of one or more unrelated samples (Büyüköztürk, 2010:25). Regression analysis conveys the process of distinguishing two or more related variables as dependent and independent variables and the characterization of their relationship with a mathematical equation. A multiple regression analysis is performed when there is one dependent variable and two or more independent variables (Büyüköztürk, 2010:26).

In addition to correlational analysis, a multiple regression analysis was performed for multi-dimensional investigation of possible associations between variables.

RESULTS

The distribution of the respondents by demographic characteristics is presented in Table 1.

Table 1: Distribution of Students by Demographic Characteristics

Variable	Group	n	Percentage
Year at University	1	34	20.0
	2	50	29.4
	3	36	21.2
	4	50	29.4
Gender	Female	144	84.7
	Male	26	15.3
Age	17-19	48	28.2
	20-22	107	62.9
	23-25	15	8.9
Family Income Level	Income is greater than expenditure.	44	25.9
	Income and expenditure are equal.	94	55.3
	Income does not meet expenditure.	32	18.8
Paternal Education Level	Primary school and below	51	30.0
	Middle school	61	35.9
	High School	43	25.3
	University	13	7.6
Maternal Education Level	Graduate	2	1.2
	Primary school and below	26	15.3

	Middle school	37	21.8
	High School	62	36.5
	University	41	24.1
	Graduate	4	2.4
	School	32	18.8
Source of Environmental Information	Books	48	28.2
	Media	66	38.8
	Family	24	14.1
Environmental Perspective	Knows what to do and is attentive	138	81.2
	Knows what to do but is not attentive	22	12.9
	Does not know what to do and is not attentive	10	5.9
Total		170	100.0

According Table 1, the percentages of the teacher candidates attending the first, second, third and fourth years at the university were 20.0%, 29.4%, 21.2% and 29.4%, respectively. 84.7% of the respondents were female and 15.3% were male. More than half of the teacher candidates (62.9%) were in the 20-22 age group. The majority of the respondents (55.3%) reported having equal family income and expenditure. 35.9% of the teacher candidates had a middle school graduate father while 36.5% had a high school graduate mother. The majority of the respondents (81.2%) stated that they knew what to do and were attentive to the environment. 38.8% and 28.2% of the respondents reported the media and books as the source of their environmental knowledge.

The subscales the ecological footprint awareness levels of the respondents concentrated on are given in Table 2.

Table 2. Descriptive Statistics for the Subscales of the Ecological Footprint Awareness Scale

Subscale	Min	Max	Mean	Std. Dev.
Food	1.50	5	3.26	0.70
Transportation and Housing	1.60	5	3.37	0.78
Energy	1.36	5	3.87	0.81
Waste	1.44	5	3.73	0.81
Water Consumption	1.40	5	3.84	0.89

Table 2 shows that energy (3.87) was the subscale the preschool teacher candidates scored the highest, followed by water consumption (3.84), waste (3.73), transportation and housing (3.37) and food (3.26).

Table 3. Comparison of the Ecological Footprint Awareness Scores of the Respondents by Gender

Variable	N	Mean	SD	T	p	
Gender	Female	144	172.4792	28.83543	5.80	.000*
	Male	26	136.3077	31.63766		

*p<0.01

The comparison of the Ecological Footprint Awareness scores of the respondents with respect to gender is presented in Table 3. The results revealed a significant difference in ecological footprint awareness by gender ($p < 0.01$). Female students had a greater awareness of ecological footprint than male students.

Table 4 shows the ANOVA results for the overall scale scores of the respondents with respect to demographic variables.

Table 4. ANOVA Results for Demographic Variables

		Sum of Squares	Sd	Mean of Squares	F	p	Significant Difference
Age	Between groups	9867.47	2	4933.73	5.059	.007*	20-22 years old>17-19 years old
	Within group	162873.04	167	975.28			
	Total	172740.52	169				
Family Income Level	Between groups	12642.184	2	6321.092	6.594	.002*	Income is greater than expenditure>Income and expenditure are equal>Income does not meet expenditure
	Within group	160098.339	167	958.673			
	Total	172740.524	169				
Maternal Education Level	Between groups	33415.767	4	8353.942	9.893	.000**	University>High School>Middle School>Primary School or below
	Within group	139324.756	165	844.392			
	Total	172740.524	169				
Paternal Education Level	Between groups	16075.930	4	4018.982	4.233	.003*	University>Middle School
	Within group	156664.594	165	949.482			
	Total	172740.524	169				

	Between groups	26759.761	3	8919.920	10.143	.000**	
Source of							
Environmental	Within group	145980.762	166	879.402			Family>Books>Media
Information							
	Total	172740.524	169				
	Between groups	48736.745	2	24368.373	32.818	.000**	Knows what to do and is
Environmental							attentive>Knows what to do
Perspective	Within group	124003.779	167	742.538			but is not attentive>Does
							not know what to do and is
	Total	172740.524	169				not attentive

*p<0.05, **p<0.01

The ecological footprint awareness of the respondents displayed a significant difference by age ($p<0.05$). The teacher candidates aged 20-22 had higher ecological footprint awareness in comparison to those in the 17-19 age group.

The results revealed a significant relationship between family income level and ecological footprint awareness ($p<0.05$). The respondents who had an income greater than their expenditure had a greater awareness of ecological footprint.

The results yielded a significant relationship between maternal education level and ecological footprint awareness ($p <0.01$). Respondents whose mothers had a university degree were found to have the highest ecological footprint awareness. There was also a similar relationship for paternal education level and children of university graduate fathers scored higher than those of fathers with middle school degrees.

Ecological footprint awareness of the respondents varied by the source of environmental information ($p<0.01$). The respondents who reported acquiring their environmental knowledge from their family had higher ecological awareness scores than those who reported books and the media as their source of environmental information.

The results also revealed a significant relationship between the ecological footprint awareness and the environmental perspective of the teacher candidates ($p<0.01$). Respondents who knew what to do and were attentive to the environment had greater ecological footprint awareness than other respondents.

DISCUSSION and CONCLUSION

As in every dimension of education, “teacher-related factors” are critical to the development of ecological footprint awareness due to teachers’ responsibility in the development of desired behaviors in their students in accordance with the goals and achievements designated in the education systems (Coşkun, Sarıkaya,

2014:1761). An awareness of the concept of ecological footprint is an essential quality in teacher candidates to ensure raising future generations who strive to minimize their ecological footprints (Coşkun, Sarıkaya, 2014:1761).

38.8% of the respondents reported the media as their primary source of environmental information. The strong emphasis on the media and the internet as the main source of environmental information indicates an imperative for increased coverage of environmental issues and ecological footprint in the media. In the study by Alpaca Tunç (2015), the majority of the science teacher candidates reported that they acquired most of their environmental knowledge from the internet.

The great majority of the students (81.2%) reported knowing what to do and being attentive to the environment. The high rate of self-reported knowledge of what needs to be done and attention to the environment is a positive and pleasing outcome for environmental consciousness and awareness, indicating a favorable level of environmental awareness among the teacher candidates.

Preschool teacher candidates had the highest ecological footprint awareness score in the energy subscale (3.87), followed by water consumption (3.84), waste (3.73), transportation and housing (3.37) and food (3.26). Assuming a smaller ecological footprint in the subscale with higher awareness, it is possible to construe that the respondents had the greatest footprint in the "food" domain and the smallest footprint in the "energy" domain. This finding might be ascribed to the dietary consumption habits of the respondents acquired from their families and social circles. In the study by Coşkun and Sarıkaya (2014), classroom teacher candidates had the highest ecological footprint awareness score in the energy domain (4.20), followed by water consumption (4.03), waste (3.65), transportation and housing (3.29) and food (3.11). These results are parallel to the findings of our study.

There was a significant difference in ecological footprint awareness by gender ($p < 0.01$). Female students had a greater awareness of ecological footprint than male students. Coşkun and Sarıkaya (2014) reported generally greater ecological footprint awareness among women in comparison to men. However, although there was no significant difference between the mean ecological footprint scores of female and male participants, they found significant differences in ecological footprint awareness in favor the female students for energy, waste and water consumption subscales. On the other hand, Akıllı et al. (2008) did not find a significant relationship between ecological footprint and gender. The variation between the studies could be attributed to differences in sample groups, area of residence and consumption habits of respondents. There are numerous studies reporting a significant relationship of environmental consciousness and awareness with gender, as well as, greater environmental consciousness and awareness among women in comparison to men, which is parallel to our findings (Özmen, Çetinkaya and Nehir 2005:330; Aksoy and Karatekin, 2011:23, Gürbüz et al., 2013:144, Connel et al., 1998:95; Zelezny et al., 2000:443).

The ecological footprint awareness of the respondents displayed a significant difference by age ($p < 0.05$). The teacher candidates aged 20-22 had higher ecological footprint awareness in comparison to those in the 17-19 age group. This can be ascribed to increased experience and, consequently, ecological footprint awareness with age. Akilli et al. (2008) reported that overall mean footprint scores increased with age and that food, transportation and housing footprints varied by age.

The results revealed a significant relationship between family income level and ecological footprint awareness ($p < 0.05$). The respondents who had an income greater than their expenditure had a greater awareness of ecological footprint. Greater ecological footprint awareness instead of a larger ecological footprint with increasing purchasing power is a salient finding and merits an in-depth examination in future studies. Coşkun and Sarıkaya (2014) found no significant difference in any subscale of ecological footprint awareness with respect to income level among classroom teacher candidates with different monthly incomes. Akilli et al. (2008) reported that income, as an important consumption factor, acted on ecological footprint. They stressed that higher income leads to greater individual imprint and demand on nature and a larger ecological footprint as it increases usage of food, energy, fuel and living space and consequently enlarges the ecological footprint.

The findings indicated a significant relationship between maternal education level and ecological footprint awareness ($p < 0.01$). Teacher candidates whose mothers had a university degree had the highest ecological footprint awareness. There was also a similar relationship for paternal education level and children of university graduate fathers scored higher than those of fathers with middle school degrees. Increased ecological footprint awareness was observed among the teacher candidates with higher parental educational level. The educational background of family members affects the attitude, behavior and awareness of children raised in that environment. Therefore, greater environmental awareness in children of parents with higher educational attainment is an expected finding. Ecological footprint awareness of the respondents varied by the source of environmental information ($p < 0.01$). The respondents who reported acquiring their environmental knowledge from their families had higher ecological awareness scores than those who reported books and the media as their source of environmental information. This shows how effective and important knowledge acquired from the family is. As in many other subjects, the family plays a critical role in ecological footprint awareness. Therefore, greater emphasis should be placed on training the parents on the environment and ecological footprint.

The results also revealed a significant relationship between the ecological footprint awareness and the environmental perspective of the teacher candidates ($p < 0.01$). Respondents who knew what to do and were attentive to the environment had greater ecological footprint awareness than other respondents. Greater awareness in individuals who know what needs to be done for the environment is an expected positive finding that shows environmentally conscious individuals are more aware of the significance of ecological footprint.

RECOMMENDATIONS

In view of the study results, the researchers would like to make the following recommendations:

- Including environmental education into undergraduate courses to promote awareness on the concept of environmental footprint, environmental issues and their prevention,
- Encouraging student participation in environmental non-governmental organizations,
- Promoting environmental consciousness and awareness through panels, symposiums and other organizations,
- Increasing media coverage and visibility of environmental issues to increase public ecological footprint awareness,
- Training parents on environmental issues and ecological footprint to promote awareness, considering the respondents who reported family as their primary source of environmental information had higher ecological footprint awareness,
- Conducting nation-wide, detailed and in-depth studies with larger samples on ecological footprint awareness.

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