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Determining the Ecological Footprint Awareness of Vocational School Students

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Abstract

As a result of human influences through rapid population growth, industrialization, urbanization, and uncontrolled agricultural practices, nonrenewable resources are depleted. Humans are also destroying renewable resources. The ecological footprint concept refers to consumption habits, how much of a living area is used, and the amount of living space needed to reuse resources. An ecological footprint analysis determines how sensitive an individual is to the environment and contributes to increasing and developing environmental awareness. It is essential to measure ecological footprints to understand environmental problems and the individual effects that cause these problems. An ecological footprint is an indicator of sustainability. Therefore, its application in educational institutions contributes to improving individual behaviors. This research aimed to determine vocational school students' awareness of ecological footprints. Our study was carried out during the 2022–2023 academic year. The study used a quantitative screening method, and the "Ecological Footprint Awareness Scale" was used to obtain the data. The SPSS 22.0 package program was used for statistical analyses. The ecological footprint awareness levels of the students were compared according to gender and the program they studied. The study found a significant difference in the students according to gender and department. Students were most aware of waste, transportation, and shelter and least of food, energy, and water consumption.

Keywords: Ecological footprint, environment, sustainability

1. Introduction

Living things need natural resources such as air, water, and soil. Natural resources must continue to be available for future generations to survive. However, humanity's rate of consumption of natural resources is currently higher than the resources' self-renewal rate, which is one of the world's most critical problems. Humans' negative impact on the world is constantly increasing due to production and consumption activities. With the increase in consumption habits, environmental problems have become inevitable. Unless people change their consumption habits, future generations will not have a world to inhabit. Therefore, it is increasingly vital to protect natural resources, limit consumption, and adopt non-harmful technologies and behaviors (Çelik & Çam, 2022).

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The global population growth rate is higher than the renewal rate of natural resources, which creates many problems. Humanity's dominance over the environment causes us to consume natural resources unconsciously. Due to the increase in population, industrialization, urbanization, and uncontrolled agricultural practices, the depletion of non-renewable resources and the destruction of renewable resources is constantly increasing. If future generations are to survive in a sustainable world, production and consumption habits must change (Günal, Işıldar & Atik, 2018). The natural balance inherent to the Earth, which is harmed by exposure to excessive pollution, is gradually losing its ability to renew itself. This situation, caused by human's selfish attitudes towards the environment and lack of education, is an important problem (Blatchford, Smith & Pramling-Samuelsson, 2010; Edwards, 2005; Güngör & Kalburan, 2022). The threat of environmental problems to public health reveals the need to produce solutions to environmental problems in all societies. Therefore, environmental awareness must increase around the world. Comprehensive environmental education can promote environmental awareness (Akçay & Pekel, 2017). Environmental education can improve environmental knowledge, create positive attitudes toward the environment, and promote environmentally-friendly behaviors (Erten, 2012).

As understanding of the importance of developing environmental awareness in solving and reducing environmental problems has increased, sustainability education has gained importance (Oğuz, Çakcı & Kavas, 2011). Thinking habits can be formed through education and training. Many activities can help to create a better world for future generations, including being a role model for children from an early age, creating an educational environment that promotes sustainability, and interacting with nature. When schools undertake these activities, it helps to raise social awareness about sustainability, especially for children, staff, and families (Güngör, 2019).

Humans are the primary cause of ecological change. Therefore, it is vital to ensure that humanity understands its responsibility to maintain the Earth's natural balance (Yücel & Morgil, 1998). Seeing nature as a never-ending resource creates irresponsible consumption and constitutes the basis of environmental disasters. People are now helpless in the face of these disasters. Society needs awareness more than anything else (Karataş, 2016). As people inherit their environment from their ancestors, leaving a healthy environment for future generations and protecting the environment are basic responsibilities (İnce, 2015).

Environmental awareness and sustainability concepts are related to attitudes and behaviors that are acquired at an early age (Söylemez, 2007; Blatchford et al., 2010; Günşen, 2023). Raising children's environmental awareness is an essential investment in the future of sustainability (Blatchford et al., 2010; Kim, 2016; Günşen, 2023). Research has found that environmental education, which aims to develop environmental awareness and sensitivity and establish the environmental ethics of leading a sustainable life, should be provided to children from an early age (Blatchford et al., 2010; Edwards, 2005; Güngör & Kalburan, 2022). To protect the environment, improving knowledge is vital (İnce, 2015). In this context, the ecological footprint is an effective environmental education tool. İt demonstrates the extent of the pressure that individuals are putting on nature (Çetin, 2015). Environmental ethics can also develop with the creation of environmental awareness (Kahriman Ozturk, Olgan & Güler, 2012; Yalçın, 2013). Ecological footprint applications help develop individuals' sustainability practices (Güngör, 2019).

The concept of the ecological footprint is becoming popularised with the rise of sustainable living practices. All living things consume resources and produce waste material throughout their lives. Soil and water are necessary for resource consumption and waste generation (Keleş, Naim & Özsoy, 2008). How long can complex natural systems withstand our consumption? The concept of ecological footprint emerged due to the difficulty of answering this question (Tosunoğlu, 2014;

Güleç & Orhan, 2022). In the most general terms, the ecological footprint can be defined as a method of measuring the overall impact of human activities on the world (Wackernagel & Rees 1996:9). This concept assesses the total environmental area required for the absorption of emissions produced by a person (Keleş et al., 2008; Lambert & Cushing, 2017). This represents the area of resource generation required to sustain the individual's lifestyle and convert their waste materials into harmless ones. It also reflects the area of carbon dioxide absorption with certain ecological limits (Keleş et al., 2008).

The ecological footprint, a concrete indicator of sustainability, effectively promotes positive and sustainable behaviors when applied in educational institutions (Keleş, 2007; Cordero, Todd & Abellera, 2008; Çetin, 2015). Ecological footprint analysis increases qualities of life and reveals how to create a more sustainable lifestyle. It creates an "ecological facts checklist" by assessing individual lifestyles (Keleş et al., 2008). This feature helps the ecological footprint act as an effective educational tool by increasing students' environmental knowledge. The tool also provides a guide for students to improve their environmental behavior. Therefore, it positively impacts students' environmental, consumption, and spending behaviors (Çıkrık & Yel, 2019).

An ecological footprint, expressed in hectares, is calculated using consumption data from organizational reports (Food and Agriculture Organization of the United Nations, World Bank, etc.). The ecological footprints of individuals living in a country are obtained by calculating the ratio of the national footprint to the country's population. An individual footprint is adjusted using questions and answers about the individual's income, lifestyle, energy use, nutrition, and shopping routine. The tools used in ecological footprint analysis are used to calculate the environmental space needed to support an individual's lifestyle by estimating how many Earths would be required if all people living on Earth had the same lifestyle. An individual ecological footprint consists of four different components: housing, carbon, food, and goods and services (Lambert & Cushing, 2017). Today, Earth would require 1.7 equivalent planets to meet human needs. This makes sustainability impossible under current consumption levels (San-Francisco, Sopelana, Fernandez, Otegi & Minguez, 2020). The 2022 Global Risks Report states that five environmental problems in the top ten risk list are expected in the next ten years. In addition, the first three risks are related to the environment: failure to act for climate, extreme weather events, and biodiversity loss (World Economic Forum, 2022; Engin, Demiriz & Koçyiğit, 2023). Conducting ecological footprint analyses is vital to raise individuals' awareness about environmental problems.

The ecological footprint supports students in understanding their impact on nature by using their critical thinking and problem-solving skills. In addition, it allows them to use their achievements by integrating them with their social life and individual behaviors (Yorgun, 2022). Therefore, it is vital to consider how ecological footprints affect the individual lives of students. Many scientific studies have been conducted on the ecological footprint concept (Akıllı, Kemahlı, Okudan & Polat, 2008; Tosunoğlu, 2014; Çetin, Güven Yıldırım & Aydoğdu, 2017; Ünal & Bağcı, 2017; Kurt & Çavuş Göngören, 2020; Arslan & Yağmur, 2022; Demirkol & Aslan, 2022; Güleç & Orhan, 2022). Özgen and Aksoy (2017) aimed to determine consumers' Ecological Footprint awareness levels. They used the "Ecological Footprint Awareness Scale" as a data collection tool and found that consumers' average awareness was low. A study conducted by Demirkol and Aslan (2021) aimed to determine classroom teachers' ecological footprint awareness levels. They also used the Ecological Footprint Awareness Scale through a scanning method. The research identified no significant difference in classroom teachers' ecological footprint awareness levels according to educational status, gender, faculty, or seminar attendance. However, they found a significant difference between grade level taught, seniority, and the region where the school was located. Lambrechts and Liedekerke (2014) discussed the use of ecological footprint awareness in higher education. They stated that universities calculate their ecological

footprints to respond to the social call to integrate sustainability into their business and evaluate the sustainability of their activities. They also use the ecological footprint as an educational tool for students and to enhance their policy development. Baabou, Grunewald, Ouellet-Plamondon, Gressot and Galli (2017) assessed the ecological footprint of 19 coastal cities in the Mediterranean region. They stated that the differences between the ecological footprint values of the cities might be caused by socio-economic factors such as disposable income, infrastructure, and cultural habits. Engin et al. (2023) examined the ecological footprint awareness of preschool teachers, the application status of environmentally friendly activities, and their environmentally friendly behaviors. They also assessed the impact of different variables. They concluded that it did not differ according to the type of institution they were employed in.

An ecological footprint can be measured over many areas and groups (Eraslan & Seç, 2021). Notably, studies on this topic have mainly been conducted with teacher candidates (Yorgun, 2022). No research has examined the ecological footprint awareness of vocational high school students. Therefore, this research will contribute to the literature and fill this gap. Our study aimed to measure and evaluate the awareness of vocational school students studying in different programs about the ecological footprint. We sought answers to the following questions:

- ✓ Is there a significant difference between the participants' awareness of the ecological footprint according to gender?
- ✓ Is there a significant difference between the participants' awareness of the ecological footprint according to their study departments?

2. Methodology

Our research used surveys, which is a quantitative research method. We also used the scanning method due to its efficiency, generalizability, and versatility. Scanning is one of the most popular methods in educational research (McMillan & Schumacher, 2010).

2.1. Sampling and Participants

A total of 186 individuals, 124 girls and 62 boys, who are students at a vocational school at Kafkas University, constituted the study sample. The sample consisted of 1st- and 2nd-year students studying at a vocational school affiliated with Kafkas University. Sixty-seven students were studying in the Social Services program, 47 in the Pharmacy Services program, 36 in the Sports Management program, 22 in the Opticinary program, and 14 in the Health Institutions Management program (Table 1).

Table 1. Demographic Information about the Sample

Gender	**N**
Female	124
Male	62
Departments	
Social Services Program	67
Pharmacy Services	47
Sports Management	36
Opticianry	22
Management of Health Institutions	14

2.2. Data Collection Methods and Procedure

In the study, the "Ecological Footprint Awareness Scale" (Coşkun & Sarıkaya, 2014) was used to determine the awareness levels of students of the ecological footprint concept. The scale, which consists of 40 items and five sub-dimensions, assesses food, transportation and shelter, energy, waste, and water consumption. The reliability coefficients of the items in the scale were 0.70 for the food sub-dimension, 0.76 for the transportation and shelter sub-dimension, 0.86 for the energy sub-dimension, 0.81 for the wastes sub-dimension, and 0.68 for the water consumption sub-dimension. The reliability coefficient of the scale was 0.92. The scale was a 5-point Likert type, and the statements in the scale were "Strongly Agree," "Agree," "Partly Agree," "Disagree," and "Strongly Disagree."

2.3. Data Analysis

The data obtained in the study were statistically analyzed using the SPSS 22.0 package program. First, the data obtained from the "Ecological Footprint Awareness Scale" were examined. They were then transferred to the SPSS program. The Kolmogorov-Smirnov test was applied to determine the suitability of the data for normal distribution. The test showed that the data were not suitable for normal distribution. Therefore, the Mann-Whitney U test was applied to reveal the differences in participants' scores according to gender. The Kruskal-Wallis test was applied to determine the differences in the participants' scores according to their departments.

2.4. Permission of Scientific Ethics Committee

Ethical rules were followed during the conduct of our research, data collection, and analysis. Approval was obtained from the Social and Human Sciences Scientific Research and Publication Ethics Committee of Kafkas University (Date: 21/04/2022 Number: 32).

3. Results

In the first sub-problem of the study, the Mann-Whitney U test was applied to determine whether gender caused a significant difference in the ecological footprint awareness scale scores. The test results are shown in Table 2.

Table 2. Comparison of Students' Ecological Footprint Awareness Scale Sub-Dimension and Average Scores in terms of Gender (Mann-Whitney U Test)

Questions	Gender	N	Rank Average	U	P
Food	**Female**	124	98,19	3262,500	,09
	Male	62	84,12		
Transportation and Housing	**Female**	124	98,76	3192,000	,05
	Male	62	82,98		
Energy	**Female**	124	93,46	3839,000	,98
	Male	62	93,58		
Wastes	**Female**	124	103,42	2614,000	,00
	Male	62	73,66		
Water Consumption	**Female**	124	94,31	3743,000	,76
	Male	62	91,87		
Average	**Female**	124	82,14	2435,500	,00
	Male	62	116,22		

Table 2 shows that the gender factor did not cause significant differences in the food, energy, and water consumption sub-dimension scores in the Ecological Footprint Awareness Scale ($p>0.05$). Conversely, gender created a significant difference ($p<0.05$) in the waste, transportation, and housing sub-dimension scores and mean scores. The gender data suggest that the mean rank values of male students' ecological footprint awareness were higher than the female students' mean rank. This is outlined in Table 2. Furthermore, the average ranking of female students was higher in the sub-dimensions of waste, transportation and housing, food, and water consumption.

In the second sub-problem, the Kruskal-Wallis test was applied to identify whether the departments where the students studied influenced their ecological footprint awareness scale scores. The results obtained are shown in Table 3.

Table 3. Comparison of Students' Ecological Footprint Awareness Scale Sub-Dimension and Average Scores in terms of Departments (Kruskal - Wallis Test)

Questions	Departments	N	Rank Average	X^2	p
Food	Social Services Program	67	103,65	4,461	,34
	Pharmacy Services	47	87,9		
	Sports Management	36	87,81		
	Opticianry	22	81,77		
	Management of Health Institutions	14	96,79		
Transportation and Housing	Social Services Program	67	100,73	23,475	,00
	Pharmacy Services	47	116,86		
	Sports Management	36	70,43		
	Opticianry	22	64,43		
	Management of Health Institutions	14	85,46		
Energy	Social Services Program	67	90,14	2,967	,56
	Pharmacy Services	47	103,84		
	Sports Management	36	94,47		
	Opticianry	22	87,14		
	Management of Health Institutions	14	82,36		
Wastes	Social Services Program	67	93,54	26,963	,00
	Pharmacy Services	47	117,56		
	Sports Management	36	57,6		
	Opticianry	22	100,7		
	Management of Health Institutions	14	93,54		
Water Consumption	Social Services Program	67	84,36	5,969	,20
	Pharmacy Services	47	100,91		
	Sports Management	36	88,31		
	Opticianry	22	110,61		
	Management of Health Institutions	14	98,82		
Average	Social Services Program	67	90,13	40,64	,00
	Pharmacy Services	47	61,51		
	Sports Management	36	136,61		
	Opticianry	22	102,84		
	Management of Health Institutions	14	91,46		

The data in Table 3 show that the department factor did not cause a significant difference in the participants' food, energy, and water consumption sub-dimension scores in the Ecological Footprint Awareness Scale ($p>0.05$). However, there was a significant difference ($p<0.05$) between the waste, transportation, and shelter sub-dimension and mean scores. The average rank in the sub-dimensions of waste, transportation, and housing suggests that the rank average of the

Pharmacy Services department was higher than the other departments. The other sub-dimensions show that the ranking averages of different departments were high. The Social Services program had the highest average score in the food sub-dimension (X = 103.65), followed by the Management of Health Institutions program (X = 96.79). When Ecological Footprint awareness was evaluated according to the departments in the energy sub-dimension, the pharmacy services program had the highest average score (X = 103.84). This was followed by the mean ranks of the Social Services program (X =90.14), the Sports Management program (X = 94 .47), the Opticianary program (X = 87.14), and the Management of Health Institutions program (X = 82.36).

4. Discussion, Conclusion, and Recommendations

Our study aimed to determine the Ecological Footprint Awareness of students studying at a vocational school. It examined whether gender and department factors impacted Ecological Footprint Awareness. The study concluded that male students' Ecological Footprint Awareness rank averages were higher than female students. This suggests that male students are more sensitive than female students about environmental issues, and their knowledge about the subject is higher. Many studies in the scientific literature reflect this finding. Özgen and Aksoy (2017) found that men's total Ecological Footprint Awareness was higher than women's and that this difference was statistically significant. Eren, Parlakay, Hilal and Bozhüyük (2017) stated that men were more aware of the ecological footprint concept than women. In their study, Medina and Toledo (2016) stated that male participants had a significantly larger ecological footprint than female participants. However, Yıldız (2014) found that the Ecological Footprint Awareness levels of female pre-service teachers were significantly higher than male pre-service teachers. Furthermore, Coşkun (2013) found no significant difference between the Ecological Footprint Awareness levels of female and male teacher candidates.

Our study found that gender did not significantly affect the vocational school students' food, energy, and water consumption sub-dimension scores on the Ecological Footprint Awareness Scale. However, gender significantly impacted the waste, transportation, and housing sub-dimensions. The average ranks of female students in the waste, transportation, and housing sub-dimensions were higher.

Although some studies have found similar results, many different results have been found on this topic. For example, Yiğitkaya (2019)'s study on the level of ecological footprint awareness showed a significant difference in waste awareness in favor of women. Demirkol and Aslan (2021) concluded that the average rank of women in terms of food, energy, waste, and water consumption was higher than men. The difference between the studies may be due to the characteristics of the sample groups studied, the place of residence, and the differences in the habits of the sample group. In addition, the unequal numbers of male and female participants may influence the gender-based differences.

Our study concluded that the departments students studied in caused significant differences in mean scores on the Ecological Footprint Scale. The results suggest that low awareness in a sub-dimension likely contributes more to the ecological footprint. The higher the level of awareness in a sub-dimension, the lower the contribution of that sub-dimension to the ecological footprint. In other words, increases in awareness suggest that an ecological footprint is shrinking (Çıkrık & Yel, 2019).

Our study shows that the departmental affiliations of high school students did not create significant differences in the food, energy, and water consumption sub-dimension scores on the Ecological Footprint Awareness Scale. There was a significant difference in the waste and

transportation and shelter sub-dimension and mean scores. The average rank in the sub-dimensions of waste and transportation and shelter suggests that the average rank of the Pharmacy Services department was higher than the other departments. The mean rank of the other departments was high across the other sub-dimensions. This may be due to the impacts of course content. Supporting this finding, Şimşek (2020) stated that students are given implicit awareness-raising training in their curriculum content. Similarly, Günal et al. (2018) found that the tendencies of students in the biology department were significantly higher than those of students in the engineering department. They showed that this was because biology students study the environment during their undergraduate courses and acquire awareness about environmental problems. Disparities may also occur because students have different income levels and parental educational backgrounds. Temizkan and Ceyhanlı (2020) stated that students' income and parents' education levels create statistically significant differences in their awareness of their ecological footprint.

This section presents the research results and provides recommendations. The results showed a statistically significant difference between the total mean scores of the students and their gender and departments. These findings highlight several suggestions for improving students' awareness of their ecological footprints:

- ✓ Adding courses related to environmental education to the curriculum.
- ✓ Providing courses and seminars on this subject by experts.
- ✓ Creating public awareness about this issue.
- ✓ Delivering relevant documents to students to make them think about their lifestyles.
- ✓ Conducting more in-depth research with larger sample groups to increase awareness and knowledge about ecological footprints.

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Permission of Scientific Ethics Committee

Ethical rules were followed during the conduct of our research, data collection and analysis. Approval was obtained from the Social and Human Sciences Scientific Research and Publication Ethics Committee of Kafkas University (Date: 21/04/2022 Number: 32).