

An Analysis of SDG-Integrated Lesson Plans by Pre-service English Language Teachers

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Abstract

This study examines how pre-service English teachers (PSETs) integrate the Sustainable Development Goals (SDGs) into language teaching. Grounded in Education for Sustainable Development (ESD) and Content and Language Integrated Learning (CLIL), it investigates which SDGs are prioritized, how learning outcomes reflect sustainability competencies, and how pedagogical tasks support sustainability-oriented thinking. The study was conducted in a compulsory “Teaching Language Skills” course at a Turkish public university. Following a workshop on ESD and the SDGs, 102 PSETs worked in groups to design 45-minute lesson plans for young adult learners. A qualitative document analysis of 27 lesson plans examined thematic focus, competency alignment, and pedagogical design. Environmental themes were most common, particularly SDG 13 and SDG 12, while SDGs 2, 4, and 15 were rarely addressed. Learning outcomes most frequently emphasized critical thinking and normative competencies, whereas anticipatory competency appeared only minimally. Although relatively few in-class outcomes explicitly reflected ESD pedagogies, homework tasks often extended lessons through action-oriented learning. Overall, the findings suggest that PSETs can incorporate sustainability themes into language teaching, but teacher education programs may need to place greater emphasis on future-oriented thinking within ESD.

Keywords: Sustainable Development Goals, Education for Sustainable Development, Content and Language Integrated Learning, Pre-service English Teachers

Sustainability has become a defining priority in education, recognized not only as a subject of instruction but also as a catalyst for global transformation (Alcantud-Díaz & Lloret-Catalá, 2023). The United Nations’ 2030 Agenda reflects this vision by positioning education, especially Sustainable Development Goal (SDG) 4 as foundational to achieving the other SDGs. Target 4.7 specifically calls for embedding sustainable development into teaching and learning, urging educators to reconsider both the content and methodology of instruction (Kioupi &

Voulvoulis, 2019). In response, educational institutions across disciplines have adopted a range of strategies including interdisciplinary course design, project-based learning, and community-oriented assignments (Boarin & Martinez-Molina, 2022; Fang & O’Toole, 2023; Guo et al., 2024; Leicht et al., 2018; Singer-Brodowski et al., 2019).

English Language Teaching (ELT), centered on communicative competence since the 1970s, has increasingly been conceptualized as a meaningful platform for engaging learners with global challenges (Arslan & Curle, 2021; Kwee, 2021; Mambu, 2023; Yu et al., 2024). Through English, learners can explore environmental, social, and cultural issues while developing transversal skills such as critical thinking, empathy, and civic awareness, which are key dimensions of Education for Sustainable Development (ESD) (Bekteshi & Xhaferi, 2020; Liu & Qi, 2021; Mercer et al., 2023). Thus, language education can function not only as a linguistic endeavor but also as an entry point into a broader sustainability discourse. To strengthen this connection, pedagogical approaches that transcend disciplinary boundaries have become increasingly relevant. Content and Language Integrated Learning (CLIL) is one such model, supporting the simultaneous development of subject knowledge and language competence (Coyle et al., 2010). CLIL’s 4Cs framework (Content, Communication, Cognition, and Culture) aligns strongly with the transformative goals of ESD, offering a structured means of integrating sustainability-related content into ELT. Emerging research shows that CLIL-based ESD practices enhance both learners’ understanding of the SDGs and their language proficiency (Arslan & Curle, 2024; Haque, 2023).

Despite growing global interest in sustainability, how these principles are interpreted and enacted within subject-specific teacher education remains uneven. In English language teacher education, in particular, research shows that the integration of ESD is often superficial, conceptual, or optional rather than systematically embedded in practice (Arslan & Curle, 2021; Majjala et al., 2023; Yılmaz-Fındık et al., 2021). Although earlier studies have introduced conceptual frameworks and highlighted promising practices, such as curriculum-level initiatives, literary and digital materials, and interdisciplinary projects, the micro-level operationalization of sustainability in concrete lesson planning remains underexplored (Alcántara-Rubio et al., 2022; Canaran & Bayram, 2024; Schina et al., 2020). This gap is especially salient in Türkiye, where national policies increasingly emphasize sustainability, but ELT programs still offer limited and largely theoretical engagement with ESD. Examining how pre-service English teachers (PSETs) translate sustainability principles into lesson design therefore provides important insight into how the 2030 Agenda is beginning to take shape within language teacher education.

Addressing this gap, the present study investigates how Turkish PSETs integrate the SDGs into lesson planning within an undergraduate “Teaching Language Skills” course. More specifically, the study examines the SDGs that PSETs prioritize, the learning outcomes they formulate, and the tasks they design to promote both language development and sustainability-focused thinking. Grounded in the principles of ESD and CLIL, the study aims to illuminate how sustainability-oriented outcomes are represented in lesson plans and how PSETs translate these into tangible classroom practices. The following research questions guide the study;

1. Which SDGs are most frequently featured in the lesson plans, and what key themes do they emphasize?
2. To what extent do the learning outcomes align with the selected SDGs?
3. How do the SDG-related learning outcomes reflect core sustainability competencies?
4. What ESD-focused pedagogical approaches are evident in the learning outcomes?

5. How do homework tasks operationalize sustainability competencies and ESD pedagogical approaches?

Literature Review

SDGs in Higher Education

SDGs are 17 global objectives introduced by the United Nations in 2015 to promote social, economic, and environmental sustainability. Among them, SDG 4 (Quality Education) directly concerns higher education, emphasizing the need to embed sustainability principles into teaching and learning. The incorporation of the SDGs into higher education has gained increasing scholarly attention, as universities are recognized as key actors in fostering sustainability-oriented thinking and competencies among students. To support this agenda, institutions have implemented a wide range of strategies, including interdisciplinary course design, project-based learning, targeted workshops, and curriculum modification (Molina et al., 2023; Rajabifard et al., 2021; Schina et al., 2020). These efforts generally aim to align disciplinary content with real-world sustainability challenges, enabling learners to acquire both subject knowledge and the capacity to act on sustainability-related issues.

Workshops and short-term courses have proven effective in promoting focused engagement with SDGs (Molina et al., 2023), while interdisciplinary teaching allows students to make meaningful connections across knowledge domains, fostering systems thinking and collaboration (Schina et al., 2020). Project-based learning, frequently developed in partnership with industry or community organizations, supports learners in addressing authentic problems and developing transferable competencies such as planning, communication, and innovation (Fang & O'Toole, 2023). Meanwhile, curriculum redesign efforts aim to embed sustainability as a central component of academic content across disciplines, particularly in engineering, architecture, and the social sciences (Boarin & Martinez-Molina, 2022; Guo et al., 2024). A comprehensive review by Alcántara-Rubio et al. (2022) showed that curriculum integration was the most common institutional response to the SDGs between 2015 and 2020, with a notable focus on SDG 4. However, challenges persist. Goals such as SDG 9 (Industry, Innovation, and Infrastructure) remain less addressed, and integration tends to be fragmented across faculties. Similar findings by Holmes et al. (2022) indicate that SDG-related efforts in higher education are often driven by curriculum initiatives rather than by institutional leadership or governance structures.

Teacher education programs have also begun to engage with the SDGs, often through activities that require the creation of lesson plans, cross-curricular tasks, or digital projects. Guo et al. (2024), for example, observed that pre-service science teachers who designed SDG-based lessons demonstrated gains in systems thinking and ESD competencies, even with limited prior exposure to sustainability content. Schina et al. (2020) reported comparable improvements through robotics-based activities, suggesting that combining digital skills with sustainability themes may amplify pedagogical impact. Yet despite these promising developments, several barriers continue to hinder full-scale implementation, including limited institutional support, insufficient educator preparation, and inconsistent curricular structures (Boarin & Martinez-Molina, 2022). Moreover, although macro-level strategies are well documented, less is known about how these initiatives translate into everyday teaching practices, particularly at the level of individual lesson planning and classroom instruction.

Approaches to Incorporating SDGs in ELT

Although ELT is often perceived primarily as a vehicle for linguistic development, there is growing recognition of its capacity to engage learners with broader global and sustainability issues (Bekteshi & Khaferi, 2020; Yu et al., 2024). Scholars have investigated diverse

approaches to embedding sustainability themes in ELT, ranging from textbook and curriculum analyses to creative and interdisciplinary pedagogies. Collectively, these studies show that ELT can nurture not only language proficiency but also critical thinking, intercultural awareness, and civic engagement, competencies that lie at the heart of ESD.

Reflecting global educational trends, the Turkish education system has also undertaken significant steps to align teaching and learning with sustainability principles. Recent curriculum reforms emphasize higher-order thinking, social and emotional competencies, complemented by instructional materials designed to foster students' learning responsibility and autonomy. The Ministry of National Education's 2024–2028 Strategic Plan foregrounds an interdisciplinary, values-based approach aimed at raising awareness of environmental and climate issues in alignment with the SDGs (Ministry of National Education, 2024). In higher education, the Council of Higher Education has committed to integrating education for sustainable production and consumption into university curricula and associated training programs (Higher Education Council, 2024). Universities are now also expected to measure and report their progress toward the SDGs, reflecting the increasing institutional emphasis on sustainability accountability.

Despite these initiatives, research suggests that sustainability integration in English language curricula remains limited in practice. Arslan and Curle (2021) identified minimal references to sustainability in Türkiye's high school English curriculum and textbooks, underscoring the need for more intentional and diverse incorporation of sustainability themes. Similarly, Cordova (2024) showed that embedding SDG themes in English literature instruction enhanced learners' ability to think critically about societal challenges and to develop a sense of agency. Across both Turkish and international contexts, studies emphasize the value of encouraging pre-service teachers to design interdisciplinary and context-sensitive activities that position learners as active participants in addressing global issues. Additional insights arise from studies employing interdisciplinary models such as CLIL. CLIL is particularly suited for sustainability topics because it supports the simultaneous development of conceptual understanding and language proficiency (Coyle et al., 2010). Haque (2023) demonstrated that incorporating sustainability themes from the "English for Today" textbook into CLIL-based lessons improved both language skills and environmental awareness, although the study also highlighted the need for targeted teacher training and pedagogical support. Technology-enhanced approaches also expand possibilities for integrating sustainability into ELT. Arıkan and Zorba (2024) showed that online projects using literary texts enabled pre-service teachers in Türkiye to deepen their understanding of the SDGs while developing positive attitudes toward sustainability. Canaran and Bayram (2024) found that Massive Open Online Courses can strengthen motivation and sustainability competencies, particularly in contexts where access to professional development remains limited. Despite these advances, most research continues to focus on macro-level frameworks; curricula, materials, or pedagogical models rather than on how SDG-related concepts are operationalized in micro-level lesson planning. There remains limited empirical evidence on how PSETs incorporate SDGs into learning outcomes, tasks, and classroom activities. Such micro-level practices are essential for translating ESD from an abstract policy mandate into meaningful pedagogical reality.

This study draws on two complementary frameworks: CLIL and ESD. CLIL offers a structured approach to integrating language learning with subject content, guided by the 4Cs framework (Coyle et al., 2010). Its flexible, learner-centered nature makes it particularly well suited for interdisciplinary, socially relevant topics such as sustainability. ESD, in turn, emphasizes the development of key competencies, including systems thinking, critical reflection, integrated problem-solving, collaboration, and a sense of responsibility, which are essential for addressing today's global challenges (UNESCO, 2017). By combining CLIL's pedagogical structure with

ESD's transformative aims, educators can design opportunities for learners to develop both linguistic proficiency and sustainability awareness. Bringing these frameworks together, the present study examines how PSETs in Türkiye integrate sustainability-oriented thinking and language development into their lesson plans. By analyzing micro-level pedagogical design within an authentic course context, the study aims to contribute to national and global efforts to embed the 2030 Agenda into language teacher education and to prepare future teachers as facilitators of both communicative competence and sustainable thinking.

Method

Context and Participants

This study was conducted during the fall term of the 2024–2025 academic year as part of the compulsory undergraduate course titled “Teaching Language Skills” which is offered in the third year of a four-year ELT program at a public university in Türkiye. The course spans 14 weeks, with three hours of weekly instruction, and aims to develop PSETs' pedagogical knowledge and instructional skills for teaching English as a second or foreign language. While the fall semester focuses on listening and speaking, the spring semester covers reading and writing. Within the broader Faculty of Education curriculum, one elective course titled “Education for Sustainable Development” is available to all students; however, there is no ELT-specific course dedicated to sustainability integration. A total of 102 PSETs enrolled in the course participated in the study. Participation in the research component did not affect course grades, and informed consent was obtained prior to data collection.

The course followed a structured sequence designed to ensure that PSETs developed foundational ELT pedagogical knowledge concurrently with their application of sustainability-related concepts. During Weeks 1–3, course instruction focused on core ELT principles, including lesson staging, sequencing, and the fundamentals of Communicative Language Teaching (CLT). This sequencing ensured that before the introduction of SDGs, PSETs had an initial grounding in ELT methodology. Subsequent weeks (Weeks 5–9) deepened this knowledge by covering task design, interaction patterns, and classroom management, allowing students to refine their lesson plans as they acquired new pedagogical concepts. In Week 4, the instructor (the second author of this paper) delivered a three-hour interactive workshop designed to introduce the SDGs and the key principles of ESD. The session began with an overview of sustainable development and the 17 SDGs, followed by a detailed explanation of the core concepts and competencies associated with ESD. Building on this conceptual foundation, the workshop incorporated practical components such as examples of student-centered and inquiry-based tasks, demonstrations of critical thinking activities, and model discussions. The instructor also modelled how to write ESD-focused learning objectives and how to design pre-, while-, and post-task stages aligned with sustainability themes. This workshop served as the primary pedagogical preparation for the SDG-focused lesson plan assignment.

As part of the course requirements, the PSETs worked collaboratively in self-selected groups of three to four to develop a 45-minute lesson plan targeting young adult learners at a minimum A2 proficiency level. To guide this process, the instructor provided a standardized lesson plan template, a model lesson plan, and written guidelines. Following the workshop conducted in Week 4, groups were given four weeks to develop their plans outside class hours, during which they could consult with the instructor regarding material selection and task alignment. PSETs were encouraged to draw on authentic materials, including videos and online resources. In Week 8, all groups submitted their lesson plans via the university's Learning Management System (LMS). The remaining weeks of the course were dedicated to demo-teaching sessions in which each group presented its lesson plan and demonstrated how sustainability themes were

integrated with listening and speaking pedagogy. In total, 27 SDG-oriented lesson plans were produced by 102 PSETs through this process.

Regarding artificial intelligence (AI), the instructor adopted a policy aligned with the university's guidelines on ethical AI use. AI-assisted work was neither explicitly encouraged nor prohibited; however, the collaborative nature of the assignment and the requirement for context-specific task design served as inherent checks against total reliance on generative AI. Lesson plans were assessed based on professional judgment and familiarity with students' typical work habits to ensure authenticity.

Research Design

To address the study's aim of examining how PSETs integrate the SDGs into lesson planning, a qualitative descriptive research design was adopted. A qualitative approach was deemed most appropriate as the research aimed to understand the nature, meaning, and characteristics of the participants' work, rather than to test a hypothesis or establish causal relationships (Merriam & Tisdell, 2016). It was also chosen for its capacity to systematically describe the characteristics and components of the SDG-oriented lesson plans developed by PSETs.

The primary method of data collection and analysis was qualitative document analysis, which involved the systematic examination of 27 lesson plans produced by PSETs. Document analysis was chosen because lesson plans function as "naturalistic" artifacts of instructional planning that reveal teachers' intentions, curricular reasoning, and underlying pedagogical rationales (Bowen, 2009). These lesson plans provided direct evidence of how PSETs interpreted and operationalized sustainability concepts, particularly those related to ESD and the SDGs, within a 45-minute instructional design. Through this approach, the researchers were able to analyze several interconnected dimensions of the lesson plans, including how frequently and in what ways specific SDGs were selected, the degree to which learning outcomes aligned with sustainability-related goals, and the extent to which core ESD competencies were embedded within planned classroom activities and tasks. The qualitative descriptive design offered a coherent and systematic means of capturing how theoretical principles introduced in the course, especially those related to ESD and CLIL, were translated into practical and pedagogically meaningful lesson plans.

Data Collection

The primary data for this study consisted of 27 lesson plans produced by the PSETs and submitted through the university's LMS as part of the course requirements. Prior to data collection, participants were fully informed both verbally and in writing about the purpose and scope of the research, and written consent was obtained in accordance with institutional ethical procedures. Participation in the study was strictly voluntary, and students were explicitly assured that choosing to participate or withdraw would not influence their course grades. No bonus points, extra credit, or grade-related incentives were offered.

Because the second author also served as the course instructor, additional measures were implemented to ensure ethical integrity and minimize bias. All lesson plans were graded solely based on the course rubric before any research-related analysis began. Only after final course grades had been submitted were the lesson plans exported from the LMS for research purposes. During this export process, the LMS automatically removed student names and replaced them with system-generated file identifiers. The researchers then assigned numerical codes to the anonymized files, ensuring that no personally identifiable information remained. As a result, when the analysis commenced, the instructor was unable to link any lesson plan to a specific student, thereby avoiding potential bias in the interpretation of data. This procedure ensured confidentiality, protected participant anonymity, and adhered to institutional and research

ethics guidelines. In line with the document-based nature of the research design, no interviews or additional self-report data were collected; therefore, the study focuses exclusively on the content of the lesson plans rather than the personal motivations underlying SDG or task selection.

Data Analysis

A qualitative content analysis approach was used to examine the SDG-focused lesson plans produced by the PSETs. Qualitative content analysis is well suited for identifying patterns, themes, and meanings in textual data while retaining sensitivity to contextual nuances (Mayring, 2014). The analysis followed Mayring's seven-step model: (1) formulating theoretically grounded research questions, (2) determining the unit of analysis, (3) developing theoretically informed coding categories, (4) pilot testing and refining categories, (5) conducting the main coding process, (6) interpreting coded data in relation to the research questions, and (7) evaluating the coding process through reliability checks.

To ensure analytic rigor and reliability, both authors served as independent coders. They first collaboratively developed the coding scheme based on the research questions and an initial sample of lesson plans. Each coder then independently coded seven lesson plans using this preliminary scheme. A debriefing session followed to compare codes, discuss inconsistencies, and refine category definitions. The process was repeated until a high level of agreement was achieved. Any remaining discrepancies during the full coding phase were resolved through discussion and consensus. This iterative procedure strengthened the trustworthiness of the analysis.

Each lesson plan was reviewed to identify the SDG explicitly selected by the PSETs and the sustainability themes addressed. A categorical content analysis procedure was used rather than a rubric-based evaluation. Coders examined SDG references across sections such as the lesson rationale, outcomes, materials, and procedural steps. Frequency counts were then generated to illustrate the distribution of SDGs across the dataset and to determine which sustainability issues appeared most prominently.

Learning outcomes were analyzed along two criteria: (a) alignment with the selected SDG, and (b) alignment with key sustainability competencies. Competency analysis was guided by UNESCO's (2017) framework, which includes systems, anticipatory, normative, strategic, critical thinking, collaboration, self-awareness, and integrated problem-solving competencies. Each learning outcome was coded to determine whether it reflected one or more of these competencies. Homework assignments were included as a complementary dataset because they demonstrate how learning was extended beyond class time. Each assignment was coded using UNESCO's competency framework, enabling comparison between the competencies emphasized in the outcomes and those operationalized in homework tasks. A second analytical layer examined whether lesson components, particularly learning outcomes, reflected core pedagogical approaches associated with ESD. The coding scheme included learner-centeredness, inquiry-based learning, critical reflection, action orientation, and real-world engagement. This analysis helped determine the extent to which the lesson plans translated ESD principles into pedagogical practice.

Findings

RQ1. Which SDGs are most frequently featured in the lesson plans, and what key themes do they emphasize?

Analysis of the 27 lesson plans revealed a clear preference for environmental sustainability topics. As shown in Figure 1, SDG 13 (Climate Action) was the most frequently selected goal

(n = 6), followed by SDG 12 (Responsible Consumption and Production) (n = 5). SDG 3 (Good Health and Well-being), SDG 5 (Gender Equality), and SDG 14 (Life Below Water) each appeared in four lesson plans, reflecting balanced engagement with both environmental and social dimensions of sustainability. In contrast, SDG 2 (Zero Hunger), SDG 4 (Quality Education), and SDG 15 (Life on Land) were the least represented (n = 1–2).

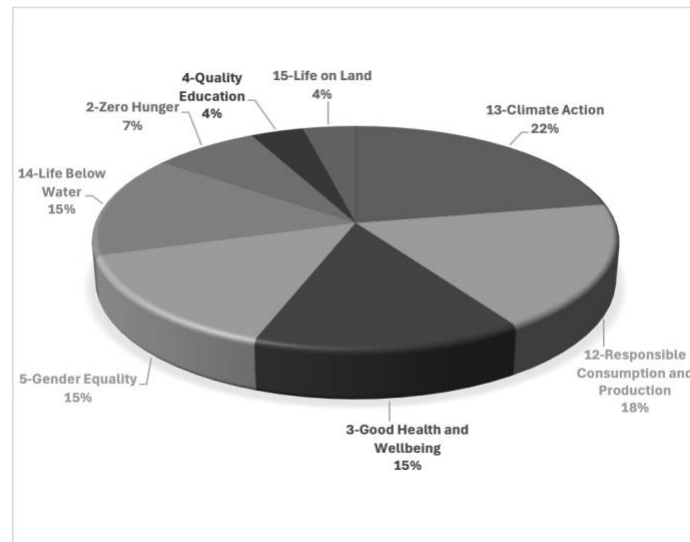


Figure 1. SDG Distribution among the Lesson Plans

Beyond the frequency of selected SDGs, the analysis examined the specific thematic foci that PSETs chose to integrate. These themes illuminate how sustainability concepts were interpreted and pedagogically framed. A summary is provided in Figure 2. Analysis of the 27 lesson plans revealed a clear preference for environmental sustainability themes, with SDG 13 (Climate Action) emerging as the most frequently selected goal, followed by SDG 12 (Responsible Consumption and Production). These choices largely reflected topics such as climate change, its causes and consequences, waste reduction, recycling, and consumerism. Many of these themes were framed through inquiry-based questions (e.g., “*How can taking action on climate change make all our lives better?*” or “*Do we really need to consume so much?*”), which created opportunities for research-informed listening tasks, critical reading, argumentation, and collaborative problem-solving activities. The relevance of these topics to learners’ everyday experiences also facilitated the integration of practical language skills such as expressing opinions, offering advice, and analyzing cause-effect relationships.

Beyond environmental issues, lesson plans also engaged with a range of social themes. SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality) were frequently selected, featuring topics related to healthy lifestyles, reproductive health, personal habits, gender equality, and gender discrimination. These themes supported vocabulary development and communicative functions such as describing routines, giving recommendations, and discussing social norms. SDG 14 (Life Below Water) addressed marine pollution, overfishing, and human impacts on aquatic ecosystems, often through provocative questions that encouraged speculation and evidence-based discussion. In contrast, SDG 2 (Zero Hunger), SDG 4 (Quality Education), and SDG 15 (Life on Land) were only minimally represented. Topics included freeganism and food waste (SDG 2), problems in the education system (SDG 4), and deforestation and desertification (SDG 15).

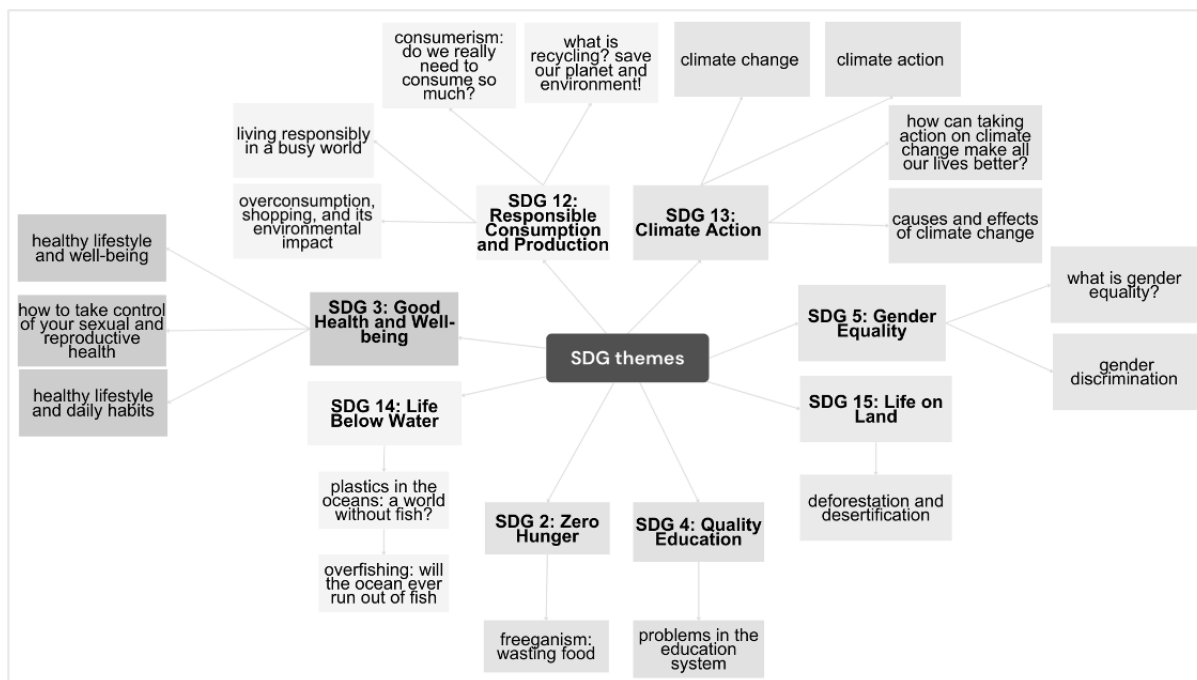


Figure 2. Selected Themes for the Lesson Plans

RQ2. To what extent do the learning outcomes align with the selected SDGs?

Analysis of the 101 learning outcomes revealed that 64 (63.3%) explicitly referenced an SDG. As shown in Figure 3, the largest proportion of SDG-linked outcomes focused on SDG 13 (Climate Action) (26.6%), reflecting strong attention to environmental sustainability. This was followed by SDG 5 (Gender Equality) (17.2%), indicating interest in social justice themes. SDG 12 (Responsible Consumption and Production) and SDG 3 (Good Health and Well-being) each accounted for 14.1% of the outcomes, showing a balanced representation of environmental and health-related issues. Lower frequencies were observed for SDG 15 (Life on Land) (9.4%), SDG 14 (Life Below Water) (7.8%), SDG 2 (Zero Hunger) (6.3%), and SDG 4 (Quality Education) (4.7%).

Overall, the distribution demonstrates that PSETs most frequently designed learning outcomes around climate action and gender equality, while outcomes addressing food security, quality education, and terrestrial ecosystems were less common. This pattern mirrors the thematic distribution of the lesson plans themselves.

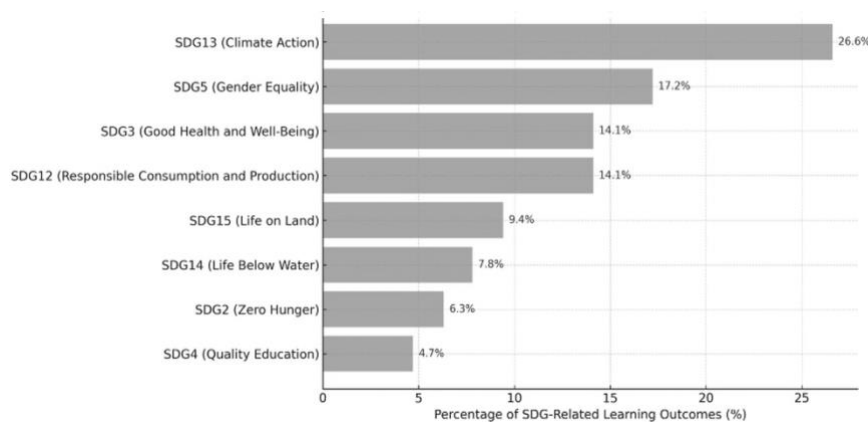


Figure 3. Distribution of SDG-related Learning Outcomes

RQ3. How do the SDG-related learning outcomes reflect core sustainability competencies?

To investigate how sustainability thinking was embedded in instructional design, each SDG-related learning outcome was mapped onto UNESCO's key sustainability competencies. As illustrated in Figure 4, the most frequently represented competency was critical thinking with 19 outcomes (21.8%). These outcomes typically required learners to analyze problems, question assumptions, or evaluate real-world issues (e.g., *identifying challenges faced within the education system*). The second most common category was normative competency with 15 outcomes (17.2%), which encouraged learners to reflect on values and ethical dimensions of sustainability (e.g., *using vocabulary related to health and well-being in meaningful contexts*).

Both systems thinking and integrated problem-solving were associated with 13 outcomes each (14.9%). Systems-thinking outcomes focused on understanding relationships among causes and consequences (e.g., *demonstrating understanding of food-waste drivers through discussion*), while integrated problem-solving outcomes required generating or evaluating solutions to sustainability challenges (e.g., *discussing strategies to reduce overconsumption*). Strategic competency appeared in 11 outcomes (12.6%), often involving action planning or decision making (e.g., *creating group-generated solutions to climate change*).

Collaboration competency was evident in 9 outcomes (10.3%), generally requiring learners to co-construct ideas or negotiate solutions (e.g., *working in groups to propose a balanced approach to an environmental issue*). Self-awareness competency appeared in 5 outcomes (5.7%) and focused on examining personal habits or roles in sustainability (e.g., *discussing one's own environmental behaviors*). Finally, anticipatory competency was the least represented, with only 2 outcomes (2.3%), typically involving future-oriented reasoning (e.g., *considering how climate-action behaviors could be incorporated into personal life*). The distribution indicates that learning outcomes designed by the PSETs were more strongly oriented toward analytical, ethical, and problem-solving competencies than toward future-oriented or introspective competencies.

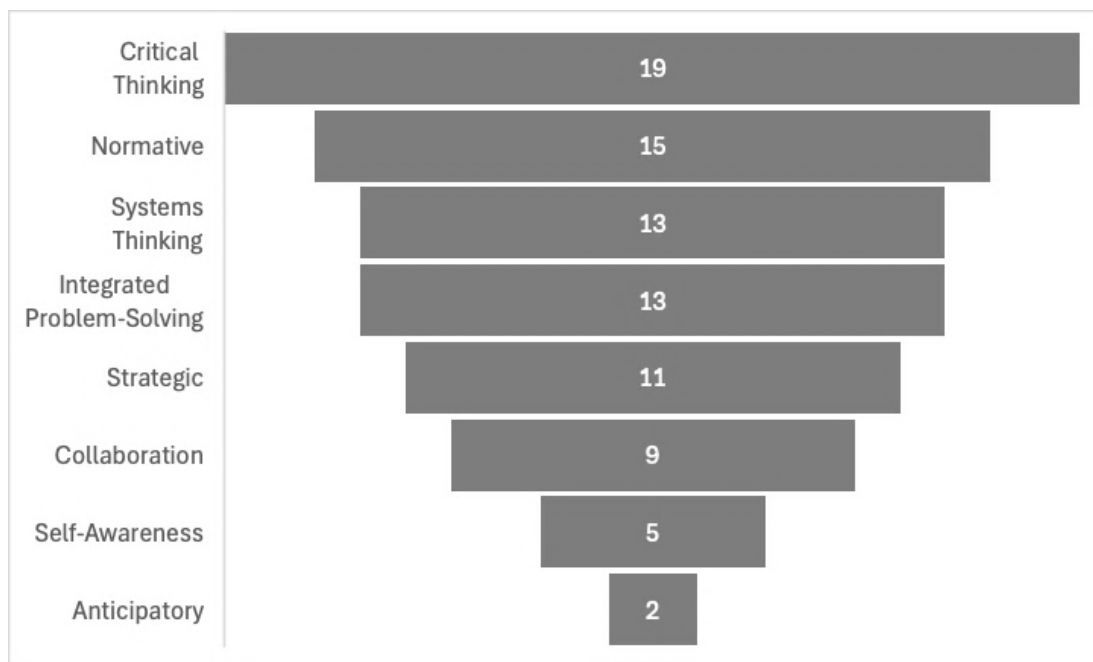


Figure 4. Alignment of SDG Learning Outcomes with Sustainability Competencies

RQ4. What ESD-focused pedagogical approaches are evident in the learning outcomes?

The analysis of learning outcomes in relation to key pedagogical approaches in ESD showed that 19 of the 64 SDG-related outcomes (29.7%) aligned with one or more core ESD approaches. The findings displayed in Figure 5 indicate a meaningful integration of ESD pedagogy into the lesson plans. Seven learning outcomes fostered a learner-centered approach, encouraging learners to engage actively, draw on prior knowledge, and engage in reflective practices. Another seven outcomes incorporated real-world experiences or project-based components, aligning with action-oriented pedagogies that promote experiential learning and practical engagement with sustainability themes. In addition, seven outcomes reflected principles of transformative learning, as they required students to question assumptions, challenge norms, and consider new perspectives. Two outcomes showed overlap across approaches: one outcome connected both learner-centered and action-oriented principles, while another bridged transformative and action-oriented learning. This overlap suggests that some learning outcomes foster multiple dimensions of ESD pedagogy simultaneously, offering richer opportunities for sustainability-oriented language learning.

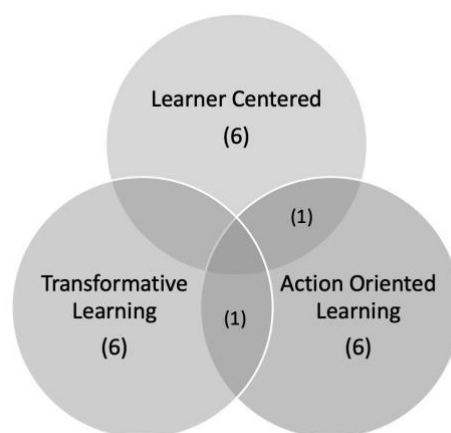


Figure 5. Alignment of SDG-Related Learning Outcomes with Key Pedagogical Approaches in ESD

RQ5. How do homework tasks operationalize sustainability competencies and ESD pedagogical approaches?

PSETs designed homework assignments for each lesson; however, two of the 27 lesson plans did not include a homework component. Therefore, a total of 25 homework tasks were examined and analyzed to determine how they aligned with the sustainability competencies. As displayed in Figure 6, analysis of the 25 homework tasks revealed that PSETs integrated a wide range of sustainability competencies into their lesson designs. Several assignments required students to analyze the interrelated environmental and social factors underlying global challenges, demonstrating systems-thinking competency (e.g., *researching additional causes of marine-life endangerment and presenting findings through a poster*). Others cultivated anticipatory competency by asking learners to envision future scenarios and evaluate the potential impact of individual actions on climate or social wellbeing. Tasks that prompted learners to reflect on cultural norms, gender roles, or societal expectations supported normative competency, while assignments involving campaign design or community-oriented action plans fostered strategic competency by encouraging learners to propose innovative responses to sustainability issues. Collaboration was also a key feature in tasks involving interviews or joint data collection, illustrating collaboration competency, whereas activities requiring learners to examine stereotypes or compare sustainability practices across countries reinforced critical-thinking competency. Several tasks prompted students to track their own habits or

reflect on personal contributions to sustainable living, thereby nurturing self-awareness competency. Finally, tasks that required generating feasible solutions to locally relevant sustainability problems demonstrated integrated problem-solving competency, indicating that many assignments designed by PSETs combined multiple competencies in meaningful ways.

KEY SUSTAINABILITY COMPETENCIES	HOMEWORK ASSIGNMENTS																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Systems Thinking			■												■	■		■							
Anticipatory				■	■												■				■				
Normative								■		■			■						■						
Strategic					■		■	■				■							■						
Collaboration	■						■											■							■
Critical Thinking		■								■			■												
Self-Awareness		■								■											■		■		
Integrated Problem-Solving			■	■	■			■				■							■						

Figure 6. Alignment of Homework Assignments with Sustainability Competencies

Furthermore, we examined how each homework assignment aligned with key ESD pedagogical approaches. Figure 7 presents the distribution of these assignments across ESD approaches. The analysis shows a strong integration of ESD pedagogy into homework design. Seven assignments aligned with a learner-centered approach, as they encouraged students to draw on prior knowledge, engage in reflective thinking, and take an active role in their learning. For instance, one assignment required students to analyze their own daily routines and identify personal habits that support or hinder sustainable living, an activity that prompts self-reflection and meaningful personal engagement with sustainability themes. Nine assignments demonstrated characteristics of action-oriented learning, requiring students to apply what they learned to real-world situations or to take concrete actions beyond the classroom. These tasks frequently involved community interaction, behavioral change, or data gathering, thereby fostering experiential engagement with sustainability issues. Another nine assignments reflected elements of transformative learning, prompting students to critically examine societal norms, question established viewpoints, and consider alternative perspectives. Such assignments encouraged learners to rethink assumptions and develop new ways of understanding sustainability challenges.

ESD APPROACHES	HOMEWORK ASSIGNMENTS																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Learner-Centered	■	■						■	■	■								■					■		■
Action-Oriented		■	■		■		■	■	■			■							■		■				
Transformative				■					■		■		■	■	■				■	■					■

Figure 7. Alignment of Homework Assignments with Key Pedagogical Approaches in ESD

Discussion

The findings of this study provide important insights into how PSETs conceptualize and operationalize sustainability within lesson planning. Although PSETs were asked to design their lesson plans around a specific SDG of their own choice, they were not required to formulate SDG-themed learning outcomes. Nevertheless, nearly two-thirds of the outcomes referenced sustainability themes. This high level of integration suggests responsiveness to the workshop session rather than spontaneous or “natural” integration. The workshop likely heightened awareness of how sustainability can be embedded into ELT, effectively scaffolding the PSETs’ ability to navigate these complex topics. This aligns with Vygotskian perspectives on teacher development, suggesting that PSETs are currently in a “novice” stage where they

cannot yet autonomously integrate complex themes without the mediation of structured pedagogical input (Arslan & Curle, 2021; Guo et al., 2024). Thus, the results highlight that equipping teachers as agents of change requires explicit modeling rather than relying solely on personal initiative.

Regarding the thematic focus, the analysis revealed a strong emphasis on environmental goals, particularly SDG 13 (Climate Action) and SDG 12 (Responsible Consumption and Production), as opposed to social or economic goals (see Figures 1&2). This preference is likely multifaceted. Firstly, it reflects the availability of accessible digital resources and the media prominence of climate change, making these topics appear pedagogically adaptable and globally urgent (Cordova, 2024). As research suggests that in contexts where institutional funding for ESD is limited, teachers often rely on free, open-access digital resources (Molina et al., 2023), which are predominantly focused on environmental science rather than complex social humanities. In contrast, the relatively limited attention to SDG 2 (Zero Hunger), SDG 4 (Quality Education), and SDG 15 (Life on Land) suggests that PSETs may perceive these topics as less accessible or more challenging to adapt for CLT, stemming from a lack of readily available level-appropriate materials, perceived topic complexity, or the abstract nature of certain sustainability issues. Secondly, this pattern may point to a “safety bias” in novice teacher cognition. Environmental topics are often perceived as scientific and distinct from political ideology, whereas social SDGs like SDG 2 (Zero Hunger) or SDG 5 (Gender Equality) may be viewed as socio-politically sensitive or affectively burdensome. PSETs may consciously avoid topics that require navigating complex socio-economic discourses in a foreign language, preferring the tangible, solution-oriented nature of climate action to the more abstract or controversial dimensions of poverty and equity. Last but not least, this selection bias must also be interpreted within the Turkish educational context. While Türkiye aligns with the 2030 Agenda, the integration of SDGs into ELT at the curricular level remains limited, often overshadowed by a systemic prioritization of grammar over global issues (Arslan & Curle, 2021). Consequently, PSETs appear to be negotiating a middle ground: selecting topics that are “safe” and relevant to learners’ daily lives to sustain engagement, while bypassing issues like educational quality (SDG 4) or biodiversity (SDG 15) that may feel distant or challenging to scaffold without existing curricular support. This underscores the need for greater thematic diversification in teacher education to prevent redundancy and ensure a balanced representation of sustainability concerns.

When mapping learning outcomes to UNESCO’s sustainability competencies, the study found a strong emphasis on critical thinking and normative competency, but a significant lack of anticipatory and self-awareness competencies (see Figure 4). This discrepancy suggests a tension between linguistic objectives and ESD goals. Anticipatory competence demands complex linguistic structures (e.g., *conditionals, future perfect, modals of speculation*) which PSETs may have deemed too advanced for their target learners. Furthermore, self-awareness requires a reflective depth that novice teachers, who are often preoccupied with classroom management and procedural mechanics, may struggle to facilitate effectively. This highlights a gap in teacher education: the need to train PSETs not just in content delivery, but in the specific pedagogical strategies required to foster deep, affective introspection and future-oriented thinking in a second language.

Despite these gaps, the pedagogical approaches embedded in the lesson plans demonstrate a meaningful alignment between ESD principles and CLT (see Figure 5). Nearly one-third of SDG-related learning outcomes are aligned with learner-centered, action-oriented, or transformative approaches. These outcomes promoted active engagement, real-world problem solving, reflective thinking, and the challenging of established norms, which are features that are central to ESD’s transformative goals. Homework assignments reflected similar patterns,

with strong representation of learner-centered, action-oriented, and transformative learning (see Figures 6 & 7). The preference for question-based themes (e.g., *Should cities ban single-use plastics?*) indicates an inclination toward Task-Based Language Teaching, where learners utilize language to interrogate real-world dilemmas. These problem-oriented questions stimulate sustained discussion and argumentation which are skills that support both language development and democratic citizenship. The strong representation of learner-centered and action-oriented approaches in both outcomes and homework assignments suggests that designing SDG-oriented lesson plans provides PSETs with a practical framework to move away from traditional, teacher-fronted instruction toward transformative learning models.

Conclusion

This study set out to explore how PSETs operationalize SDGs within their lesson planning. The findings underscore that while PSETs possess the potential to design transformative, SDG-oriented lessons, this capability is not innate. The analysis reveals that the integration of sustainability principles was largely driven by targeted pedagogical scaffolding rather than spontaneous initiative. This confirms that teacher agency in ESD requires explicit intervention. Without structured support, novice teachers tend to rely on “safe,” resource-abundant topics like climate action, while overlooking complex social dimensions and future-oriented competencies. As teacher education programs increasingly aim to prepare teachers as agents of change (Goodwin, 2020), the integration of ESD into ELT represents a promising pathway. Future initiatives should focus on expanding thematic diversity beyond environmental topics, strengthening linguistic support for future-oriented thinking, and deepening the alignment between learner interests and the broader spectrum of the 2030 Agenda.

Our findings carry significant implications for teacher education programs, particularly in resource-constrained contexts. As noted by Molina et al. (2023), funding for ESD integration is often scarce. Our study suggests that lesson planning serves as a cost-effective, scalable strategy for advancing SDG integration. By utilizing existing human resources and digital materials, institutions in low- and middle-income countries can make meaningful progress toward the 2030 Agenda without requiring extensive financial investment. To maximize the impact of this approach, we recommend that teacher education programs incorporate a specific “localization step” into lesson planning templates. Requiring PSETs to explicitly link global SDGs to local regional priorities could force a move beyond generic environmental themes and foster the anticipatory and self-awareness competencies found to be lacking in this study. Studies conducted between 2015–2020 show that universities most often address the SDGs by embedding them in curricula (Alcántara-Rubio et al., 2022). Efforts focus on research and teaching, with governance and leadership rarely tackled beyond theory. Few initiatives adopt holistic or systemic approaches, and most treat SDGs in isolation. Although our study does not fully bridge the gaps identified by Alcántara-Rubio et al. (2022), it offers a valuable case from a low-income country, showing how institutions that rely mainly on human resources can still make meaningful progress toward a more sustainable future.

The study is not without limitations. The analysis was restricted to 27 lesson plans from a single institutional context in Türkiye, which limits the generalizability of the findings. Furthermore, the study examined “planned” curriculum (lesson plans) rather than “enacted” curriculum (classroom teaching). Thus, the actual implementation of these tasks remains to be verified. Despite these limitations, the study offers a promising pathway. It demonstrates that when provided with appropriate scaffolding, language teachers can effectively bridge the gap between linguistic instruction and global citizenship. Future research should focus on longitudinal studies to observe how these planning skills translate into classroom practice and investigate whether thematic diversification improves as PSETs gain teaching experience.

Ultimately, empowering teachers to design their own SDG-integrated materials ensures that sustainability is not treated as an abstract policy goal, but as a lived classroom reality. Integrating SDGs at the micro level within individual lesson plans could also pave the way for broader, curriculum-level transformations. Lessons centered on SDGs can significantly enhance student agency over time, enabling them to recognize their personal agency to influence sustainability (Fang & O’Toole, 2023).

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