



On the Trail of Future's Conscious English Teachers: Recycling and Zero-waste Awareness and Practices of ELT Students

Geleceğin Çevre Bilinçli İngilizce Öğretmenlerinin İzinde: İngilizce Öğretmenliği Öğrencilerinin Geri Dönüşüm ve Sıfır Atık Farkındalıkları ve Uygulamaları

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Geliş tarihi - Received: 7 May 2025
Kabul tarihi - Accepted: 18 July 2025
Yayın tarihi - Published: 28 October 2025



Abstract. Sustainability in English Language Teaching (ELT) is a current paradigm that entails language education as a vehicle for empowering individuals to address environmental challenges on global platforms and to cultivate environmental consciousness and socially responsible mindsets. EFL teacher candidates have critical roles in shaping future generations' habits for sustainability while teaching English as a lingua franca. As educators-in-training, their personal sustainability habits such as zero-waste and recycling can reflect on their teaching strategies and set powerful examples for their students. This study aims to investigate EFL teacher candidates' awareness and attitudes towards zero-waste and recycling practices, and to highlight their role in promoting sustainability in education. A total of 288 ELT students from three state universities participated in this quantitative study. The research data were collected using two structured questionnaires and analyzed through statistical methods. The findings revealed high mean scores for zero-waste and recycling practices of the participants, with statistically significant differences regarding age and gender. These results indicated that EFL teacher candidates possess strong sustainable habits that could positively impact their future teaching practices. The study highlights the need to include sustainability-oriented content into the English Language Teaching curriculum in training environmentally conscious educators.

Keywords: : Eco-consciousness, EFL teacher education, Sustainable education.

Öz. İngilizce öğretiminde sürdürülebilirlik; dil eğitiminin, bireylerin çevre sorunlarını küresel platformlarda ele alma ve çevre bilinci ve sosyal sorumluluk zihniyetini geliştirme konularında güçlendirmede bir araç olarak değerlendirildiği güncel bir yaklaşımdır. İngilizce öğretmen adayları, ortak dil olan İngilizce'yi öğretirken gelecek nesillerin sürdürülebilirlik alışkanlıklarını şekillendirmede önemli bir role sahiptir. Eğitim sürecindeki eğiticiler olarak, İngilizce öğretmeni adayları sıfır atık ve geri dönüşüm gibi kişisel sürdürülebilirlik alışkanlıklarını öğretim stratejilerine yansıtabilir ve öğrencileri için güçlü örnekler oluşturabilirler. Bu çalışmanın amacı, İngilizce öğretmen adaylarının sıfır atık ve geri dönüşüm uygulamalarına yönelik farkındalık ve tutumlarını araştırarak eğitimde sürdürülebilirliğin teşvik edilmesindeki rollerini vurgulamaktır. Bu nicel çalışmaya üç devlet üniversitesinden İngilizce Öğretmenliği programına kayıtlı toplam 288 öğrenci katılmıştır. Araştırma verileri yapılandırılmış iki anket kullanılarak toplanmış ve istatistiksel yöntemlerle çözümlenmiştir. Bulgular, katılımcıların sıfır atık ve geri dönüşüm uygulamalarına yönelik ortalama puanlarının yüksek olduğunu göstermekle birlikte yaş ve cinsiyete göre anlamlı bir biçimde farklılaştığını ortaya koymuştur. Bu sonuçlar, İngilizce öğretmen adaylarının gelecekteki öğretim uygulamalarını olumlu yönde etkileyebilecek güçlü sürdürülebilir alışkanlıklara sahip olduklarını göstermektedir. Çalışma, İngilizce Öğretmenliği müfredatına sürdürülebilirlik odaklı içerik dâhil edilmesinin çevre bilincine sahip eğitimciler yetiştirmedeki gerekliliğine dikkat çekmektedir.

Anahtar Kelimeler: Çevre bilinçliliği, İngilizce öğretmen eğitimi, Sürdürülebilir eğitim.



Genişletilmiş Özet

Giriş. Sürdürülebilir eğitimde, küresel sorunlar çevresel farkındalık yaratma ve toplumsal sorumluluk bilincine sahip bireyler yetiştirme odağında ele alınmaktadır. Birleşmiş Milletler'in 2030 sürdürülebilirlik hedeflerinden biri olan Sürdürülebilir Kalkınma için Eğitim (ESD), insan faaliyetlerinin neden olduğu ekolojik sorunlara çözüm sunmayı amaçlamaktadır. Bu çerçevede, bireylere çevresel, sosyal ve ekonomik olarak sorumlu yaşam bilgisi ve davranışlar kazandırılması hedeflenmektedir. Küresel 'ortak dil' İngilizce'nin öğretimi bağlamında, İngilizce öğretmenlerinin sürdürülebilirlik bilincini mesleki ve kişisel olarak içselleştirmesine yönelik beklentiye bağlı olarak İngilizce Öğretmenliği lisans programları da bu yaklaşımın bir parçası haline gelmektedir. Artan nüfus ve daha önce rastlanmayan bir hızda tanık olunan teknolojik gelişmeler, tüketimi artırarak atık sorununa yol açmaktadır. 2024 BM raporuna göre atık miktarının 2050 yılına kadar 3.8 milyar tona ulaşacağı tahmin edilmektedir. Bu durum, tüm insanlığı ilgilendirmekte ve eğitim yoluyla söz konusu sorunun çözümüne yönelik yöntemler geliştirilmesinin gerekliliğini ortaya koymaktadır. İngilizce öğretmen adaylarının da geri dönüşüm ve sıfır atık konularında farkındalık sahibi olması, gelecek nesillere bu bilincin kazandırılmaları açısından önem arz etmektedir.

Yöntem. Nicel yaklaşımın esas alındığı bu araştırma betimsel tarama modelinde gerçekleştirilmiştir. Bu çalışmanın katılımcılarını, üç farklı devlet üniversitesinin İngilizce Öğretmenliği (ELT) programlarında öğrenim gören 288 öğrenci oluşturmaktadır. Veri toplama aracı olarak Aksan ve Çeliker (2017) tarafından geliştirilen *Geri Dönüşüm Farkındalık Ölçeği* ile Kayış ve Yıldırım (2022) tarafından geliştirilen *Sıfır Atık Farkındalık Ölçeği* kullanılmıştır. Ayrıca, katılımcıların günlük yaşantılarında uyguladıkları sekiz farklı sıfır atık davranışını belirlemeye yönelik bir uygulama formu kullanılmıştır. Veriler SPSS 21.0 programı ile çözümlenmiştir. Ölçek puanlarının normal dağılım gösterip göstermediği çarpıklık ve basıklık katsayılarıyla değerlendirilmiş; normal dağılmayan veriler için Mann-Whitney U testi, normal dağılanlar için ise bağımsız örneklem t-testi uygulanmıştır. *Geri Dönüşüm Farkındalığı* ile *Sıfır Atık Farkındalığı* arasındaki ilişki Spearman Rho testi ile analiz edilmiş, uygulama formundan elde edilen veriler için ise frekans analizi yapılmıştır.

Bulgular. Çalışmada, İngilizce öğretmen adaylarının geri dönüşüm farkındalık puanı 190.77 ± 20.11 ve sıfır atık farkındalık puanı 47.15 ± 6.19 olarak hesaplanarak farkındalık düzeylerinin yüksek olduğu sonucuna ulaşılmıştır. En yüksek geri dönüşüm farkındalığı medya, eğitim ve ekonomik boyutlarda; en düşük farkındalık ise geri dönüştürülebilir ürün özellikleri ve biyolojik boyutlarda gözlemlenmiştir. Geri dönüşüm ve sıfır atık farkındalıkları arasında olumlu yönde anlamlı ilişkilere rastlanmıştır. Kadın katılımcıların geri dönüşüm ve sıfır atık farkındalık düzeyleri erkeklere göre anlamlı şekilde daha yüksek bulunmuştur. Geri dönüşüm uygulamalarında en çok kâğıt, plastik, cam ve pil atıklarının ayrıştırıldığı, elektronik atık, ambalaj, yağ ve metal atıklarının ise daha az sıklıkla ayrıştırıldığı anlaşılmıştır. Tüm uygulama maddeleri en az bir katılımcı tarafından işaretlenmiştir.

Tartışma, Sonuç ve Öneriler. Bu çalışma, İngilizce öğretmen adaylarının geri dönüşüm ve sıfır atık farkındalıklarının yüksek olduğunu; özellikle medya, eğitim ve ekonomik boyutlarda güçlü bilinç düzeylerine sahip olduklarını ortaya çıkarmıştır. Kadınlar erkelere ve nispeten daha genç katılımcılar diğerlerine göre daha yüksek çevresel farkındalık sergilemiştir. Katılımcıların günlük yaşamlarında

WAJES, (2025), 16 (Special issue 4), 71-92.
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temel geri dönüşüm alışkanlıklarına sahip olmakla birlikte elektronik atık ve atık yağ gibi özel kategorilerdeki maddelerinin geri dönüşümüne yönelik farkındalık ve alışkanlıklarının düşük düzeyde olduğu belirlenmiştir. Bu durum, sürdürülebilir davranışların geliştirilmesi için eğitsel müdahalelere gereksinim duyulduğunu göstermektedir. İngilizce Öğretmenliği programlarında çevresel içeriklerin artırılmasının öğretmenlerin hem bireysel hem mesleki çevresel liderlik rollerini güçlendireceği düşünülmektedir.



Introduction

Global issues are central to sustainable education, aiming to raise environmental awareness and foster socially responsible mindsets in future generations. Education for Sustainable Development (ESD) is a key component of the United Nations' 2030 sustainability goals, addressing the critical environmental challenges caused by human activity that threaten Earth's ecosystems and human survival. The ESD framework address to equip individuals with the knowledge, skills, values, and behaviors needed to act in environmentally, socially, and economically responsible ways (UNESCO, 2024).

In recent years, rapid population growth, industrialization and technological development have increased consumption and contributed to the global waste crisis. According to the United Nations' 2024 report, total solid waste is projected to rise from 2.1 billion tons in 2023 to 3.8 billion tons by 2050. This alarming trend has prompted urgent calls for immediate action and the implementation of waste management policies to avoid catastrophic environmental outcomes. Education plays a vital role in addressing such problems by nurturing generations with robust problem-solving abilities and a sense of environmental responsibility. In this sense, the field of English Language Teaching (ELT) is closely aligned with the goals of ESD as it involves not only teaching the global lingua franca but also cultivating values that contribute to the preservation of the planet. More specifically, English language teachers, key actors of language education processes, are expected to internalize sustainability both in their personal and professional lives. Their attitudes and practices can influence students profoundly, making them important role models for developing lifelong eco-friendly habits in the 21st century. Therefore, integrating sustainability into ELT curricula is essential to equip future teachers with a global outlook and an understanding of environmental responsibility, and to raise environmentally conscious language teachers.

In the context of Türkiye, in-service and pre-service English as a foreign language (EFL) teachers have a responsibility to raise awareness of waste management and sustainability through their teaching. As noted by Aksan and Çelikler (2017), pre-service EFL teachers who will educate future generations must themselves have a high level of recycling awareness. This aligns with the view that teachers play a central role in shaping student behaviors in line with educational goals (Kurt, 2013, cited in Şahin et al., 2018, p. 1763). Accordingly, the present study investigated the zero waste and recycling awareness of a group of students studying at English language teaching departments of three state universities in Türkiye. To the best of the researchers' knowledge, no research has previously investigated the awareness and habits of sustainability with a focus on recycling or waste management. Hence, and the present study attempted to contribute to the existing literature by bridging this gap. Accordingly, the following research questions were sought to be answered:

- What is the level of zero-waste awareness of pre-service EFL teachers?
- What is the level of recycling awareness of pre-service EFL teachers?
- Do pre-service EFL teachers statistically differ in the awareness of zero-waste and recycling with respect to gender and age?
- What type of recycling practices do pre-service EFL teachers have?



- Do pre-service EFL teachers statistically differ in the practices of zero-waste and recycling with respect to gender and age?

The following section informs about the existing literature with a focus on the research previously conducted on the integration of sustainability into English language education.

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Literature review

Teaching English for the planet: ELT for sustainability

One of the most crucial Sustainable Development (SD) goals for 2030 addressed by the United Nations (UN) in 2015 is to foster sustainable management and efficient use of natural resources by reducing global waste in energy, food, and water to a large extent. In this vein, Zygmunt (2016, p.116) argues that “the need for a successful construction of social environment and its protection must be clearly understood and globally accepted”. Education is the most powerful weapon to combat the alarming worldwide problems related to energy inefficient consumption and environmental pollution (ESCAP, 2016). Education for sustainable development (ESD) is a part of SD paradigm as an attempt to empower individuals with knowledge, skills, values and behaviors to become global citizens who are globally sensitive to social, environmental and economic issues and have ability to take action to solve the global problems. As a matter of fact, SD goal 4 of 2030 necessitates all learners to acquire the knowledge and skills that promote SD and substantially increase the supply of qualified teachers under international cooperation for teacher training.

Zygmunt (2016) draws our attention to the role of language education in ESD, noting that it enables participation in negotiations and discussions over environmental issues and dangers. This positions foreign language education as a cornerstone of ESD when viewed holistically. Listed among the prominent official languages used by international organizations such as WHO, UNESCO, UN, OPEC (Rao, 2019), English serves as a powerful communication tool to address global issues with collaboration (Yu et al. 2024, Bilsborough, 2022) for global discourses (Bowden, 2010). In this respect, the field of ELT provides a promising pathway for dissemination of SD understanding among people primarily thanks to its potential to raise students’ awareness of global issues by integrating topics on global issues into the classroom where teachers can provide students a rich array of activities to increase their engagement with diverse cultures, issues of local and global importance (Cordova, 2024). They, for example, can enable them with the avenues to comprehend the roots and impacts of environmental crises through diverse theoretical, philosophical, and physical activities about the environment in English lessons (Saiful, 2023). While there is a growing emphasis on integrating the SDGs into English language education, few studies critically evaluate whether these initiatives lead to lasting eco-conscious practices among students. This gap highlights the need for more research connecting the theoretical potential of ELT for sustainability with measurable outcomes.

Eco-consciousness in ELT Programs

It is reported in the European Society for Child and Adolescent Psychiatry (ESCAP) that we can face the sustainability issues only through conscious education and educational environmentalism

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DOI. 10.51460/baebd.1694319



with the help of teachers' awareness of production and consumption of food, energy and water (2016, p. 121). In a similar vein, it is acknowledged by UNESCO (2017) that educators who are knowledgeable about sustainability are in a better position to impart the values, skills and attitudes needed to create a more equitable and resilient world. Ultimately, by equipping educators to inspire meaningful change in their students and communities is an investment in the long-term impact of sustainability education. In this regard, the adoption of sustainability as a concern in ELT teacher training embodies a worldwide effort which in this case addresses social, cultural and environmental issues through education. Programs of this kind in various countries are increasingly highlighting the role of language teachers as change agents and preparing them to incorporate sustainability issues into their teaching practices. These attempts are often based on the tenets of ESD, which promotes a holistic voice, action as well as learning in different contexts (UNESCO, 2017). For instance, some initiatives in Europe like "Teach for Future in ELT" position the English language practitioners in the light of the vision of the UN's SD goals to ensure the learners are both environmental and global citizens (McKeown and Hopkins, 2016). Likewise, local sustainability issues that promote culturally relevant pedagogies in terms of climate, social and linguistic justice among others are incorporated into teacher education programs in some South American and Asian countries (Mohamed, 2020; Torres, 2019). Considering ELT's potential to serve as a powerful vehicle for sustainability (Yu et al. 2024), these context-oriented approaches highlight the relevance that the ELT has in making the world a better place through strategically crafted teacher education programs. All in all, developing awareness and practices of sustainability in ELT students is essential to the agenda of raising eco-conscious EFL teachers for the 21st century.

Why zero-waste and recycling?

Waste refers to unwanted stuff or material to be discarded or no longer used for any purpose that can be solid, liquid or gaseous (Debrah et al., 2021). After their utilization and waste production, natural resources lose both their usefulness and monetary value regardless of their origin (domestic, commercial, or industrial) (Bulut, 2020). Being entirely human-based, waste production causes serious risks to eco-systems and human health and presents the fastest-growing challenge for developed and developing countries (UNEP, 2025). According to the Annual Report 2024 on global waste management, increasing wealth, industrialization and urbanization leads to changes in housing and consumption patterns and a broader range of products entering the market (UN, 2024). As a result, the average amount of solid waste generated per person is increasing rapidly and natural sources are being depleted especially in developing countries such as Türkiye whose sustainable futures are at risk (Artvinli and Bayar, 2018).

Waste management and recycling are addressed in UN's 2030 SD goals agenda by Goal 12 (2015) which aims to ensure sustainable consumption and production patterns. To achieve sustainable management and efficient use of natural resources, countries and companies are called to take actions to reduce waste generation through prevention, reduction, recycling and reuse and to make sure people have relevant information and awareness for SD principles and lifestyles in harmony with the nature at regional and national levels. For instance, Türkiye's 'Zero Waste' initiation launched in 2017 captures national environmental policy that aims to reduce waste, promote recycling, and encourage sustainable consumption across various sectors, including households, businesses, municipalities, and



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public institutions. This supports a circular approach to resource and waste management, which promotes efficient use of resources through waste prevention, reuse and recycling that can contribute to positive socio-economic outcomes, including social solidarity (<http://www.zerowaste.gov.tr/>).

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UNEP (2025) offers sustainable lifestyles for people as ways of living, social behaviors and choices, that minimize environmental degradation such as the use of natural resources, waste and pollution. Studies on recycling and other environmentally related behaviors suggest that people choose to participate in recycling programs for a variety of reasons such as growing up in a family that saved and reused materials (e.g. jars and wood), and having the sense of responsibility for the future generations (Simmons and Widmar, 2010). Specifically, recycling-related behaviors are encouraged by intentions, attitudes, subjective norms and awareness of consequences (Niyaz-Altınok et al., 2024). Hence, it is crucial to raise eco-conscious individuals and guide them towards environmentally responsible behavior rooted in sustainable lifestyles. By emphasizing recycling and zero waste approaches, we can inspire lasting habits that reduce waste, conserve resources and promote a circular economy for a more sustainable future. Accordingly, this study focuses on zero-waste and recycling within English Language Teaching (ELT) contexts, seeking to bridge the gap by offering insights into how language classrooms can promote environmental responsibility.

Extensive research

Investigating knowledge and views of teachers from multiple branches on developing zero waste education, Atınış et al. (2024) reported that teachers have limited knowledge about sustainable development and zero waste. The participant teachers emphasized the need for a separate course and utilizing novel methodologies to educate students on zero waste. In a similar study, Avan et al. (2023) analyzed a group of pre-service pre-school teachers' views on zero waste. The researchers reported that the participants had limited knowledge about zero waste and sustainability. The research agenda of sustainability, ESD, and environmental issues in the field of ELT has mostly concentrated on the integration of eco-conscious themes into ELT, promotion of environmental literacy, encouragement of sustainable practices in language learners, and awareness of in-service and pre-service language teachers towards sustainability. Related topics studied include perceptions of EFL teachers on SD (Bedir, 2021), EFL teacher candidates' conceptualizations and awareness of SD (Yılmaz-Fındık et al., 2021; Arıkan and Zorba, 2024), integration of SD in English lessons in university (Cordova, 2024), and sustainability literacy of learners of English (Ludwig, 2021). These studies highlight an increasing emphasis on the integration of sustainability in ELT programs both for personal and professional development. In a recent study, Çevik-Yörük and Ağçam (2024) reported high levels of eco-psychological awareness of pre-service EFL teachers in Türkiye. Gürsoy and Sağlam (2010), on the other hand, conducted a study with the participation of English teacher trainees, and informed a lack of recycling efforts and responsible consumerism in their lives although they were concerned about global warming. This supports the idea that knowledge does not always translate into action -an important gap that the current study was motivated to bridge.

Despite not specifically addressing recycling or zero waste practices, the above-mentioned body of research collectively constructs a foundational background and provides conceptual support

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DOI. 10.51460/baebd.1694319



to guide the development and focus of the present study. Thus, it is hoped to contribute to the existing literature by investigating a group of pre-service EFL teachers' awareness of sustainability and daily recycling practices with a focus on such demographic influences as gender and age.

Method

This section covers the study design, participant profile, data collection instruments and analysis procedures. Ethical approval for the study was granted on 14 March 2024, in accordance with decision number 109, dated 5 April 2024. Informed consent was obtained from all participants prior to data collection, and the confidentiality of participant data was strictly maintained throughout the research process in accordance with ethical research standards.

Study design

This study adopted a quantitative approach within a descriptive survey design to systematically examine and describe pre-service EFL teachers' awareness and practices of zero-waste and recycling, while avoiding any manipulation of variables. Quantitative survey methods are effective for gathering extensive data from large groups. They are particularly useful for measuring attitudes and opinions that are hard to capture through observation (Pinsonneault and Kraemer, 1993; Gul, 2023). In addition to being cost-effective and time-efficient, they can be integrated with other methods. When applied to a sample, they provide reliable and valid results by quantifying individual perspectives.

Participants

In accordance with the aim to investigate awareness and practices of pre-service EFL teachers, participants of the study were selected by purposive sampling. They consisted of undergraduate students enrolled in English Language Teaching programs at three state universities located in the Mediterranean region in Türkiye due to their accessibility. Age and gender were set as independent variables of the research since previous studies informed that demographic factors can influence environmental awareness and sustainability-related behaviors, particularly among teacher candidates who are expected to model such practices in educational settings (Vicente-Molina et al., 2013 and Vinkóczi et al., 2024). Demographics of the participants are listed in Table 1.

Table 1.
Demographic features of the participants

Demographic Feature	Groups	n	%
Gender	Female	187	64.9
	Male	101	35.1
Age	18-25	278	96.5
	26-30	10	3.5



As illustrated in Table 1, among the total of 288 pre-service EFL teachers who participated in the study, 65% were female and 35% were male. They were distributed into two age groups: 18 to 25 years (96,5%) and 26 to 30 years (3,5 %).

Instruments

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The research data were gathered with the aid of a questionnaire consisting of two scales and a form of recycling practices. The first questionnaire includes the Recycling Awareness Scale (RAS) developed by Aksan and Çeliker (2017), comprised of 48 five-point Likert type items with 10 dimensions (environmental, educational, economic, administrative, legal, sensitivity, media, protection of natural resources, characteristics of recycled products, biological). For instance, the **biological** sub-dimension includes items such as “*Recycling helps microorganisms proliferate,*” reflecting awareness of ecological and biological benefits. The **legal** dimension covers regulatory perspectives, with items like “*An environmental protection tax should be introduced to encourage recycling,*” indicating participants’ views on policy-level interventions. These are intended to illustrate the multidimensional nature of the scale in assessing diverse aspects of recycling awareness of the participants. A high average scale score indicates a high level of recycling awareness. In this study, the Cronbach Alpha coefficient of the scale was 0.90; the Cronbach Alpha coefficients of the sub-dimensions 0,72 / 0,66 / 0,83 / 0,44 / 0,55 / 0,69 / 0,84 / 0,82 / 0,67 and 0,49. Some sub-dimensions indicated limited internal consistency but kept due to theoretical importance though it constituted a methodological limitation for the study.

The second part of the questionnaire form includes the Zero Waste Awareness Scale (ZWAS) developed by Kayış and Yıldırım (2022), consisting of 27 triple Likert-type items with 3 dimensions (waste reduction, reuse, recycling). In this study, the Cronbach Alpha coefficient of the scale was 0.80; the Cronbach Alpha coefficients of the sub-dimensions were 0,64 / 0,75 and 0,48, indicating a high level of zero waste awareness.

Finally, the form of recycling practices used to gather in-formation of participants’ daily habits includes the options of recycling items. It is noteworthy that zero waste practices in Türkiye are undertaken by the Ministry of Environment, Urbanization and Climate Change jointly with the local administrations of the provinces on waste management. Wastes collected separately at collection centers by citizens are stored in temporary storage areas, where records of all incoming and outgoing waste are kept. Recyclable wastes are sent to recycling facilities with the environmental license while non-recyclable wastes are sent to disposal facilities with environmental license (<https://cygm.csb.gov.tr>) (<https://cygm.csb.gov.tr/sifir-atik-uygulamaları-dairesi-baskanligi-i-108111>). Due to the presence of various recycling and zero waste possibilities in the system, the study investigated which of them are daily performed by the participants. Accordingly, they were asked to choose among the following eight items on zero-waste practices:

- Separating plastic waste and throwing them separately into recycling bins.
- Throwing paper waste into recycling bins.
- Throwing glass waste into glass bins.



- Dispose of electronic waste (old phones, computers, white goods and small household appliances, etc.) in electronic recycling bins.
- Collecting vegetable waste oils and throwing them into waste oil bins.
- Collecting used batteries and throwing them into battery boxes.
- Separating packaging waste (milk cartons, chocolate wrappers, etc.) and throwing them into recycling bins.
- Sorting metal waste (aluminum beverage cans, oil cans, tin cans, etc.) and putting them in recycling bins.

The following section presents information about the way the collected data was analyzed.

Data analysis

The data were quantitatively analyzed using SPSS 21.0 software. The normality of scale and sub-dimension scores was assessed using the skewness and kurtosis coefficients to determine whether parametric or non-parametric tests would be applied. As noted in Büyüköztürk (2011), scores with values within ± 1 exhibit an acceptable level of normal distribution. For variables that did not meet this assumption and could not be normalized through transformation, appropriate non-parametric tests were selected. In this regard, the Mann–Whitney U test was employed to compare recycling and zero-waste awareness scores regarding gender and age when distributional assumptions were not met. The independent samples t-test was used for normally distributed scores. Due to the ordinal nature and distribution characteristics of the data, the Spearman's Rho correlation test was employed to examine relationships between recycling and zero-waste awareness of the participants.

To explore the participants' recycling practices, **frequency analysis** was conducted on items related to daily recycling and waste reduction practices with a focus on gender and age groups. Additionally, a **chi-square test** was applied to determine whether significant associations existed between demographic variables (particularly gender) and the frequency of specific recycling and zero-waste practices. The significance level was set at $p < .05$ for all analyses. It is also significant to note that a chi-square analysis was further conducted to expand the understanding of whether observed differences in recycling and zero-waste practices among ELT students were statistically significant across gender groups.

The following section is intended to outline the findings obtained from data analysis.

Findings

The initial measurements of the scales were carried out through descriptive statistics of findings and the related results are presented in Table 2.



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Table 2.
Descriptive findings for total and sub-dimension scores of the scales

Scales and Sub-dimensions	Item	N	Min.	Max.	$\bar{X}$	SS	Skewness	Kurtosis
RAS	48	288	80.00	232.00	190.77	20.11	-1.00	3.12
Environmental	9	288	15.00	45.00	35.98	5.21	-0.43	0.36
Education	5	288	5.00	25.00	21.24	2.86	-1.88	6.29
Economic	5	288	5.00	25.00	20.82	3.48	-0.92	1.46
Administrative	6	288	10.00	30.00	22.47	3.00	-0.36	1.86
Legal	4	288	5.00	20.00	15.72	2.88	-0.56	0.47
Susceptibility	5	288	5.00	25.00	18.99	3.66	-0.63	0.96
Media	3	288	3.00	15.00	13.20	2.06	-1.39	2.71
Protection of Natural Resources	4	288	4.00	20.00	16.70	2.90	-1.22	2.70
Properties of Recycled Products	4	288	7.00	20.00	14.58	2.87	0.01	-0.28
Biological	3	288	5.00	15.00	11.08	2.03	-0.10	0.05
ZWAS	27	288	0.00	30.00	47.15	6.19	-1.33	1.41
Waste Reduction	12	288	0.00	24.00	20.90	3.09	-1.50	2.72
Reuse	8	288	0.00	16.00	13.85	2.98	-1.81	3.23
Recycling	7	288	0.00	14.00	12.40	1.77	-1.52	3.02

As indicated in Table 2, the mean total score of the Recycling Awareness Scale (RAS) was 190.77 (SD = 20.11). Considering the possible score range of 48–240, this indicates relatively high scores among participants. At the sub-dimension level, the highest mean scores were observed for media (M = 13.20, SD = 2.06), followed by educational (M = 21.24, SD = 2.86) and economic awareness (M = 20.82, SD = 3.48), while the lowest were for characteristics of recycled products (M = 14.58, SD = 2.87) and biological awareness (M = 11.08, SD = 2.03). The mean total score for the ZWAS was 47.15 (SD = 6.19), with a score range of 0–54, suggesting relatively high values. Among its sub-dimensions, the highest mean scores were found for waste reduction (M = 20.90, SD = 3.09), reuse (M = 13.85, SD = 2.98), and recycling (M = 12.40, SD = 1.77).

Subsequently, the Spearman's Rho correlation test was conducted for the relationship between recycling awareness and zero waste awareness. The related results are presented in Table 3.



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Table 3.
Correlation matrix of recycling awareness and zero-waste awareness scores

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Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group 1	1	0.61**	0.67**	0.72**	0.60**	0.63**	0.54**	0.67**	0.77**	0.62**	0.65**	0.13	0.06	0.09	0.20*
1. Recycling Awareness															
2. Environmental		1	0.27**	0.38**	0.07	0.20*	0.10	0.32**	0.55**	0.31**	0.36**	0.12	0.09	0.13	0.09
3. Educational			1	0.44**	0.48**	0.44**	0.23**	0.47**	0.42**	0.46**	0.54**	0.09	0.08	0.06	0.15
4. Economic				1	0.40**	0.37**	0.36**	0.34**	0.68**	0.27**	0.37**	-0.01	0.00	0.03	0.01
5. Administrative					1	0.50**	0.32**	0.39**	0.37**	0.28**	0.39**	-0.05	0.04	-0.15	0.09
6. Legal						1	0.27**	0.53**	0.36**	0.38**	0.35**	-0.02	-0.11	0.01	0.10
7. Susceptibility							1	0.40**	0.32**	0.31**	0.24**	0.18*	0.09	0.10	0.22**
8. Media								1	0.49**	0.41**	0.39**	0.18*	0.07	0.15	0.15
9. Protection of Natural Resources									1	0.36**	0.41**	0.08	-0.02	0.10	0.21*
10. Properties of Recycled Products										1	0.48**	0.15	0.10	0.11	0.14
11. Biological											1	-0.04	-0.03	-0.01	0.05
Group 2												1	0.75**	0.68**	0.57**
12. Zero-Waste Awareness															
13. Waste Reduction													1	0.30**	0.18*
14. Reuse														1	0.25**
15. Recycling															1

* Correlation is significant at the 0.05 level ($p < 0.05$); ** Correlation is significant at the 0.01 level ($p < 0.01$)



According to Table 3, there was a moderate and significant positive correlation between overall recycling awareness and zero-waste awareness of the participants ($r = .33$, $p < .05$), as well as with its sub-dimensions: waste reduction ($r = .30$), reuse ($r = .17$), and recycling ($r = .33$). Among the recycling sub-dimensions, media ($r = .77$) and economic awareness ($r = .72$) showed the strongest correlations with total recycling awareness, suggesting that information access and perceived economic benefits strongly influence recycling behavior. Educational, administrative, and legal awareness also showed moderate positive associations ($r \approx .60-.67$), indicating their meaningful but secondary role.

Within zero-waste awareness, waste reduction ($r = .75$) and reuse ($r = .68$) demonstrated strong positive correlations with the total score, reflecting internal consistency in sustainable behavior orientations. Environmental, educational, economic, legal, and biological awareness were all positively associated with various zero-waste sub-dimensions, though reusable practices generally showed weaker or non-significant correlations, especially with environmental and economic subscales. Notably, media awareness was positively correlated with all zero-waste dimensions, underscoring the role of digital platforms in promoting sustainability. Overall, the correlation matrix suggests an interconnected and reinforcing structure among recycling and zero-waste attitudes, where improvements in one domain (e.g., media or education) may support broader behavioral engagement.

Further analysis was conducted to determine whether there were significant differences in recycling and zero-waste awareness scores of the participants by gender. The results are provided in Table 4.

Table 4. Participants' recycling awareness and zero waste awareness scores by gender

Sub-dimensions	Gender	n	$\bar{X}$	SS	T	p
RAS	Female	187	193.60	19.78	-3.68 ¹	0.000
	Male	101	185.54	19.77		
Environmental	Female	187	36.44	4.95	2.05	0.041
	Male	101	35.13	5.60		
Educational	Female	187	21.42	2.97	-2.28 ¹	0.023
	Male	101	20.89	2.63		
Economic	Female	187	21.05	3.35	-1.29 ¹	0.198
	Male	101	20.40	3.67		
Administrative	Female	187	22.52	3.02	-0.86 ¹	0.389
	Male	101	22.38	2.97		
Legal	Female	187	15.95	2.94	1.86	0.063
	Male	101	15.29	2.72		
Susceptibility	Female	187	19.57	3.50	3.76	0.000
	Male	101	17.91	3.72		
Media	Female	187	13.51	1.97	-3.93 ¹	0.000
	Male	101	12.62	2.10		
Protection of Natural Resources	Female	187	17.02	2.70	-2.39 ¹	0.017
	Male	101	16.12	3.18		
Properties of Recycled Products	Female	187	14.83	2.89	2.04	0.042
	Male	101	14.11	2.78		
Biological	Female	187	11.28	2.11	2.31	0.022
	Male	101	10.70	1.82		

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ZWAS	Female	187	48.56	5.02	-4.79¹	0.000
	Male	101	44.55	7.25		
Waste Reduction	Female	187	21.48	2.72	-4.12¹	0.000
	Male	101	19.84	3.46		
Reuse	Female	187	14.34	2.48	-3.38¹	0.001
	Male	101	12.94	3.57		
Recycling	Female	187	12.74	1.37	-3.61¹	0.000
	Male	101	11.77	2.21		

As shown in Table 4, no statistically significant gender differences were observed in the economic, administrative and legal sub-dimensions of the Recycling Awareness Scale (RAS) ($p > 0.05$). However, significant gender differences were found in the total RAS score ($Z = -3.68$, $p < .05$), as well as in the environment sub-dimension ($t = 2.05$, $p < .05$), education sub-dimension ($Z = -2.28$, $p < .05$), susceptibility ($t = 3.76$, $p < .05$), media ($Z = -3.93$, $p < .05$), protection of natural resources ($Z = -2.39$, $p < .05$), recyclable product features ($t = 2.04$, $p < .05$) and biological awareness ($t = 2.31$, $p < .05$). In each of these dimensions, the female participants scored higher than the male participants. Similarly, statistically significant gender differences were found in the total score of the Zero Waste Awareness Scale (ZWAS) ($Z = -4.79$, $p < .05$) and its sub-dimensions: waste reduction ($Z = -4.12$, $p < .05$), reuse ($Z = -3.38$, $p < .05$) and recycling ($Z = -3.61$, $p < .05$). Higher scores were reported in favor of female participants in all dimensions.

An analysis on age-groups were carried out since the participant groups were distributed into two age groups. The participants did not significantly differ in their RAS scores and scores for the categories of education, economy, administration, law, awareness, media, protection of natural resources, recyclable products and biology by age group ($p > 0.05$). The only significance was observed in environmental sub-dimension scores ($t = 2.48$; $p < 0.05$) that differed significantly ($p < 0.05$) by age group. Participants aged 18-25 had higher environmental awareness scores than those aged 26-30. Total zero-waste awareness scale sub-dimension scores were similar across age groups.

Recycling and zero-waste practices of the participants were analyzed through a multiple response part to reveal their waste-management practices. The relevant results are shown in Table 5.

Table 5.

Frequency of participants' recycling and zero-waste practices

Waste Types	f /288	%
Paper	205	71
Plastic	170	59
Glass	152	58
Battery	156	54
Electronic	104	36
Packaging	96	33
Metal	88	30
Oils	88	30

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As presented in Table 5, participants' recycling and zero-waste practices were mostly concentrated on the waste of paper (71%), followed by plastic (59%), glass (58%) and battery (54%). In return, less than one third of the participants reported recycling and zero-waste practices for the substances of metal and oils (30%). Yet, recycling practices of electronic waste and package waste were also reported by 30 to 40 per cent of all recycling and zero-wastes practices although they had low frequencies. As a subsequent step, a Chi-square analysis was conducted to triangulate the observed significant differences in recycling awareness and zero-waste awareness scores of the participants in terms of gender. The related test results are presented in Table 6.

Table 6.
Chi-square test results on gender differences in sustainability practices

Sustainability Practice Items for Waste	df	χ^2	p
Plastic	1	13.47	.001***
Paper	1	7.27	.006**
Glass	1	1.13	.287
Electronic	1	1.35	.244
Oils	1	1.69	.193
Battery	1	2.76	.096
Package	1	4.03	.002*
Metal	1	.093	.760

***p<.001, **p<.0.01, *p<.005

As seen in Table 6, the Chi-square test results showed significant gender differences in the participants' sustainability practices related to plastic ($\chi^2 = 13.47$, $p = .001$), paper ($\chi^2 = 7.27$, $p = .006$), and packaging ($\chi^2 = 4.03$, $p = .045$). These findings indicated that female and male participants differed in their waste-related practices. In contrast, no significant gender differences were found in their waste management practices related to glass, electronics, oils, batteries, and metal, as their p-values exceeded the .05 threshold. This suggests that gender plays a role in certain sustainability practices, but not uniformly across all waste categories.

Discussion and Conclusion

The results of this study showed a high level of awareness of both recycling and zero waste among pre-service EFL teachers, addressing the 1st and 2nd research questions. The high mean overall scores suggest that participants demonstrate strong levels of awareness towards sustainable waste management practices, which aligns with the previous research (Çevik Yörük and Ağçam, 2024). Whilst media, education, and economic factors appear to be the strongest drivers of recycling awareness, the relatively lower scores on the sub-dimensions of biological and recycled product characteristics indicate areas where further education and development could be beneficial. The prominence of media awareness may be attributed to the high social media influence on the participants, who are likely to be exposed to sustainability messages, campaigns, and peer behaviors through various platforms. These channels often serve as informal but influential sources of environmental knowledge and motivation, particularly for younger generations. The significant correlations between recycling

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and zero waste awareness and their sub-dimensions indicate that ELT students with high recycling awareness are more likely to engage in waste reduction efforts. Their daily waste management and reduction practices show that they have certain behavior patterns and habits for sustainability in general. It is particularly revealed that they are mostly engaged in the recycling of such materials as paper, plastic, glass, and batteries, and less in recycling electronic waste, packaging, waste oils, and metals. This finding is in partly in line with Avan et al. (2023) who reported that pre-service pre-school teachers prioritized especially plastic wastes in terms of recycling. While basic recycling practices are widely adopted, specialized waste categories are often neglected, possibly due to a lack of awareness or accessible infrastructure. Since awareness is a critical factor that influence recycling-related behaviors (Niyaz-Altınok et al., 2024), the participants' overall high awareness scores are promising—especially when these practices are considered an output of their levels of sustainability awareness. These findings can be understood through the lens of Education for Sustainable Development (ESD), which emphasizes the role of education in equipping individuals with the knowledge, skills, values, and behaviors needed for responsible citizenship and environmental stewardship. The patterns observed in this study reflect key ESD principles, particularly in fostering environmental responsibility through critical awareness and everyday action.

The third research question investigated whether the participant pre-service EFL teachers statistically differ in the awareness of zero-waste and recycling regarding the variables of gender and age. The findings showed that gender differences in recycling and zero-waste awareness were evident, with female participants scoring higher in multiple sub-dimensions, including environmental, educational, and biological awareness. These findings align with the existing literature (Konstantinidou et al., 2024; Vinkóczy et al., 2024), which reported that women exhibit greater environmental concern and are more engaged in sustainable behaviors. This is further supported by the Chi-square analysis results, which revealed statistically significant gender differences in recycling practices related to plastic, paper, and packaging waste in favor of the female participants. In return, no significant gender differences were observed in the sub-dimensions of economic, administrative, and legal, indicating that the participants perceive these regulatory aspects in a similar way regardless of their gender. Regarding age, younger participants (18–25 years) demonstrated significantly higher environmental awareness than those in the 26 to 30 age group. This particular finding is consistent with Konstantinidou et al. (2024), which informed that younger individuals are more influenced by environmental campaigns and education often delivered through digital and social media platforms. The lack of significant differences in other dimensions suggests that recycling and zero-waste awareness are relatively stable across age groups.

The fourth research question was motivated to explore the type of recycling practices of the pre-service EFL teachers have. In response to this question, the participants reported engaging in a range of daily recycling practices, most commonly recycling paper, plastic, glass, and batteries, while showing lower engagement in recycling electronic waste, packaging, waste oils, and metals. These findings suggest that students adopt basic recycling practices more readily, likely due to greater accessibility and awareness of them.



The last research question was generated to investigate whether the participant pre-service EFL teachers statistically differ in the practices of zero-waste and recycling with respect to gender and age. It is revealed that the female participants demonstrated higher awareness in environmental, educational, and biological aspects and engaged more frequently in recycling practices related to plastic, paper, and packaging. However, no significant gender differences were found in the sub-dimensions of economic or legal awareness or in less common recycling categories (glass, oil, battery, metal). Overall, these findings show that gender plays a meaningful and selective role in shaping both awareness and practical engagement in sustainability-related behaviors. They highlight the need for targeted awareness initiatives focusing on biological aspects of recycling, product properties, and reuse practices. Thus, addressing gender-based and age-related differences in environmental awareness could further enhance recycling and zero-waste engagement. Hence, future studies could explore policy interventions and incentive structures that encourage participation in lesser-known recycling practices and promote behavioral shifts across different demographic groups.

While the importance of sustainability is increasingly acknowledged in global educational agendas, the findings of this study emphasize the need for a well-designed approach with strong pedagogical background to integrate sustainability into ELT programs. Rather than viewing sustainability as an abstract moral imperative, teacher education should operationalize ESD principles such as critical thinking, systems thinking, and participatory learning to cultivate real-world competencies. The integration of sustainable education in ELT is gaining momentum, yet its implementation at the classroom level remains limited.

As a practical implication, it is recommended that educational professionals have an awareness of sustainability at least at the environmental level as this supports the broader societal shift toward collective responsibility and behavior change especially in critical areas like waste management. Neglecting such issues on an individual level may increase cumulative environmental risks. Less frequently zero-waste and recycling practices of such materials as metal or glass may result from lack of limited infrastructure, low perceived importance or low visibility of these waste types when compared to paper and plastic recycling.

The high levels of recycling and zero-waste awareness observed among the pre-service EFL teachers underline the potential of future eco-conscious educators to champion environmental issues in their classrooms. To support this, teacher training programs should incorporate specific strategies such as integrating sustainability themes into tasks in language classrooms, promoting sustainability themed material development skills, using real-world environmental texts, designing project-based learning around local waste issues, and collaborating with community recycling initiatives. For instance, a workshop for ELT students will raise awareness about the environmental and health risks of improper battery disposal, highlighting how toxic metals like lead, mercury, and lithium can pollute ecosystems, harm human health, and increase fire hazards if not recycled properly. Or how AI tools can be used to create engaging materials that promote lesser-practiced recycling behaviors, such as glass or metal recycling. Enriching teacher education with environmental content through such strategies, aligning with global frameworks such as the UN SDGs, leveraging digital tools, and fostering

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global citizenship, ELT can evolve to meet the dual goals of language proficiency and environmental responsibility.

Despite the valuable insights offered by this study, several limitations should be acknowledged. These include the small sample size, the quantitative design and the relatively low Cronbach's alpha values in some subscales. These factors may affect the reliability and generalizability of the findings. Future research could focus on qualitative and in-depth analysis of ELT students' views or teachers' perspectives to fill the research gap and expand existing body of research on sustainability in field of ELT.



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