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Enhancing ecological footprint awareness among academic staff at Gazi University: a sustainability communication approach

Gazi Üniversitesi akademik personelinde ekolojik ayak izi farkındalığının artırılması: sürdürülebilirlik iletişimi yaklaşımı

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Enhancing Ecological Footprint Awareness among Academic Staff at Gazi University: A Sustainability Communication Approach

Highlights

- ❖ Research focuses on deepening ecological footprint awareness among Gazi University academic staff
- ❖ Assessing the awareness levels and utilizing a sustainability communication framework through a survey
- ❖ Proposes targeted strategies for enhanced sustainability consciousness

Graphical Abstract

The study at Gazi University explores ecological footprint awareness among academic staff, revealing diverse levels across dimensions influenced by factors like gender and academic title, highlighting potential implications for policymakers and university administrators.

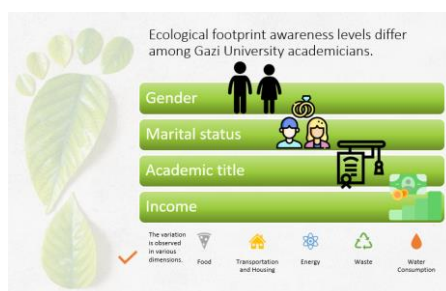


Figure. Ecological footprint awareness

Aim

The research aims to enhance ecological footprint awareness among academic staff by employing a comprehensive sustainability communication approach.

Design & Methodology

The study utilizes a cross-sectional survey design with 467 participants at Gazi University, employing the Ecological Footprint Awareness Scale. Data analysis, including *t*-tests and ANOVA, explores the impact of socio-demographics on ecological footprint awareness, with findings contributing to targeted sustainability communication strategies and adhering to ethical protocols.

Originality

The study aims to elevate the discussion on sustainability communication within academia and drive concrete changes by fostering a more environmentally conscious academic community. It seeks to raise awareness and promote sustainable behaviors, positioning academic institutions as influential catalysts for broader societal shifts toward a sustainable future.

Findings

Findings indicate varying levels of awareness across dimensions influenced by gender, marital status, academic title, and income, suggesting potential implications for policymakers and university administrators.

Conclusion

Tailored communication strategies are crucial for promoting sustainability, and integrating ecological footprint education into academic courses is proposed to foster a culture of sustainability within the academic community.

Declaration of Ethical Standards

The study was conducted following the Declaration of Helsinki, and approved by the Ethics Committee of GAZI UNIVERSITY (protocol code 2022 – 1248 and date of approval: 25.11.2022)

Enhancing Ecological Footprint Awareness among Academic Staff at Gazi University: A Sustainability Communication Approach

Research Article / Araştırma Makalesi

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ABSTRACT

Sustainability communication is vital in informing, inspiring, and mobilizing individuals and organizations to take collective actions that contribute to environmental protection, social justice, and economic prosperity. A crucial aspect of sustainability, ecological footprint awareness assesses the consciousness of the impact of individuals or communities on the environment. This research investigates the level of ecological footprint awareness among academic staff at Gazi University, Turkey, using a comprehensive scale. Findings indicate varying levels of awareness across dimensions influenced by gender, marital status, academic title, and income, suggesting potential implications for policymakers and university administrators. The efficacy of sustainability and ecological footprint reduction initiatives can be increased among heterogeneous cohorts of academic personnel by implementing customized communications and awareness initiatives. Additional investigation may further elucidate the precise determinants underlying these disparities and scrutinize the most efficacious modes of communication for each faction, thereby augmenting the sustainability discourse at Gazi University and in the broader context.

Keywords: Ecological footprint awareness, sustainability communication, sustainable practices, communication strategies.

Gazi Üniversitesi Akademik Personelinde Ekolojik Ayak İzi Farkındalığının Artırılması: Sürdürülebilirlik İletişimi Yaklaşımı

ÖZ

Sürdürülebilirlik iletişimi, bireyleri ve kuruluşları çevrenin korunmasına, sosyal adalete ve ekonomik refaha katkıda bulunacak kolektif eylemlerde bulunmaları için bilgilendirmek, ilham vermek ve harekete geçirmek açısından hayati önem taşımaktadır. Sürdürülebilirliğin önemli bir yönü olan ekolojik ayak izi farkındalığı, bireylerin veya toplulukların çevre üzerindeki etkilerinin bilincini değerlendirir. Bu araştırma, Gazi Üniversitesi akademik personelinin ekolojik ayak izi farkındalık düzeyini kapsamlı bir ölçek kullanarak incelemektedir. Bulgular, cinsiyet, medeni durum, akademik unvan ve gelirden etkilenen boyutlar arasında değişen farkındalık düzeylerine işaret ederek politika yapıcılar ve üniversite yöneticileri için potansiyel çıkarımlar önermektedir. Sürdürülebilirlik ve ekolojik ayak izi azaltma girişimlerinin etkinliği, özelleştirilmiş iletişim ve farkındalık girişimleri uygulanarak heterojen akademik personel grupları arasında artırılabilir. Ek araştırmalar, bu eşitsizliklerin altında yatan kesin belirleyicileri daha da aydınlatılabilir ve her bir grup için en etkili iletişim biçimlerini inceleyerek Gazi Üniversitesi'nde ve daha geniş bağlamda sürdürülebilirlik söylemini güçlendirebilir.

Anahtar Kelimeler: Ekolojik ayak izi farkındalığı, sürdürülebilirlik iletişimi, sürdürülebilir uygulamalar, iletişim stratejileri.

1. INTRODUCTION

The 21st century represents a critical juncture in human history in which global challenges, such as climate change, depleting natural resources, and biodiversity loss, demand immediate action toward sustainability. Climate change has had a significant effect on the earth's ecosystem and, as a result, on human health concerns and

mortality. Climate change generates extreme environmental conditions and hazards that result in acute and chronic morbidity, as well as premature and preventable human mortality in many regions worldwide. Abnormal temperatures cause up to 5 million fatalities annually. Climate change's impact risks and damages are unequally distributed, and the poorest nations will likely be hit hardest by rising climate-related catastrophe risks in a warmer world [1].

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Sustainability, a concept that transcends geographical and disciplinary boundaries, is one of our most urgent global issues. It urges us to reconsider our interactions with the environment, recognizing the finite nature of Earth's resources and the necessity of preserving them for future generations. Malhotra 2013 highlights sustainability as the responsible conservation, deployment, and reuse of resources to optimize social, environmental, and economic dimensions [2]. Sustainable development has become an imperative, guiding us to balance environmental, social, and financial considerations for the benefit of future generations [3]. The Sustainable Development Goals (SDGs) of the United Nations offer a comprehensive framework for achieving a sustainable and equitable world. SDGs emphasize the interconnectedness of various social, economic, and environmental challenges and address issues like poverty, inequality, climate change, and social injustice. By emphasizing sustainable development, SDGs underline the significance of cooperation and inclusive methods to address global challenges by providing a roadmap for nations, organizations, and individuals to work together toward a shared vision of a sustainable future [4]. At the midpoint of our collective endeavor spanning 15 years, the special report by the esteemed UN Secretary-General on Sustainable Development Goals brings to light a discerning observation. It indicates that a mere 15 percent of the 140 targets are progressing as anticipated, while half have exhibited modest advancements since 2015. Furthermore, it reveals that approximately 30 percent of these targets have encountered stagnation or, in some cases, even regression [5].

Sustainability encompasses many interrelated issues, such as energy conservation, pollution reduction, sustainable transportation, responsible consumption, and environmentally conscious behavior [6, 7]. Assessing the magnitude of environmental harm inflicted by human activities is imperative to promote sustainability. Using the ecological footprint as a strategic management tool has considerable promise in achieving ecological sustainability [8].

The ecological footprint is a measure of the environmental impact of an individual, community, organization, or country in terms of the natural resources and ecosystem services they consume and the waste they generate and is typically expressed in terms of global hectares (gha) or acres [9,10]. In 2023, the global average footprint was 2.6 global hectares per capita, while the biocapacity was 1.5 global hectares [11]. Footprint can be subdivided according to area categories (ecological footprint of humanity by land use - outer circle) or by activity areas (ecological footprint of humankind by activities - the inner circle) with Multi-Zone Input-Output Analysis (Figure 1).

Measuring the environmental impact of individual and societal practices provides a lens through which we can evaluate our sustainability efforts and reflects humanity's demand for nature's resources. Since human health and

its future depend on the continuity of natural resources, sustainability can be achieved by defining the ecological footprint with all its components, causes, and consequences, eliminating the risks brought by the ecological deficit, and implementing economic and social policies based on the correct management of natural resources [13].

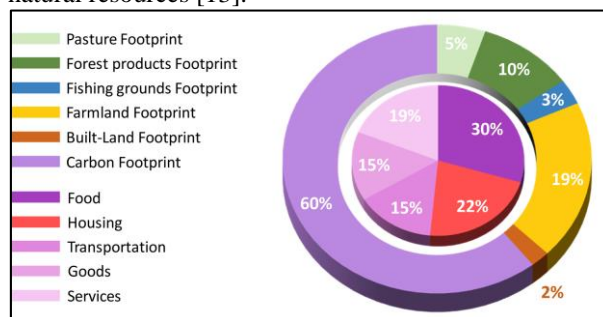


Figure 1. Ecological footprint of humanity by land use and activities [12]

Ecological footprint size can be calculated for people, companies, communities, and countries. The total ecological footprint of a country represents the impact of all its inhabitants and is made up of many components with an influence on various sectors [14]. The most significant element of Turkey's ecological footprint is personal consumption, with 82%. The ecological footprint due to private consumption mainly consists of food (52%). This is followed by products (21%) and personal transportation (15%). The contribution of housing and housing expenditures to the ecological footprint is 6% [9]. As exemplified below, the environmental footprint can change due to several factors linked to human activities and lifestyle choices.

Food: Producing meat, especially beef, requires large amounts of land, water, and energy. High meat consumption significantly amplifies the ecological footprint [15,16]. Discarding food contributes to wasted resources, including water and energy, used in its production, processing, and transportation [17].

Transportation and Housing: Fossil fuel-powered vehicles and heating systems contribute to the ecological footprint by emitting greenhouse gases and other pollutants [18,19]. Expanding cities and urban areas can lead to longer commuting distances, increasing the need for transportation and associated emissions [20,21]. Bigger houses and apartments demand more construction materials and energy for heating, cooling, and lighting [22]. Relying on fossil fuels (coal, oil, natural gas) for energy generation substantially raises the ecological footprint due to the associated greenhouse gas emissions and resource depletion [23]. Using energy inefficiently, with outdated appliances or poor insulation, leads to higher consumption and increased environmental impact [24].

Waste: The extensive use of single-use plastics and disposable items contributes to waste, which ends up in landfills or oceans, further polluting the environment

[25]. Inadequate recycling and management practices lead to more waste being disposed of in landfills or incinerated, exacerbating the ecological footprint [26].

Water Consumption: Overusing water for daily activities, irrigation, and industrial processes strains water resources and contributes to a higher ecological footprint [27]. Pollution of water sources due to industrial, agricultural, or household waste affects water quality and sustainability [28].

To diminish the ecological footprint across these domains, it is imperative to enact sustainable practices, engage in conservation endeavors, optimize resource efficiency, transition to renewable energy sources, embrace a plant-based dietary approach, encourage waste reduction and recycling, and advocate for responsible consumption patterns. Promoting awareness and education is vital to fostering a sense of informed decision-making among individuals and groups, facilitating the pursuit of a more sustainable and environmentally advantageous future.

1.1. The Role of Academic Institutions and Academics in Sustainability

Academic institutions have emerged as centers for fostering sustainable practices and cultivating future stewards in this context. Higher education institutions worldwide have increasingly recognized their pivotal roles in advancing sustainability and addressing climate change. Universities engage in sustainability initiatives and monitor environmental resource utilization [29]. These institutions serve as knowledge generators, preparers of future leaders, and, significantly, large-scale operations with substantial environmental impacts [30]. Sustainability in higher education encompasses a broad spectrum of initiatives, including curriculum integration, energy efficiency improvements, waste reduction, and community engagement [31]. The endeavors undertaken by higher education institutions in developing sustainability reports have the potential to facilitate additional advancements in the field of sustainability [26]. Universities are pivotal in driving transformative sustainability efforts and effectively addressing the Sustainable Development Goals [32].

Efforts to embed sustainability within higher education institutions have often emphasized curriculum development, fostering eco-conscious behaviors among students, and greening campus operations. However, one aspect that deserves closer attention is the awareness and engagement of academic staff, who play vital roles in shaping the institutional culture and directly influencing students through teaching, research, and administrative functions [33]. Through education, research, and advocacy, universities are at the vanguard of shaping a sustainable future [34]. In addition to disseminating information, they are responsible for imparting ecological awareness and guiding students and faculty toward conscientious environmental stewardship [35]. Moreover, universities serve as incubators for informed discourse, transformative ideas, and innovative solutions to our sustainability challenges.

Academic staff members represent a diverse group with unique roles and responsibilities within higher education institutions. Educators mold students' intellectual and ethical foundations, who become leaders and decision-makers in various sectors. Moreover, academic staff members engage in research that informs public policy, industry practices, and societal attitudes. Their contributions extend to governance, administration, and institutional policy development. Given their multifaceted roles, academic staff members possess considerable potential to serve as catalysts for sustainability within academic institutions and beyond [32]. As custodians of knowledge and role models for their students, academic staff members exert considerable influence over the sustainability ethos of the university. Their awareness and dedication to sustainable practices permeate the institution, influencing the behaviors and aspirations of the next generations. Their comprehension, commitment, and active participation in sustainable practices have a cascading effect, affecting the academic community and society. There is a growing demand for universities to proactively promote attitudes and practices supporting sustainable development while engaging the academic community in this endeavor [36]. Improving faculty members' awareness of their ecological footprint is crucial for guiding them toward sustainability.

This study aims to assess the level of awareness among academic staff members at Gazi University, which has been chosen as a pilot institution for implementing sustainable and climate-friendly campuses in Turkey, aligning with the nation's developmental objectives. The findings of this research will contribute to the support and advancement of the project above. In doing so, we employ the theoretical framework of Sustainability Communication, a potent strategy that employs effective communication to spread sustainability awareness and catalyze behavioral change.

1.2. Communication for Sustainability

As a potent change agent, communication is essential for fostering sustainability in academic circles [37]. Sustainability Communication's theoretical framework provides a road map for developing effective communication strategies to increase ecological footprint awareness and nurture sustainable practices. The purpose of sustainability communication is to engage in a critical evaluation and facilitate the introduction of a comprehensive understanding of the intricate interaction between humans and the environment within social discourse [38]. Sustainability Communication emphasizes the importance of clear, compelling, and contextually relevant messages to inform, educate, and mobilize individuals toward sustainability and to cultivate a culture of environmental stewardship. It emphasizes that communication is not a one-size-fits-all endeavor; instead, it must be tailored to the specific traits and preferences of the intended audience. Sustainability Communication acknowledges the importance of dialogue, transparency, and community engagement in

fostering a shared commitment to sustainability objectives [39].

1.3. Objectives and Importance

Academic research on ecological footprint is conducted within two branches: assessing and examining footprint awareness. By conducting awareness studies on diverse sample groups, researchers can draw generalizations about the overall level of awareness. These generalizations then inform predictions about the appropriate methodologies for conducting studies to reduce the ecological footprint, beginning at the individual level [40]. Various methods are commonly employed to evaluate awareness, including surveys, interviews, and focus groups [41]. Despite the documented low levels of awareness about ecological footprints and their associated repercussions, existing research consistently indicates that individuals possess a basic understanding of key concepts, including the consequences of greenhouse gas emissions and the adverse effects of climate change [42, 43]. There is widespread recognition among individuals regarding the imperative to mitigate carbon emissions, with a significant majority actively endeavoring to achieve this objective [44].

The research findings indicate that Turkey exhibits a higher ecological footprint concerning personal consumption than the global average. Moreover, the study highlights notable areas for improvement among participants in adopting behaviors that could effectively mitigate their ecological footprint. These behaviors include recycling, repairing and reusing products, composting, and conserving resources like water, food, and clothing [45]. Several surveys indicate a low level of conviction in Turkey's implementation of adequate measures to address the issue of global warming [46].

This study examines the ecological footprint consciousness of the academic staff at Gazi University to identify development opportunities and refine sustainability communication strategies. It is intended to ascertain the academic community's current level of ecological footprint awareness and communication effectiveness by employing a robust survey methodology and applying the principles of Sustainability Communication. In addition, this study aims to identify areas for improvement and propose targeted communication strategies to increase sustainability awareness and encourage sustainable behavior.

Understanding and increasing the academic staff's awareness of their ecological footprint is paramount. It contributes to the academic discourse on sustainability and the creation of targeted communication initiatives. These initiatives, founded on the principles of Sustainability Communication, have the potential to substantially increase ecological footprint awareness, resulting in a more environmentally conscious academic community. Using the Sustainability Communication framework, this study investigates the ecological footprint awareness of the academic staff at Gazi University. It is intended to ascertain the academic

community's current level of ecological footprint awareness and communication effectiveness by employing a robust scale methodology and utilizing Sustainability Communication principles. In addition, this study aims to identify areas for improvement and propose targeted communication strategies to increase sustainability awareness and encourage sustainable behavior.

This study aims to provide a nuanced understanding of how academic staff at Gazi University can be more conscious of their ecological footprint by applying the study's principles and findings. The objective is not only to contribute to the field of sustainability communication but also to inspire positive change within the academic community by cultivating a culture of sustainability that extends far beyond the boundaries of the examined university. It aims to contribute to the growing knowledge of sustainability communication to catalyze change at Gazi University and inspire similar initiatives across academia. As the world navigates complex sustainability issues, academic institutions must serve as eco-conscious beacons to propel society toward a more sustainable and equitable future. The findings of this study may have a cascading effect, propagating sustainability values and practices to a larger population through the influence of academic professionals.

2. SUSTAINABILITY COMMUNICATION

Sustainability Communication, as a rigorous theoretical framework, provides indispensable guidance for academic communities seeking to increase ecological footprint awareness and promote sustainable behaviors. Sustainability communication is a nascent discipline integrating diverse research methodologies and practical applications [47]. It transcends the conventional comprehension of communication by integrating a holistic approach to addressing environmental challenges, societal norms, and individual behavioral patterns [48]. At its foundation, sustainability communication emphasizes the power of practical, customized messaging to raise awareness, educate, and ultimately influence positive sustainability-related actions.

In academic institutions such as Gazi University, the sustainability communication framework operates on multiple levels to bridge the divide between sustainability knowledge and active engagement [49]. It enables the creation of communication strategies that profoundly resonate with academic staff, eliciting comprehension and a sense of responsibility and action. Successful application of Sustainability Communication necessitates understanding the academic community's distinctive characteristics, including various disciplines, points of view, and levels of environmental consciousness.

2.1. Information Dissemination and Awareness

Acquiring environmental information and perceiving environmental risks favor individuals' engagement in

environmentally responsible behavior [50]. The analysis of communication's role in increasing awareness regarding sustainability concerns, solutions, and best practices, as well as its potential to empower individuals to make informed decisions, is crucial [51]. Increasing awareness among university staff who possess advanced academic qualifications is a somewhat more attainable objective than other demographic groups within society.

2.2. Communication as a Catalyst for Change

Fundamentally, Sustainability Communication acknowledges that communication is not a passive act but a potent change agent [52]. It emphasizes that information transmission alone does not guarantee action; communication must be designed to engage, enlighten, and inspire. In our context, this emphasizes the significance of crafting messages that resonate with academic staff members, thereby stimulating a transition from awareness to action in their efforts to reduce their ecological imprint.

2.3. Communication Tailored to the Academic Community

One core tenet of sustainability communication is recognizing that communication strategies cannot be universally applied since messages must be carefully tailored to align with specific target audiences' unique traits, tastes, and values [53]. Within the framework of Gazi University's academic community, it is imperative to comprehend its faculty members' distinct responsibilities, fields of study, scholarly endeavors, viewpoints, and inherent drives. To ensure effective sustainability communication among academic staff, it is crucial to emphasize the interconnectedness between their academic endeavors and sustainable practices. Illustrating the congruence between sustainability and scientific endeavors, scholarly investigations, and educational objectives enhances the persuasiveness of the narrative.

2.4. Behavioral Change and Action

One of the objectives of sustainability communication is to promote behavioral change. Sustainability Communication employs behavioral insights to persuade individuals to take sustainable actions [54]. Understanding how communication can motivate individuals and communities to adopt sustainable behaviors and lifestyles, resulting in positive environmental and social outcomes, makes this attainable. By inspiring and motivating individuals and organizations to implement sustainable practices and lifestyles, communication can contribute to a more sustainable future [55]. Comprehending behavioral patterns and biases facilitates the development of messages encouraging academic professionals to make more sustainable decisions. In addition, utilizing normative influence—highlighting the sustainable behaviors of peers and academic leaders—can have a substantial impact on adoption rates and cultivate a sense of collective responsibility. Given that academicians are role models for younger generations, if academic staff

awareness can be raised through sustainability communication and behavioral change can be achieved, the new generations that academicians will educate will be able to adopt these behaviors through imitation of their mentors.

2.5. Mobilizing Peer Influence

Sustainable behaviors are significantly influenced by social dynamics [56]. Sustainability Communication recognizes the influence of peers within communities. The impact of colleagues and peers on academic staff members' ecological footprint cognizance and practices at Gazi University should not be underestimated. Sustainability communication efforts can be amplified by employing strategies that leverage peer networks and facilitate knowledge-sharing and collaboration [57].

2.6. Transparency and Trust

Trust has a vital role in fostering effective communication on sustainability. Transparency and honesty are paramount, as they establish credibility and cultivate trust between communicators and their audience [50]. Transparency and sincerity in communicating are crucial components of good sustainability communication. This signifies the importance of maintaining transparency in sustainability endeavors and effectively communicating objectives, advancements, and obstacles in academia. This methodology establishes confidence and credibility, further solidifying the institution's dedication to sustainability and cultivating a culture of transparency throughout the academic community. Academic personnel proficient in critical analysis frequently seek reliable and genuine knowledge. Academic staff members are more inclined to adopt measures to reduce ecological footprints when they trust the university's genuine commitment to sustainability and perceive their contributions as meaningful.

2.7. Building a Culture of Dialogue and Engagement

The effectiveness of the sustainability journey is maximized when it adopts a participatory approach that engages academic staff in substantive debate. Significant transformation can be realized when individuals can actively engage in discussions on sustainability [58]. Academic personnel should not be passive listeners of sustainability messaging but actively engage as contributors to the university's ongoing sustainability endeavors. This framework promotes a culture emphasizing open communication channels, enabling academic staff to actively share their ideas, insights, and sustainable practices. These talks enhance sustainability plans and allow academic staff to assume responsibility for the sustainability agenda and implement tangible measures.

2.8. Utilizing Various Communication Channels

Communication regarding sustainability utilizes a variety of channels, including traditional media, social media, websites, educational programs, public events, and campaigns. The channel selection depends on the intended audience and the message [59]. The use of

academic programs at all levels in sustainability communication is a crucial strategy for influencing the behavior of a large audience. Universities incorporating sustainability education into their programs can contribute effectively to the global solution.

2.9. Community Narratives and Storytelling

One influential instrument in sustainability Communication can be considered the skillful practice of narrating stories. The compelling strategic narrative of sustainability necessitates an emotive and genuine approach and has the potential to catalyze significant transformation when employing appropriate storytelling components. The four fundamental strategic factors in this context are objectives, active cooperation with stakeholders, an inspiring atmosphere, and the utilization of proper media platforms [60]. Narratives, which incorporate authentic anecdotes and relevant scenarios, effectively engage audiences and establish a meaningful connection with individuals. Within academic personnel, narratives that exemplify how their sustainable endeavors contribute to the overarching reduction of ecological footprints and preservation of the environment can serve as influential catalysts. Anecdotes about colleagues who have effectively incorporated sustainability into their academic pursuits might serve as compelling sources of motivation.

2.10. Multi-Stakeholder Collaboration

Collaboration and dialogue between diverse stakeholders, such as enterprises, governments, NGOs, communities, and academics, are frequently required for effective sustainability communication. This collaboration fosters a holistic and inclusive approach to solving sustainability challenges [38]. In this context, academics can be crucial to governments' sustainability efforts.

2.11. Measuring Impact and Adaptation

Sustainability Communication acknowledges the significance of ongoing evaluation and adaptation [52]. Effective communication strategies should be data-driven, with regular assessment to determine their impact and receptivity among academic personnel. This iterative process allows for the refinement of sustainability communication initiatives, ensuring they remain aligned with the evolving requirements and priorities of the academic community.

3. MATERIALS AND METHODS

The effort to increase academic staff at Gazi University's awareness of their ecological footprint is supported by a comprehensive and systematic research methodology that conforms with the principles of Sustainability Communication. This section describes the study's methodology, including the research design, participant selection, survey instrument, data collection procedure, and data analysis techniques.

3.1. Research Design

The research design of this study is anchored in a cross-sectional survey approach. A survey methodology permits the accumulation of a vast array of data from a diverse group of academic staff members at a single time. This method allows for evaluating their current level of ecological footprint awareness and formulating targeted recommendations to improve sustainability communication strategies.

3.2. Participant Selection

This study's target population comprises academic personnel from numerous faculties and departments at Gazi University. Recognizing that sustainability communication strategies should be adapted to different academic backgrounds and interests, all academic staff registered in the Gazi University personnel database when the research was conducted were determined as the study's target audience to ensure representation from various disciplines and departments. The sample size was calculated as 435 with an error margin of $\pm 4.7\%$ with a 95% confidence level, and the survey was sent to 653 academic staff (1.5 times the calculated sample size) considering the non-responsiveness. The sampling units were randomly selected with simple random sampling as proportional to strata size from the database, using gender and academic title as stratification criteria.

3.3. Survey Instrument: Ecological Footprint Awareness Scale

The "Ecological Footprint Awareness Scale (EFAS)" [61] was used to measure awareness of ecological footprints. EFAS consists of 46 questions to determine the environmental footprint awareness levels, with five sub-dimensions: food, transportation and housing, energy, waste, and water consumption. The questions in the scale are structured to evaluate the contributions of end users to the ecological footprint within the scope of the five dimensions. The scale was supported by demographic questions to allow a comparative analysis of the findings of the participant groups.

The research study incorporated a quantitative approach by utilizing a structured survey as a means of data collection. The survey instrument had a series of questions in the form of multiple-choice and Likert-scale items. Its purpose was to evaluate the level of ecological footprint knowledge and sustainable behaviors among academic staff members. The environmental footprint awareness scale, as a well-established instrument used in the study, is employed to assess levels of environmental consciousness.

The survey consisted of two parts:

- Socio-Demographic Information: Gender, age, marital status, title, and income.
- Ecological Footprint Awareness Scale: This section used Likert-scale questions to evaluate ecological footprint awareness, sustainable practices, and receptivity to sustainability communication initiatives.

3.4. Data Collection

The cross-sectional study was conducted with data from 467 academic staff, 14 % of the population, who responded to the web-based survey. The survey was administered to academic staff members electronically through a secure online platform, ensuring anonymity and confidentiality. E-mail invitations were sent to participants, encouraging them to participate in the survey. A reminder was sent to maximize response rates and provide a representative sample.

3.5. Data Analysis

The present study aims to verify the impact of socio-demographic characteristics (gender, age, marital status, title, and income) of academic staff on each dimension of ecological footprint awareness. Inferential data analysis methods were used to make statistical comparisons. Group comparisons were made using parametric independent samples, t-tests, and one-way analysis of variance (ANOVA).

Since some scores deviated from the normal distribution, outliers were detected. Eight observations were removed from the dataset to test the parametric hypotheses, and the analyses were carried out with 459 observations. Thus, overall estimations were obtained with an error margin of $\pm 4.57\%$. The survey data collected in an electronic environment were analyzed in SPSS V.27. The Gazi University personnel database was used as the sampling frame. However, since the actual distribution of respondents differs from the sample distribution, the calibration process was performed with the raking method to balance the observed sampling distribution with the actual distribution. The academic title and

gender were considered balancing criteria in the raking process.

The research study incorporated a quantitative approach by utilizing a structured survey as a means of data collection. The survey instrument had a series of questions in the form of multiple-choice and Likert-scale items. Its purpose was to evaluate the level of ecological footprint knowledge and sustainable behaviors among academic staff members. The ecological footprint awareness scale, as a well-established instrument used in the study, is employed to assess levels of environmental consciousness. The acquired data were subjected to a rigorous analysis following the research objectives of the survey. An Item-Based Table showing the responses' mean and standard deviation values and the minimum and maximum scores for each item is presented as an appendix. The study followed ethical protocols of research involving human subjects. The data underwent anonymization procedures and were securely stored to safeguard the participants' privacy.

4. RESULTS

4.1. Scale and Demographic Data

This section includes a descriptive analysis based on the demographic profile of respondents, the reliability of the research instrument, and a comparative analysis of academic staff's ecological footprint awareness for demographic variables using independent samples t-tests and one-way ANOVA. Demographic characteristics of the respondents are given in Table 1.

Table 1. Socio-demographic characteristics of the sample respondents

	Frequency (n)	Percent (%)
Gender		
Female	304	66
Male	155	34
Age		
25-34	154	34
35-44	139	30
45-54	107	23
55-64	59	13
Marital Status		
Married	341	74
Single	118	26
Education Level		
Bachelor	195	43
PhD	264	57
Title		
Professor	113	25
Associate Professor	65	14
Assistant Professor	33	8
Instructor	120	26
Research Assistant	128	27
Income (1 U.S. Dollar was approximately 18.8 Turkish Liras when the study was conducted).		
20000TL and under	106	23
20001TL-30000TL	144	31
30001TL and over	209	46
Total	459	100

The Ecological Footprint Awareness Scale (EFAS) consists of 46 items that were ranked on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The scale is composed of five dimensions: food (items 1–8), transportation and housing (items 9–18), energy (items 19–32), waste (items 33–41), and water consumption (items 42–46) and according to confirmatory factor analysis supported five factors and the 46 items under those in the original form (See *Supplementary Material for Item Based Total Score Table*). The five-dimensional model was well fit ($\chi^2/df=3.07$, RMSEA = .07, SRMR = .07, CFI = .79). Internal consistency coefficient (Cronbach alpha) was found as .94 for the whole scale and 0.75, 0.78, 0.91, 0.85 and 0.83 for the food, transportation and housing, energy, waste, and water consumption dimensions, respectively.

4.2. Independent Samples t-Tests

Independent samples t-tests were performed to compare academic staff's five dimensions and total awareness

Waste: There was a significant difference in the waste dimension ($M_f=37.39$, $SD_f=5.14$, $M_m=36.29$, $SD_m=6.34$, $p<0.001$) awareness scores for female and male academic staff however Cohen's d, ($d=0.193$) indicates a small effect for this test.

Water Consumption: There was a significant difference in the water consumption dimension ($M_f=21.42$, $SD_f=3.17$, $M_m=20.94$, $SD_m=3.23$, $p<0.001$) awareness scores for female and male academic staff whereas the effect size, as measured by Cohen's d, is $d=0.152$, indicating a small effect.

Transportation and Housing: No significant difference was noted between awareness scores of female and male academic staff for the transportation and housing dimension ($M_f=33.39$, $SD_f=5.66$, $M_m=33.54$, $SD_m=6.63$, $p=0.477$).

Energy: No significant difference was noted between the awareness scores of female and male academic staff for the energy dimension ($M_f=61.46$, $SD_f=7.62$, $M_m=61.52$,

Table 2. Independent samples t-test on gender

DIMENSION OF EFA SCALE		Mean	Std. Deviation	t	p	Cohen's d
FOOD	Female	27.34	4.85	3.23	<0.001*	0,114
	Male	26.73	5.83			
TRANSPORTATION AND HOUSING	Female	33.39	5.66	-0.711	0.477	-
	Male	33.54	6.63			
ENERGY	Female	61.46	7.62	-0.21	0.831	-
	Male	61.52	7.92			
WASTE	Female	37.39	5.14	5.46	<0.001*	0,193
	Male	36.29	6.34			
WATER CONSUMPTION	Female	21.42	3.17	4.39	<0.001*	0,152
	Male	20.94	3.23			
TOTAL SCORE	Female	181.00	20.62	2.52	0.012*	0,089
	Male	179.02	24.37			

* $p<0.05$.

scores regarding gender and marital status. (Note that the mean and standard deviations and sample statistics for demographic variables will be briefly shown with M and SD. For example, M_m , M_f for gender shows the mean for male and female, respectively, SD_m and SD_f show the standard deviations for males and females. Similarly, for example, F_{food} shows the F statistic for the food score.

4.2.1. Gender

There was a significant difference in the food, waste, water consumption, and total awareness scores for female and male academic staff. In terms of these dimensions and total, female academic staff have higher awareness than male academic staff. No significant difference was noted between the awareness scores of female and male academic staff for transportation, housing, and energy. The findings given in Table 2 are explained in the following subheadings.

Food Consumption: There was a significant difference in the food dimension ($M_f=27.34$, $SD_f=4.85$, $M_m=26.73$, $SD_m=5.83$, $p=0.001$) awareness scores for female and male academic staff whereas the effect size, as measured by Cohen's d, is $d=0.114$, indicating a small effect.

$SD_m=7.92$, $p=0.831$)

Total Awareness Scores: There was a significant difference in the total ($M_f=181.0$, $SD_f=20.62$, $M_m=179.02$, $SD_m=24.37$, $p=0.012$) awareness scores for female and male academic staff however Cohen's d, ($d=0.089$) indicates a small effect for this test.

Although there is a statistically significant difference between male and female academic staff regarding food, waste, and water consumption awareness scores, small Cohen's d effect sizes show that the practical effect of this difference is not significant.

4.2. Marital Status

There was a significant difference between awareness scores of marital status groups in food, transportation, housing, waste, water consumption, and total score. The results showed that the married academic staff has a significantly higher awareness score than the single academic staff for total and all dimensions except energy score. The findings given in Table 3 are explained in the following subheadings.

Table 3. Independent samples t-test on marital status

DIMENSION OF EFA SCALE		Mean	Std. Deviation	t	p	Cohen's d
FOOD	Married	27.55	5.31	9.24	<0.001*	0,368
	Single	25.62	5.09			
TRANSPORTATION AND HOUSING	Married	33,72	6,15	4.29	<0.001*	0,171
	Single	32.68	5.93			
ENERGY	Married	61.60	7.89	1.42	0.156	-
	Single	61.16	7.35			
WASTE	Married	37.03	5.64	2.31	0.021*	0,095
	Single	36.49	6.01			
WATER CONSUMPTION	Married	21.28	3.16	2.27	0.023*	0,093
	Single	20.98	3.33			
TOTAL SCORE	Married	181.17	22.48	4.78	<0.001*	0,190
	Single	176.92	21.92			

*p< 0.05.

Food: There was a significant difference between awareness scores of groups of marital status in the dimension of food ($M_{mar}=27.55$, $SD_{mar}=5.31$, $M_s=25.62$, $SD_s=5.09$, $p<0.001$) while Cohen's d, ($d = 0.368$) indicates a small effect for this test.

Transportation and Housing: There was a significant difference between awareness scores of groups of marital status in the dimension of transportation and housing ($M_{mar}=33.72$, $SD_{mar}=6.15$, $M_s=32.68$, $SD_s=5.93$, $p<0.001$) whereas the effect size, as measured by Cohen's d, is $d = 0.171$, indicating a small effect.

Waste: There was a significant difference between awareness scores of groups of marital status in the dimension of waste ($M_{mar}=37.03$, $SD_{mar}=5.64$, $M_s=36.49$, $SD_s=6.01$, $p=0.021$) however, the effect size, as measured by Cohen's d, is $d = 0.095$, indicating a small effect.

Water Consumption: There was a significant difference between awareness scores of groups of marital status in the dimension of water consumption ($M_{mar}=21.28$, $SD_{mar}=3.16$, $M_s=20.98$, $SD_s=3.33$, $p=0.023$) but the effect size, as measured by Cohen's d, is $d = 0.093$, indicating a small effect.

Total Score: There was a significant difference between awareness scores of groups of marital status in total score ($M_{mar}=181.17$, $SD_{mar}=22.48$, $M_s=176.92$, $SD_s=21.92$, $p<0.001$) while Cohen's d, ($d = 0.190$) indicates a small effect for this test.

Although there were statistically significant differences between different marital status groups in the awareness scores of Food Consumption, Waste, Transportation and Housing, Water Consumption, and Total Awareness, small Cohen's d effect sizes show that this difference's practical effect is insignificant.

4.3. ANOVA Tests

Analysis of variance tests was carried out to see whether academic title and income had a statistically significant effect on awareness scores. Evaluations in the study were carried out within the framework of the title groups of Professor (Prof.), Associate Professor (Assoc. Prof.), Assistant Professor (Asst. Prof.), Instructor and Research Assistant (Res. Assistant). The income level of the participants was categorized into three groups: 20000TL and under, 20001TL-30000TL, and 30001TL and over (1 US Dollar is approximately equal to 18.8 Turkish Liras when the study was conducted).

4.3.1. Academic title

There was a significant effect of academic titles on awareness scores for total [$F_{total}= 66.71$, $p_{total}< 0.001$], food [$F_{food}= 92.71$, $p < 0.001$], transportation and housing [$F_{trans\&hous}= 53.83$, $p < 0.001$], energy [$F_{energy}= 66.71$, $p < 0.001$], waste [$F_{waste}= 49.14$, $p < 0.001$], and water consumption [$F_{waterCons}= 32.18$, $p < 0.001$]. The results of the Games-Howell post-hoc

Table 4. One-way ANOVA tests on academic title

DIMENSION OF EFA SCALE		Mean	Std. Deviation	F	p	Eta Squared
FOOD	Prof.	28.54	4.89	92.71	<0.001*	0,099
	Assoc.Prof.	28.13	5.55			
	Asst. Prof.	29.07	4.15			
	Instructor	26.99	4.89			
	Res. Asst.	24.87	5.30			

Continuation of Table 4

		Prof.	34.56	5.68		0,060
TRANSPORTATION AND HOUSING	Assoc.Prof.	34.98	6.94	53.83	<0.001*	
	Asst. Prof.	34.80	5.25			
	Instructor	33.85	5.58			
	Res. Asst.	31.42	6.08			
	Prof.	62.23	7.10			
ENERGY	Assoc.Prof.	62.75	7.63	17.13	<0.001*	0,020
	Asst. Prof.	62.17	7.98			
	Instructor	62.02	7.59			
	Res. Asst.	59.99	8.15			
	Prof.	37.73	5.39			
WASTE	Assoc.Prof.	38.50	5.08	49.14	<0.001*	0,055
	Asst. Prof.	37.72	4.74			
	Instructor	37.65	5.81			
	Res. Asst.	35.05	6.02			
	Prof.	21.64	2.78			
WATER CONSUMPTION	Assoc.Prof.	22.24	3.55	32.18	<0.001*	0,037
	Asst. Prof.	20.70	3.37			
	Instructor	21.40	3.16			
	Res. Asst.	20.51	3.24			
	Prof.	184.70	20.15			
TOTAL SCORE	Assoc.Prof.	186.60	23.37	66.71	<0.001*	0,074
	Asst. Prof.	184.46	20.38			
	Instructor	181.90	21.28			
	Res. Asst.	171.85	22.60			
	Prof.	184.70	20.15			

*p< 0.05.

analysis, considering heterogeneity between group variances, can be summarized as follows (see Table 4).

Food Awareness Score: There was a significant effect of academic titles on awareness scores for food [$F_{food}=92.71, p<0.001$]. The obtained effect size, quantified by Eta Squared, is $\eta^2 = 0.099$, suggesting a substantial influence. Therefore, it might also be assessed as a significant disparity. Food Dimension Scores by Academic Titles are given in Figure 2.

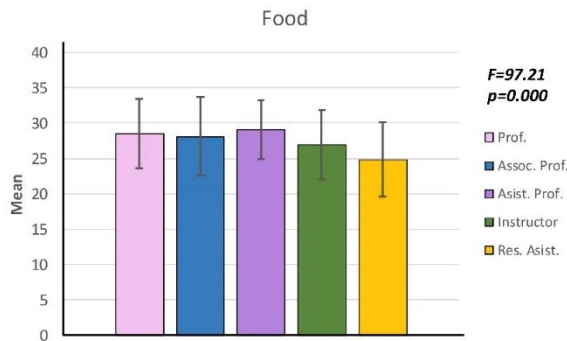


Figure 2. Food dimension scores by academic titles

Test results indicated that the mean score of food for Res. Asst. given in Figure 2 ($M_{ra}=24.87, SD_{ra}=5.30$) is significantly different than all other academic-titled staff ($M_p=28.54, SD_p=4.89, p<0.001$), ($M_{asc}=28.13, SD_{asc}=5.55, p<0.001$), ($M_{ass}=29.07, SD_{ass}=4.15, p<0.001$), ($M_i=26.99, SD_i=4.89, p<0.001$). The mean score of food for instructors is also significantly different than all other academic titled staff.

Transportation and Housing Awareness Score: The mean score of Transportation and housing for Res. Asst. given in Figure 3 ($M_{ra}=31.42, SD_{ra}=6.08$) is significantly different than all other academic groups ($M_p=34.56, SD_p=5.68, p<0.001$), ($M_{asc}=34.98, SD_{asc}=6.94, p<0.001$), ($M_{ass}=34.80, SD_{ass}=5.25, p<0.001$), ($M_i=33.85, SD_i=5.58, p<0.001$). The F-statistic for transportation and housing awareness scores ($F_{(trans\&hou)}=53.83$) indicates that there is a statistically significant difference between the academic title groups ($p<0.001$). The value of eta squared ($\eta^2 = 0.06$) suggests a medium effect size, indicating a significant difference between the groups. Transportation and Housing Dimension Scores by Academic Titles are given in Figure 3.

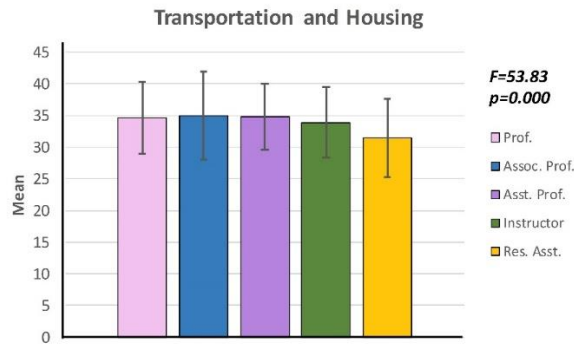


Figure 3. Transportation and housing dimension scores by academic titles

Energy Awareness Score: The mean score of Energy for Res. Asst. given in Figure 4 ($M_{ra}= 59.99, SD_{ra}= 8.15$) is significantly different than all other academic groups ($M_p=62.23, SD_p=7.10, p<0.001$), ($M_{asc}= 62.75, SD_{asc}= 7.63, p<0.001$), ($M_{ass} =62.17,SD_{ass} =7.98, p<0.001$), ($M_i= 62.02, SD_i= 7.59, p<0.001$). The value of eta squared ($\eta^2 = 0.02$) suggests a small effect size for the test in question. In this study, the distinction between academic title groups lacks practical significance. Energy Dimension Scores by Academic Titles are given in Figure 4.

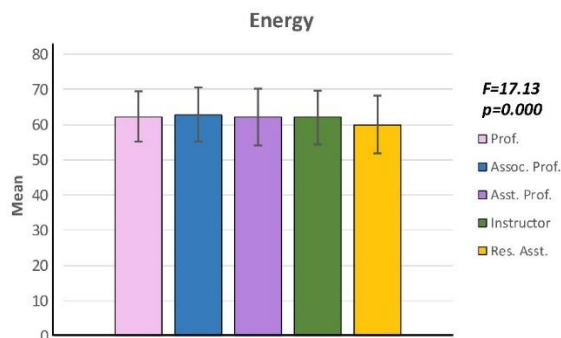


Figure 4. Energy dimension scores by academic titles

Waste Awareness Score: Similar to scores of factors given above, there is a significant difference between mean scores of Res. Asst. given in Figure 5 ($M_{ra}=35.05, SD_{ra}= 6.02$) and other academic staff groups for Waste ($M_p=37.73, SD_p=5.39, p<0.001$), ($M_{asc}= 38.50, SD_{asc}= 5.08, p<0.001$), ($M_{ass} =37.72,SD_{ass} =4.74 p<0.001$), ($M_i= 37.65, SD_i= 5.81, p<0.001$). The observed effect size, quantified by Eta Squared ($\eta^2 = 0.05$), suggests a minor magnitude of effect. Consequently, the disparity seen between the academic title groups does not possess practical significance. Waste Dimension Scores by Academic Titles are given in Figure 5.

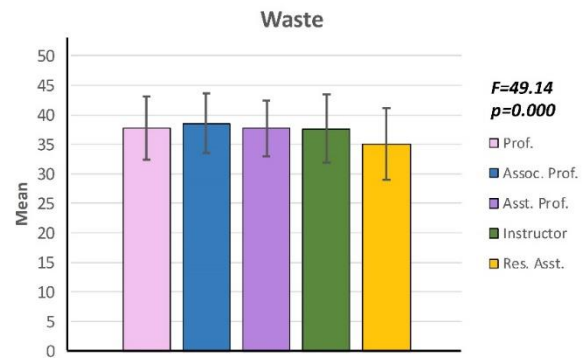


Figure 5. Waste dimension scores by academic titles

Water Consumption Awareness Score: As a result of paired comparisons, there was no statistically significant difference between the mean scores of water consumption only between the professor and instructor given in Figure 6 ($M_p=21.64, SD_p=2.78, M_i= 20.51, SD_i= 3.24, p=0.639$) and between assists. prof. and research assistant ($M_{ass} =20.70,SD_{ass} =3.37, M_{ra}=21.40, SD_{ra}= 3.16, p= 0.894$). The p-value ($p<0.001$), less than the conventional significance level of 0.05, indicates a statistically significant influence of academic titles on water consumption awareness scores. However, the effect size ($\eta^2 = 0.037$) is relatively modest, suggesting no practically significant difference in the scores based on academic title. Water Consumption Dimension Scores by Academic Titles are given in Figure 6.

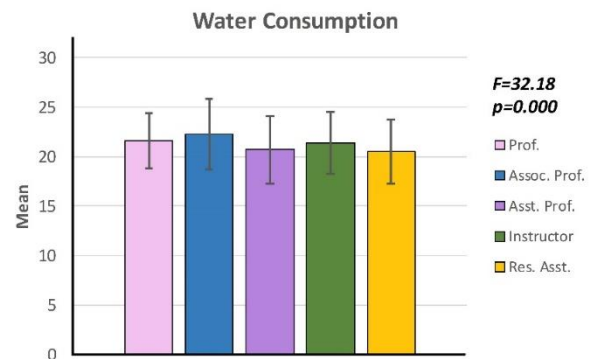


Figure 6. Water consumption dimension scores by academic titles

Total Awareness Score: The pairwise comparisons between academic groups in terms of the total score showed that the mean score of the research assistant ($M_{ra}=171.85, SD_{ra}= 22.60$) is significantly different from the mean score of all other academic staff ($M_p=184.70, SD_p=20.15, p<0.001$), ($M_{asc}= 186.60,SD_{asc}=23.37, p<0.001$), ($M_{ass} =184.46,SD_{ass} =20.38, p<0.001$), ($M_i= 181.90, SD_i= 21.28, p<0.001$). In addition, there is a significant difference between the mean scores of instructors and associate professor ($p=0.018$). Additionally, the calculated eta squared value ($\eta^2 = 0.099$) indicates a moderate effect size and shows that academic title has an

effect on ecological footprint awareness. Total Scores by Academic Titles are given in Figure 7.

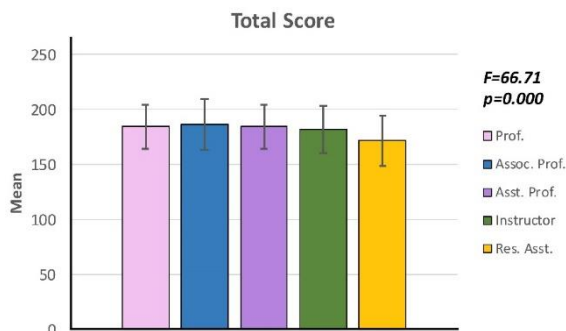


Figure 7. Total scores by academic titles

4.3.2. Income level

One-way ANOVA Tests on income are given in Table 5. The analysis revealed that there were statistically significant differences in all scores between at least two income groups ($F_{food} = 18.21, p < 0.001, F_{trans\&hous} = 9.06, p < 0.001, F_{energy} = 24.64, p < 0.001, F_{waste} = 10.23, p < 0.001, F_{watercons} = 24.68, p < 0.001, F_{total} = 23.88, p < 0.001$). The results of the Games-Howell post-hoc analysis can be summarized as follows.

Food Awareness Score for Income Group: Test results indicated that the mean score of food for 30001TL and over income group ($M_{i3} = 27.66, SD_{i3} = 5.00$) significantly differs from the score of academic staff in other income groups ($M_{i1} = 26.53, SD_{i1} = 5.85, p < 0.001$)

Table 5. One-way ANOVA tests on income

DIMENSION OF EFA SCALE		Mean	Std. Deviation	F	p	Eta Squared
FOOD	20000TL and under	26.53	5.85	18.21	<0.001*	0,011
	20001TL-30000TL	26.57	5.26			
	30001TL and over	27.66	5.00			
TRANSPORTATION AND HOUSING	20000TL and under	33.52	6.70	9.06	<0.001*	0,005
	20001TL-30000TL	32.79	6.15			
	30001TL and over	33.84	5.74			
ENERGY	20000TL and under	61.66	7.43	24.64	<0.001*	0,014
	20001TL-30000TL	60.09	8.88			
	30001TL and over	62.28	7.01			
WASTE	20000TL and under	36.57	5.97	10.23	<0.001*	0,006
	20001TL-30000TL	36.40	6.05			
	30001TL and over	37.37	5.37			
WATER CONSUMPTION	20000TL and under	20.99	3.25	24.68	<0.001*	0,014
	20001TL-30000TL	20.74	3.48			
	30001TL and over	21.60	2.95			
TOTAL SCORE	20000TL and under	179.26	23.47	23.88	< 0.001*	0,014
	20001TL-30000TL	176.60	24.59			
	30001TL and over	182.75	19.96			

*p < 0.05.

($M_{i2}=26.57$, $SD_{i2}=5.26$, $p<0.001$). Awareness of the food dimension of academic staff with 30001TL and over income is higher than that of academics from other income groups (see Figure 8). The obtained effect size ($\eta^2 = 0.011$) suggests a small magnitude of influence.

Transportation and Housing Awareness Score for Income Group: The mean Transportation and Housing awareness score of academic staff with an income of 20001TL-30000TL ($M_2=32.79$, $SD_2=6.15$) is significantly different from the score of academic staff with all other income levels ($M_1=33.52$, $SD_1=6.70$, $p=0.045$), ($M_3= 33.84$, $SD_3= 5.74$, $p<0.001$). (see Figure 9). However, Eta squared ($\eta^2 = 0.005$) indicates a small effect for this test. Therefore, we cannot easily conclude that there is a meaningful difference. It's important to note that at the time of the research, 1 USD was approximately 18.7 TRL.

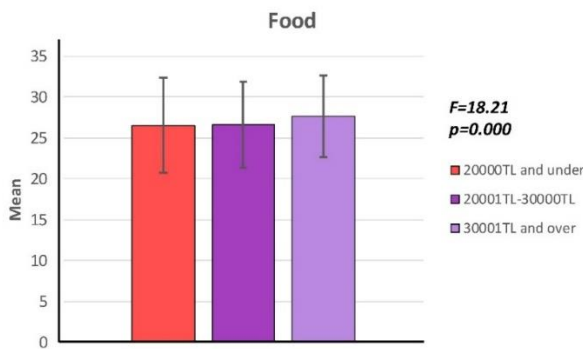


Figure 8. Food dimension score by income level

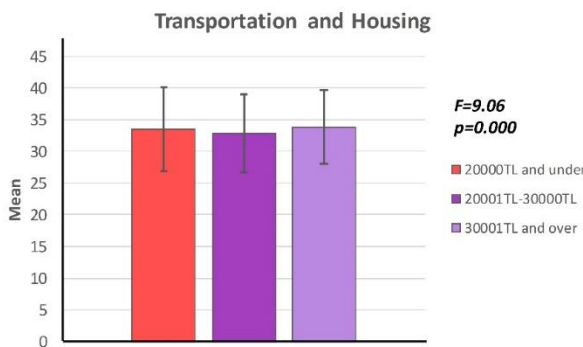


Figure 9. Transportation and housing dimension score by income

Energy Awareness Score for the 20001TL-30000TL Income Group: The mean score of Energy for academic staff with an income of 20001TL-30000TL ($M_{i2}=60.09$, $SD_{i2}=8.88$) is significantly different from the score of academic staff with other income levels ($M_{i1}=61.66$, $SD_{i1}=7.43$, $p<0.001$), ($M_{i3}= 62.28$, $SD_{i3}= 7.01$, $p<0.001$). Academics in the 20001TL-30000T income group are more aware of the energy dimension than those in the other two income groups. (see Figure 10). The calculated effect size, quantified by Eta Squared, is $\eta^2 = 0.014$, suggesting a minor influence.

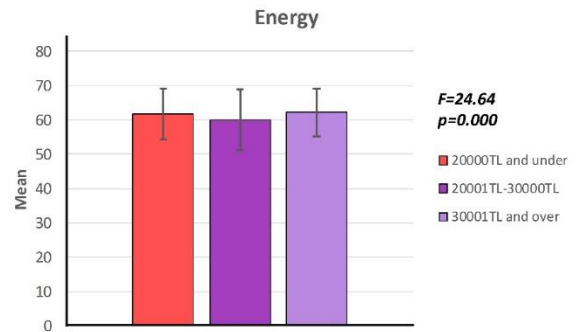


Figure 10. Energy dimension score by income

Waste Awareness Score for Income Group: According to the results of the pairwise comparison for the waste score, the mean score of academic staff with 30001TL and over income ($M_{i3}=37.37$, $SD_{i3}=5.37$) is significantly different from the score of academic staff with all other income levels ($M_{i1}=36.57$, $SD_{i1}=5.97$, $p<0.001$), ($M_{i2}= 36.40$, $SD_{i2}= 6.05$, $p<0.001$). (see Figure 11). However, Eta squared ($\eta^2 = 0.006$) indicates a small effect for this test.

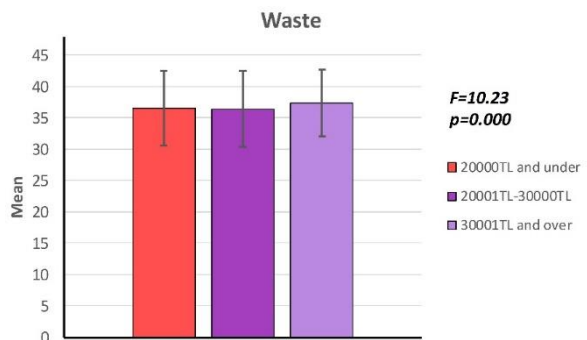


Figure 11. Waste dimension score by income

Water Consumption Awareness Score for the 30001TL and Over Income Group: Similar to waste score results, the mean score of water consumption for the academic staff with 30001TL and over income ($M_{i3}=21.60$, $SD_{i3}=2.95$) is significantly different from the score of academic staff with all other income levels ($M_{i1}=20.99$, $SD_{i1}=3.25$, $p<0.001$), ($M_{i2}= 20.74$, $SD_{i2}= 3.48$, $p<0.001$) (see Figure 12). The effect size, as measured by Eta Squared, is $\eta^2 = 0.014$, indicating a small effect.

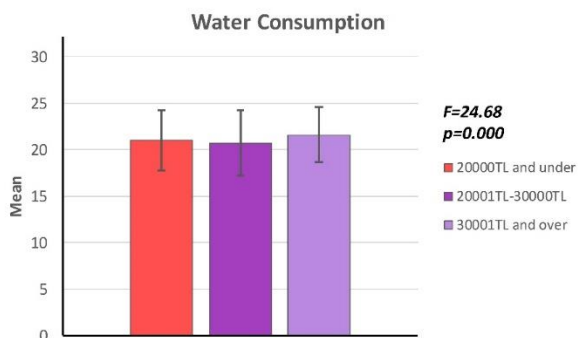


Figure 12. Waste dimension score by income

Total Awareness Score for Income Group: The mean total score of the academic staff with 30001TL and over income ($M_3=182.75$, $SD_3=19.96$) is significantly different from the score of academic staff with all other income levels ($M_1=179.26$, $SD_1=23.47$, $p<0.001$), ($M_2=176.60$, $SD_2=24.59$, $p<0.001$). Eta squared ($\eta^2 = 0.014$) indicates a small effect for this test. It is concluded that academicians with 30001TL and above income are more aware of waste, water consumption, and total scores than other income groups (see Figure 13).

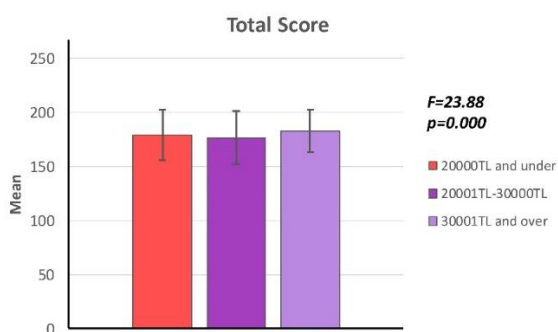


Figure 13. Total scores by income level

While there is a statistically significant difference in the awareness scores of all aspects among income groups, the modest effect sizes make it challenging to assess whether there is a substantial difference between the mean scores of these groups.

5. DISCUSSION

The primary objective of this study was to examine and enhance the level of ecological footprint awareness among academic staff members at Gazi University by implementing the Sustainability Communication strategy. The results of our study provide insights into the variations in ecological footprint awareness across different dimensions, such as food consumption, waste generation, water consumption, transportation and housing, energy, and overall awareness scores concerning gender, marital status, academic title, and income. The findings of this study hold significant significance for the development of impactful sustainability communication strategies within academic institutions.

5.1. Gender Differences

The study found significant gender differences in food, waste, water consumption, and total ecological footprint awareness scores, with female academic staff demonstrating higher awareness than their male counterparts in these dimensions. While statistically significant, these differences are characterized by small effect sizes, implying that gender alone may not be the primary driver of awareness. These results suggest that sustainability communication efforts need to be tailored to different genders to maximize their impact, even though the effect size is modest. Prior research indicates that women tend to demonstrate more significant levels of environmental consciousness through their actions and

preferences related to sustainable consumption patterns [62]. These patterns encompass several aspects, such as dietary choices and practices to reduce waste. Recent findings indicate that female faculty members demonstrate a heightened awareness of their ecological footprints and engage in more sustainable food consumption, waste management, and water usage practices. The gender disparities discovered underscore the significance of tailoring sustainability communication tactics to effectively engage individuals of both genders[63]. To enhance the efficacy of communication efforts, strategies should consider the distinct motives, values, and preferences that shape sustainable habits.

5.2. Marital Status

In the context of marital status, the research revealed that married academic staff exhibited significantly higher ecological footprint awareness scores in all dimensions and the total score, except for energy awareness. The effect sizes, though statistically significant, were relatively small, suggesting that the awareness differences may not be practically significant. It is found that marital status may influence their awareness of their ecological imprint and associated behaviors [64]. It is essential to recognize that the married participants displayed slightly higher awareness, possibly due to shared responsibilities and a family-oriented perspective, highlighting the importance of considering marital status in sustainability communication strategies. These findings underscore the potential for designing sustainability communication initiatives incorporating family dynamics and responsibilities, promoting collaborative efforts toward sustainable living practices.

5.3. Academic Title

Significant differences between academic titles in total scores and all subscales were found. However, the effect of academic title on energy and water consumption dimensions is minimal. Food consumption, transportation, shelter, and waste awareness had the most significant impact. Therefore, when developing a communication strategy, raising awareness about food consumption, transportation and accommodation, and waste should be emphasized, considering academic titles.

5.4. Income Differences

Income was also found to influence ecological footprint awareness, with participants in the higher income group (30001TL and over) demonstrating more heightened awareness in some dimensions, particularly food and water consumption. While these differences were statistically significant, the effect sizes were relatively small, suggesting that income alone may not be the sole determinant of awareness. Nevertheless, the results indicate that higher-income participants may be more receptive to sustainability communication efforts, highlighting the potential for targeting these groups with tailored messages. It is essential to address economic disparities when devising communication strategies for sustainability and raising academic staff awareness. To

ensure equitable participation and engagement across all income categories, sustainability initiatives must prioritize inclusivity and affordability [65].

5.5. Implications for Sustainability Communication

Communication theories and methods provide dynamic and strategic lenses within transdisciplinary processes that enable collaborators to build change capacity, sustain critical and reflective inquiry, and view difference as generative in collective efforts to achieve sustainability[66]. By enacting policies and practices that reduce greenhouse gas emissions, promote sustainable development, and build resilience to extreme weather events, governments, and individuals may play a vital role in tackling the challenges of climate change. Climate change impacts, hazards, and damages must be effectively monitored and communicated promptly [1]. There is an opportunity to customize sustainability communication initiatives to effectively engage academic staff members of both genders [67]. The communication should prioritize highlighting the distinct domains in which each group may make valuable contributions to promote sustainability[68]. It is advisable to use a media-mix strategy to effectively disseminate messages, encompassing several communication channels, such as mainstream media, interpersonal channels, and local media [69]. Understanding the psychological traits associated with gender can further enhance the effectiveness of gender-specific messages. Communication methods should consider the problems and opportunities for unmarried and married academic staff members. By doing so, these tactics can help cultivate a feeling of community and develop a shared sense of responsibility.

The involvement of educational institutions in imparting basic knowledge to young individuals to address environmental concerns is essential. The participation of young individuals is particularly pertinent to this endeavor as they represent the future generation that will significantly necessitate the implementation of environmental sustainability measures[69]. Mentorship and targeted communication can be valuable tools for junior faculty members and research assistants to boost their knowledge of ecological footprints. Promoting collaboration with senior faculty members can be a worthwhile strategic approach. To mitigate income-based disparities, sustainability programs must contemplate providing resources and incentives to academic personnel from lower-income brackets. This may encompass the provision of incentives for environmentally friendly products or facilitating access to sustainable activities. An all-encompassing sustainability communication strategy should incorporate all aspects of ecological footprint awareness. Promoting the recognition of the interdependencies among food systems, transportation networks, energy sources, waste management, and water utilization can foster a comprehensive perspective toward the pursuit of sustainability. Sustainable consumption communication

can support efforts to promote sustainable consumption behaviors and system change [70].

5.6. Implications for Gazi University

The findings from this study underscore the significance of tailoring sustainability communication strategies to specific demographic characteristics. Understanding gender, marital status, academic title, and income-related differences in ecological footprint awareness is essential for designing practical communication approaches that promote sustainable behaviors among academic staff. By acknowledging and addressing these differences, sustainability communication can be optimized to engage a broader audience and inspire collective action toward a more environmentally sustainable future within academic communities. By recognizing and attending to disparities in ecological footprint awareness among the academic staff, Gazi University has the potential to cultivate a sustainable culture, enable individuals to adopt more ecologically conscious behaviors, and actively contribute to advancing a more environmentally friendly future. The present analysis provides a significant basis for future research endeavors and the formulation of influential sustainability efforts within academia.

5.7. Limitations and Future Research Directions

Acknowledging that this study has certain limitations, including using self-reported data, is imperative. The inherent self-reporting aspect of the survey creates a potential for answer bias. Notwithstanding these constraints, our study provides significant perspectives and establishes a basis for forthcoming endeavors in sustainability communication within academic establishments.

This study is vital for future research and developing impactful sustainability initiatives within academic institutions. Further investigations can explore factors influencing ecological footprint awareness, such as educational background and disciplinary affiliation, as well as the impact of awareness on actual behavior change. Longitudinal studies can also assess the effectiveness of sustainability communication strategies over time.

6. CONCLUSION

Academic institutions play a pivotal role in generating change and shaping a sustainable future in an era in which ecological sustainability is the foremost global concern. This study explored the ecological footprint awareness of Gazi University's academic staff. The "Ecological Footprint Awareness Scale (EFAS)" findings indicate that academic staff possess varying levels of awareness in different dimensions of ecological footprint, which are influenced by gender, marital status, academic title, and income. Through an exhaustive analysis of multiple dimensions, valuable insights have been obtained to inform targeted communication strategies for sustainability. Our study's results indicate gender-based disparities in ecological footprint

awareness among academic staff. Specifically, female academic staff exhibit significantly greater awareness in various aspects, including food consumption, waste management, water usage, and the overall ecological footprint score. Nevertheless, it is essential to note that these variations were accompanied by effect sizes that were very minor in magnitude. This implies that although there are discernible variances, the practical implications of these disparities are constrained. Additionally, it was observed that marital status impacted ecological footprint awareness. Specifically, married academic staff members exhibited higher scores in all aspects and the overall score compared to persons who were not married. Similar to the inequalities observed in gender, these statistically significant differences were marked by relatively minor effect sizes.

The study revealed notable variations in ecological footprint awareness across different academic cohorts, as determined by their respective academic titles. Professors consistently showed greater awareness across all aspects and achieved better overall scores than other academic titles, but research assistants always obtained lower scores in all categories. This finding suggests that the academic title of individuals has a notable influence on their level of awareness regarding ecological footprint, and this variation is linked to a considerable effect size. The investigation also examined the impact of income levels on the awareness of ecological footprint. The findings indicated a positive correlation between the income levels of academic staff and their level of awareness regarding their ecological footprint across multiple dimensions, with a particular emphasis on food consumption and energy awareness. Nevertheless, despite the statistical significance of these disparities, their impact sizes were relatively modest, indicating that income in isolation may not substantially influence the ecological consciousness of academic personnel.

This research highlights the significance of promoting ecological footprint awareness among the academic staff at Gazi University, as it plays a crucial role in attaining sustainability objectives. The factors of gender, marital status, academic title, and income exert varying degrees of influence on the formation of ecological awareness. To foster sustainability, institutions must consider various demographic aspects while formulating tailored communication strategies to promote sustainability.

The findings suggest that to promote ecological consciousness among academic staff, it may be necessary to employ multifaceted and complete strategies beyond considering only demographic parameters, according to the relatively small impact sizes reported in particular comparisons. Furthermore, it is suggested that future studies investigate the efficacy of distinct sustainability communication tactics in promoting heightened ecological consciousness and inducing behavioral modifications. To foster sustainable practices within academic institutions and society as a whole, it is imperative to prioritize cultivating ecological footprint awareness within academic communities. As educational

institutions persist in spearheading sustainability endeavors, the significance of faculty and staff in propelling these initiatives becomes progressively paramount.

The results align with the Sustainability Communication framework, emphasizing the need for tailored communication strategies to enhance ecological footprint awareness. Academic staff at Gazi University are willing to engage with sustainability topics, indicating a receptive audience for targeted communication efforts. Strategies such as interactive workshops, online resources, and peer-led initiatives can effectively promote sustainability within the academic community. When developing effective communication strategies for sustainability, it is essential to construct messages that resonate with the scholarly community's diversity, recognizing the interconnectedness of food, transportation, energy, waste, and water consumption. Integrating these dimensions into holistic communication can inspire a collective and concerted effort toward sustainable living.

This study casts light on the ecological footprint consciousness of the academic staff at Gazi University and provides a road map for developing effective sustainability communication strategies. Tailored approaches can be designed to bridge awareness gaps and encourage more sustainable practices among specific demographic groups. By comprehending and addressing academic staff's unique characteristics and contexts, customized initiatives can be designed to empower individuals to make sustainable decisions.

This endeavor will increase public consciousness and cultivate knowledgeable and conscientious individuals who actively contribute to adopting sustainable lifestyle choices. This holistic approach will ultimately foster a culture of sustainability in the academic realm and contribute to a greener and more environmentally conscious society.

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DECLARATION OF ETHICAL STANDARDS

The study was conducted following the Declaration of Helsinki, and approved by the Ethics Committee of GAZI UNIVERSITY (protocol code 2022 – 1248 and date of approval: 25.11.2022)

AUTHORS' CONTRIBUTIONS

Hafize Nurgül DURMUŞ ŞENYAPAR: Conceptualization, investigation, writing, review, and editing.

Kenan ÜNAL: Conceptualization, data curation, visualization.

Filiz KARDİYEN: Methodology, software, data curation, analysis, and tests.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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