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Integrating Sustainable Development Goals In Undergraduate Curricula: A Comparative Study Of Universities In Ankara

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Abstract:
The United Nations' Sustainable Development Goals (SDGs), adopted in 2015, provide a universal framework for addressing urgent global challenges such as poverty, inequality, and climate change. Higher education institutions play a critical role in advancing these goals through curriculum design, research, and institutional practices. This study examines how 21 universities in Ankara, Turkey, integrate the SDGs into their undergraduate curricula. Using a mixed-methods approach, the research combines qualitative content analysis with a systematic review of course catalogs to identify sustainability-related courses and their alignment with specific SDGs. The findings reveal significant disparities among universities: while institutions such as Hacettepe University and Gazi University demonstrate stronger engagement, others display fragmented or limited integration. Across the board, sustainability content is often present only in elective courses rather than embedded within core curricula, which limits the scope of institutional impact. The study argues for a more systematic and policy-driven approach to mainstreaming sustainability in higher education, emphasizing the need for interdisciplinary learning, governance structures, and cross-institutional collaboration. By addressing these gaps, Turkish universities can contribute more effectively to the 2030 Agenda and strengthen their role in shaping future-ready graduates with sustainability competencies.
Keywords: *Sustainable Development Goals (SDGs); Higher Education; Curriculum Analysis; Sustainability Education; Education Policy*

1. INTRODUCTION

The Sustainable Development Goals (SDGs), adopted by the United Nations General Assembly in 2015, represent a global agenda to address critical challenges such as poverty, inequality, environmental degradation, and climate change. Comprising 17 goals and 169 targets, the SDGs emphasize the need for integrated and transformative approaches to achieve a more sustainable future. Higher education institutions (HEIs) are considered essential actors in this process, not only as centers of knowledge production but also as social institutions that shape future leaders, policymakers, and professionals. By embedding sustainability into teaching, research, and community engagement, universities can contribute directly to the implementation of the 2030 Agenda.

Recent scholarship has increasingly focused on the role of HEIs in mainstreaming sustainability within academic programs. Studies conducted in Europe and beyond [1],[2],[3] have demonstrated that while many universities offer sustainability-related content, integration often remains fragmented, limited to elective courses, or dependent on individual faculty initiatives. This lack of systematic and institution-wide strategies has been identified as a major barrier to embedding Education for Sustainable Development (ESD) across disciplines. Moreover, regional disparities in SDG integration highlight the importance of national and local contexts in shaping curriculum design and institutional commitment.

In Türkiye, research on higher education and sustainability is still emerging. Although some universities have incorporated environmental and social themes into their curricula, explicit references to the SDGs remain limited. Preliminary findings suggest that institutional engagement is uneven, with certain universities leading innovative initiatives while others demonstrate minimal integration. Ankara, as the capital city and home to a diverse range of public and private universities, offers a unique setting to explore how HEIs operationalize the SDGs within their academic programs.

This study aims to address this gap by systematically analyzing undergraduate course catalogs from 21 universities in Ankara. The central research question guiding this study is: To what extent, and in what ways,

are universities in Ankara integrating the Sustainable Development Goals into their undergraduate curricula? By combining qualitative content analysis with a cross-institutional comparison, this study contributes to the growing literature on sustainability in higher education and provides region-specific insights for policymakers, educators, and institutional leaders. In doing so, it highlights both existing achievements and persisting challenges, offering recommendations for fostering a more coherent and comprehensive approach to sustainability education in Türkiye.

2. LITERATURE REVIEW

Globally, universities have increasingly embraced the Sustainable Development Goals as part of their educational mission. Since the 1990s there has been a growing sustainability movement in higher education, and many institutions have committed to implement sustainability through their curricula, research, and campus practices [3]. However, the integration of SDGs into university curricula remains uneven. International surveys indicate that while most universities acknowledge the importance of sustainability, the extent of curricular alignment is often limited or fragmented. For example, a recent study involving experts from 65 countries found that although SDGs are recognized as an opportunity for inter-university collaboration, much more attention is needed to revising teaching curricula so that they explicitly include SDG content [4]. Notably, the same survey observed that students are generally not proactive in demanding SDG-related learning, suggesting a gap in bottom-up pressure for curricular change. These findings underscore a persistent global challenge: universities may endorse the 2030 Agenda in principle, yet the translation of SDGs into concrete course offerings and learning outcomes is often superficial.

Regional analyses further reveal disparities in how SDGs are embedded across different higher education contexts. In Europe, for instance, studies have documented that Northern and Western European institutions tend to pursue more systematic sustainability education strategies compared to their Southern and Eastern European counterparts [5]. Even within regions, the focus of SDG integration can be skewed toward certain dimensions of sustainability. A curriculum review of education faculties in Andalusian universities showed that courses overwhelmingly addressed social sustainability goals—particularly Quality Education (SDG 4), Gender Equality (SDG 5), and Reduced Inequalities (SDG 10)—whereas environmental goals like Clean Water and Sanitation (SDG 6) and Affordable and Clean Energy (SDG 7) were much less represented [2]. While it was encouraging that a majority of courses examined did include some reference to sustainability principles, the authors noted “a long way to go” toward thorough and comprehensive incorporation of all SDGs. This example illustrates a common pattern: universities may preferentially integrate SDG themes that align with existing social or educational priorities, resulting in gaps (especially around environmental or interdisciplinary SDGs) that remain under-addressed. Scholars argue that more systematic, institution-wide approaches are needed to overcome ad hoc integration and to fully realize the transformative potential of higher education for sustainable development[1],[3].

2.1. Pedagogical Strategies for Sustainability Education

Research on Education for Sustainable Development (ESD) emphasizes that integrating sustainability is not only a matter of what is taught but also how it is taught. Advancing ESD in universities requires a shift from traditional lecture-based instruction toward active, participative, and experiential learning methods [6]. These methods align with key competencies that sustainability education aims to foster—critical thinking, systems thinking, collaboration, and future-oriented problem solving [7].

Implementing innovative pedagogical strategies at scale poses challenges. Transitioning to experiential learning models requires faculty development, time, and resources [8]. Instructors often lack training in sustainability topics or in facilitative teaching methods, which can hinder the incorporation of new material into existing courses. Additionally, large class sizes and rigid curriculum structures may limit opportunities for project-based or experiential modules. Despite these hurdles, there is a growing consensus that reorienting pedagogy is crucial: without engaging teaching methods, the presence of sustainability content alone may not yield meaningful learning outcomes.

2.2. Institutional Policies and Governance

Another critical dimension in SDG integration is the role of institutional policy and governance. Top-down support and clear strategic commitments can significantly influence the breadth and depth of sustainability education. Universities that establish sustainability committees, dedicated offices, or formal policies tend to

achieve more comprehensive integration [3]. Conversely, in the absence of institutional mandates, sustainability often relies on individual "champions" within faculties, leading to patchy implementation. Case studies from various countries highlight that when university leadership prioritizes sustainability—by including it in strategic plans, allocating funding, or setting curriculum guidelines—there is a marked increase in the number and diversity of SDG-related courses [1].

National and regional policy frameworks also play a role. In some contexts, education authorities or accreditation bodies encourage (or require) universities to incorporate sustainable development into curricula, which can drive more uniform adoption. For instance, Kioupi and Voulvoulis (2020) note that countries with sustainability directives in higher education policy see more systematic curricular integration.

3. METHODOLOGY

3.1. Research Design

This study utilizes a mixed-methods research design to examine SDG integration in undergraduate curricula. The approach combines quantitative mapping of course offerings with qualitative content analysis of course descriptions and syllabi. This design allows for both breadth (capturing the extent of SDG-related content across universities) and depth (understanding the nature of that content and how it aligns with specific goals). Such a mixed-methods strategy is well-suited to exploratory education research, as it enables triangulation of findings and provides a richer perspective than either quantitative or qualitative analysis alone [9],[10].

In the quantitative phase, course catalogs from each of the 21 universities in Ankara were systematically reviewed to identify courses explicitly or implicitly related to sustainable development. Keywords linked to the SDGs (e.g., sustainability, climate, gender, energy, poverty, etc.) were used to filter course titles and descriptions. Each identified course was documented along with its department/faculty and any stated learning outcomes related to sustainability. The courses were then coded and mapped to the corresponding SDGs based on content (for example, a course on renewable energy would be mapped to SDG 7, Affordable and Clean Energy).

The qualitative phase involved content analysis of course descriptions and, where available, syllabi for the identified courses. This entailed reading each description to ascertain how sustainability or specific SDG themes are addressed (if at all). We applied a directed content analysis approach [11], using the SDG framework as an analytical lens. Passages in course descriptions that referenced sustainable development concepts were coded to categories corresponding to SDG targets or ESD competencies [7]. This allowed us to characterize not just which SDGs are covered, but in what ways (e.g., whether courses take an interdisciplinary approach, emphasize social justice, etc.).

3.2. Sample and Data Sources

The sample for this research comprised 21 universities located in Ankara, Turkey. This included all major public and foundation (private) universities in the city as of the 2022–2023 academic year. The rationale for focusing on Ankara is its diverse higher education landscape: as the capital, it hosts large research-intensive public universities, smaller teaching-focused institutions, and various private universities, providing a broad spectrum for analysis.

Data sources consisted primarily of official university documents: online course catalogs, departmental course lists, and published syllabi. In cases where detailed syllabi were not publicly accessible, we relied on catalog descriptions and any available course summaries. All data were drawn from publicly available information on university websites during the 2023–2024 academic year. To ensure consistency, only publicly accessible sources were used, which allowed for replicability and transparency of the research process.

Additionally, institutional strategy documents (where available) were reviewed to contextualize the curricular findings. For example, some universities have sustainability reports or strategic plans referencing the SDGs (e.g., Istanbul Bilgi University's strategic plan emphasizes integrating sustainability into education [12]). Such documents, when available, were used to supplement our understanding of each institution's commitment to the SDGs, though the core analysis remained focused on the curricula.

3.3. Data Analysis

For the quantitative mapping, we calculated the number of sustainability-related courses at each university and their percentage of the total number of undergraduate courses. We also tallied how many courses were linked to each of the 17 SDGs. These figures were used to compare integration levels across institutions and

across SDGs. Descriptive statistics (means, ranges) highlighted general patterns (e.g., average proportion of courses per university that include sustainability, most/least addressed SDGs).

In the qualitative content analysis, coded course descriptions were analyzed to identify common themes and differences. We specifically looked for indications of how sustainability is taught: for instance, whether courses adopt a problem-based learning approach, include community projects, or explicitly mention interdisciplinary perspectives. We also noted whether courses frame sustainability in environmental terms only or also incorporate social and economic dimensions.

Throughout the analysis, the convergence of quantitative and qualitative findings was examined. If a university had a high number of sustainability courses, the qualitative data helped determine whether those courses offered deep engagement with SDG themes or only superficial mentions. Conversely, if certain SDGs were rarely mapped in the quantitative step, the qualitative review helped confirm whether those themes were truly absent or just not labeled clearly in course descriptions.

Triangulation was further enhanced by comparing our findings with external indicators. For instance, universities that emerged as leaders in curricular integration were checked against any known sustainability accolades or initiatives (such as participation in the UI GreenMetric or SDSN's university SDG rankings). While not a formal part of our method, this background check provided additional confidence that our curriculum-based findings aligned with broader institutional behaviors.

3.4. Reliability and Limitations

To ensure reliability in the content analysis, two researchers independently coded a subset of course descriptions (15% of the sample) and compared results. Inter-coder agreement was calculated at 85%, and discrepancies were resolved through discussion and refinement of the coding scheme. This process helped clarify coding rules (e.g., what qualifies as an implicit reference to a particular SDG) and improved consistency in the remaining analysis.

Despite careful design, the study has several limitations. First, it is limited to documented curriculum content. There may be informal or co-curricular sustainability activities not captured in course catalogs (such as student club projects or one-off seminars) that nonetheless contribute to SDG education. Second, the analysis assumes that course descriptions accurately reflect course content. In practice, how a course is taught could differ from its description; some courses might include sustainability topics without mentioning them in the catalog. Third, the mapping of courses to SDGs, while systematic, involves subjective judgment in cases where links are not explicit. For example, a course on "Urban Transportation" might implicitly advance SDG 11 (Sustainable Cities and Communities) even if not stated. We attempted to err on the side of inclusion by counting such implicit links, but this always involves a degree of subjectivity (Mayring, 2014). Fourth, the study's focus on Ankara universities limits the generalizability of findings to other regions or countries. Finally, our evaluation centers on curricular presence rather than learning outcomes—we do not assess how effectively students acquire sustainability competencies [10].

By acknowledging these limitations, we aim to maintain transparency and highlight areas for future research, such as incorporating direct measures of student learning or extending the study to a national sample of universities. Overall, the mixed-methods framework provides a credible basis for assessing SDG integration in higher education curricula in Türkiye.

4. Findings

4.1. Integration of Sustainability Courses in Curricula

Content analysis revealed that sustainability concepts are present in undergraduate programs across all 21 universities in Ankara, though their prevalence varies considerably. In total, 318 sustainability-related courses were identified (approximately 15 per institution on average), accounting for around 5–10% of all undergraduate courses. This indicates that explicit SDG-oriented content remains a relatively small fraction of total curricula. Some large public universities offer over 25 such courses, while smaller private institutions provide fewer than 10. These patterns mirror global trends where leading institutions demonstrate deeper curriculum greening while others remain at early stages [13],[14]. Chang and Lien (2020) found that over half of all courses at a proactive Asian university were linked to at least one SDG, a level far beyond what is currently seen in Ankara. Similarly, Aranda et al. (2024) note widespread deficiencies in sustainability

inclusion across European higher education. Such comparisons highlight that most Ankara universities are still progressing toward comprehensive SDG alignment.

4.2. Differences Across Faculties and Disciplines

Disciplinary disparities in SDG integration are prominent. Faculties of engineering and natural sciences contain the majority of sustainability courses, typically aligned with SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). In contrast, social sciences and humanities faculties have far fewer offerings, often limited to electives addressing SDG 5 (Gender Equality) or SDG 16 (Peace, Justice, and Strong Institutions). Interdisciplinary or general education programs show the broadest SDG coverage, reflecting an institutional effort to reach students from diverse disciplines. These findings align with prior literature indicating that general education units often provide diversified SDG exposure, whereas disciplinary programs concentrate narrowly on field-specific goals [13]. However, this "siloed" integration remains a limitation, since faculty-driven efforts tend to fragment SDG implementation across the institution rather than achieving a coherent, university-wide strategy [1].

4.3. Alignment with Specific SDGs

Quantitative mapping of courses to the 17 SDGs revealed uneven representation. The most frequently addressed goal was SDG 4 (Quality Education), appearing in approximately 32% of sustainability-related courses. SDG 13 (Climate Action) and SDG 11 (Sustainable Cities and Communities) followed, each accounting for 20–25% of the total. SDGs 7 (Affordable and Clean Energy) and 9 (Industry, Innovation, and Infrastructure) were present in about 15–20% of courses. Conversely, SDGs 14 (Life Below Water), 2 (Zero Hunger), and 15 (Life on Land) appeared in fewer than 5% of courses. Socially oriented goals, such as SDG 1 (No Poverty), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities), were collectively represented in around 10% of courses. This imbalance reflects broader trends in sustainability education, where environmental and technological goals tend to dominate over social and economic ones[15]. Studies show that curricula often favor topics like climate change or renewable energy while underrepresenting social justice and equity [14],[13]. In Ankara, this pattern suggests that universities are integrating sustainability themes primarily through environmental and technical perspectives, with limited attention to social dimensions of the SDG framework.

4.4. Course Status: Elective vs. Compulsory

Analysis of course status revealed that 88% of sustainability courses are electives, while only 12% are compulsory components of degree programs. This implies that most students can complete their studies without engaging in sustainability education unless they actively choose relevant electives. Such elective-based approaches are common in early phases of SDG integration [3]. Several institutions have begun experimenting with required sustainability modules—such as mandatory courses for engineering students—but these remain exceptions rather than the rule. The predominance of elective courses limits consistent exposure and undermines the mainstreaming of sustainability within higher education curricula, echoing global critiques that SDG education is often treated as peripheral [14].

4.5. Comparative and Contextual Perspective

Overall, Ankara universities exhibit patterns consistent with global higher education: sustainability education is emerging but remains uneven, discipline-specific, and largely optional. The dominance of environmental SDGs (notably 4, 11, 13, and to a lesser extent 7, 9) over social ones (1, 5, 10) parallels results from prior international analyses [13],[15]. Nevertheless, a few Ankara universities demonstrate growing alignment with international frameworks such as the UN's Education for Sustainable Development roadmap [16]. Although Ankara's integration level (5–10% of courses) remains modest compared to global exemplars—some achieving SDG alignment in over 50% of curricula [13] —these findings represent early but tangible progress. The results underscore the importance of embedding sustainability in core curricula, broadening SDG scope to include social justice dimensions, and fostering institutional strategies beyond faculty initiatives.

5. CONCLUSION AND DISCUSSION

This study's findings reveal that the integration of Sustainable Development Goals into undergraduate curricula at 21 universities in Ankara is present but uneven and limited in scope. Sustainability-related courses are not uniformly embedded across all institutions or faculties; instead, they tend to be concentrated in certain universities and disciplines. Larger or more research-oriented universities in the sample demonstrated broader

engagement with SDG themes, whereas several smaller or newer institutions showed minimal offerings. Overall, sustainability education remains fragmented and largely peripheral in these curricula, indicating that most Ankara universities have yet to fully institutionalize the SDGs in their teaching programs.

A key observation is that the majority of identified sustainability courses are offered as electives, with very few being mandatory for graduation. In our analysis, roughly 80–90% of the sustainability-related courses were optional. This implies that many students can complete their degrees without any exposure to sustainability or SDG concepts, unless they proactively choose such electives. Such an elective-heavy approach positions sustainability as a supplementary topic rather than a core competency. This finding aligns with international observations that universities often introduce sustainability through isolated or ad hoc initiatives (typically optional seminars, special topics, or faculty-driven courses) rather than via institution-wide curricular requirements [1],[2]. Franco et al. (2019), for example, note that despite rhetorical commitments to sustainable development, few higher education institutions have made sustainability a compulsory part of all programs, resulting in patchy implementation. Our results echo this pattern, underscoring that Ankara's universities are largely treating sustainability education as an add-on. The lack of compulsory courses suggests that sustainability competencies are not yet considered essential for all graduates—a limitation that undermines the transformative potential of higher education in advancing the 2030 Agenda [3].

Furthermore, the coverage of specific SDGs within courses is uneven. The analysis showed a dominance of certain goals—most notably SDG 4 (Quality Education), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action)—in the content of sustainability-related courses. These three SDGs were by far the most frequently addressed across the curricula, indicating that educational quality, urban sustainability, and climate change are focal themes. This likely reflects the existing strengths or interests of particular faculties: for instance, education departments naturally engage with SDG 4, while engineering, environmental science, and architecture programs often emphasize topics relevant to SDG 11 and SDG 13. However, other SDGs received considerably less attention. Several social and equity-oriented goals—such as SDG 1 (No Poverty), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities)—were markedly underrepresented in the curricula. In fact, courses explicitly linking to these social goals were rare, comprising only a small fraction of the total identified courses. This imbalance suggests that the social dimension of sustainable development is not being adequately incorporated, with universities prioritizing environmental and technical aspects of sustainability over issues of social justice, inclusion, and equity.

Reflecting on this pattern, it appears that Ankara's universities are not unique in exhibiting such an imbalance—many institutions worldwide have struggled to achieve an integrated approach that gives equal weight to environmental, social, and economic dimensions of sustainability. Studies in other regions similarly document a tendency for curricula to focus on environmental topics (e.g., climate change, renewable energy, sustainable cities) while neglecting social challenges like poverty alleviation and gender equality [5],[13]. For instance, Lozano et al. (2015), in a worldwide survey of higher education sustainability efforts, found that technical and environmental sustainability initiatives were more commonly implemented than socially oriented ones. Likewise, Poza-Vilches et al. (2022) observed in Spanish universities that certain SDGs (such as Quality Education and Gender Equality) received attention in education faculties, whereas critical environmental goals like Clean Water (SDG 6) and Clean Energy (SDG 7) were often overlooked. Our findings add a nuanced perspective: in the Ankara context, we see strong emphasis on climate and urban sustainability (SDGs 13 and 11), which are environmental in nature, but we also see SDG 4 (education) featuring prominently—indicating an interplay between addressing educational quality and addressing environmental themes. The underrepresentation of social equity goals in Ankara's case underscores a generalizable challenge: achieving a holistic integration of all three pillars of sustainable development (social, environmental, economic) remains difficult. It may be that universities gravitate towards SDGs that align with existing curricula or funding priorities, while topics that require more interdisciplinary or critical pedagogical approaches (like inequality or poverty, which often fall between traditional departmental boundaries) receive less curricular attention.

Another notable finding is the uneven distribution of sustainability courses across institutions and faculties. Some universities in Ankara emerged as clear leaders, embedding a range of SDG-related courses across multiple departments, whereas others offered very few such courses (and those often confined to a single faculty or subject area). This kind of disparity is reflected in international literature: the degree of sustainability

integration often varies widely between institutions even within the same country, due to differences in leadership commitment, resources, faculty expertise, and institutional culture [6]. In our study, for instance, a few well-established universities had proactively incorporated sustainability into programs like engineering, business, and social sciences, while at other universities sustainability content was virtually absent outside of perhaps one environmental science elective. Our results from Ankara, without a cohesive policy framework, some universities forge ahead with sustainability curriculum innovation while others lag behind, contributing to a landscape of inconsistent SDG integration.

Despite these challenges, it is important to acknowledge that the integration of SDGs in Ankara's universities, although modest, represents a starting point and shows parallels with global trends. In line with worldwide patterns, we see that technical and professional disciplines (e.g., engineering, urban planning, environmental sciences) are at the forefront of incorporating sustainability content, whereas social sciences and humanities are less involved [6]. This disciplinary imbalance suggests that sustainability is still often framed as an environmental or technical issue in higher education, rather than a broad societal challenge that every field should engage with. Our study's findings mention, engineering and natural science faculties in Ankara provide many of the SDG-linked courses. The limited presence of sustainability content in social science or arts curricula in Ankara indicates missed opportunities to explore sustainability through lenses of ethics, culture, equity, and governance.

Implications for curriculum policy and institutional strategy are evident from these findings. To address the fragmentation and selectivity observed, a more systematic, policy-driven approach is required to mainstream sustainability in higher education. At the institutional level, universities should consider establishing clear sustainability strategies or action plans that include curriculum reform. This could involve setting targets for each faculty to incorporate relevant SDGs, or creating incentives and support for faculty to develop new courses and modules related to sustainable development. University leadership and governance play a crucial role: without top-down commitment (such as dedicating resources for curriculum development, or making sustainability a key criterion in academic program review), sustainability efforts may remain isolated pilot projects [3]. One immediate step could be to integrate sustainability into general education requirements or core curricula. For example, universities might introduce a mandatory introductory course on sustainability or weave SDG topics into existing required courses (for instance, incorporating ethics of sustainability into philosophy classes, or sustainable development case studies into economics and engineering fundamentals). Some pioneering institutions internationally have implemented such requirements, recognizing that all students should graduate with basic sustainability literacy [1]. If Ankara's universities were to move even a portion of sustainability content from the elective category into the required core, it would ensure broader exposure and signal that sustainability is a priority competency for all graduates.

Moreover, curriculum design should strive for balance across different SDGs and sustainability dimensions. The current dominance of environmental topics at the expense of social equity topics suggests curriculum planners need to consciously include social sustainability themes. This might entail developing courses on topics like sustainable development policy, social entrepreneurship for poverty reduction, gender and development, or ethics of sustainability, ensuring that issues of inequality and social justice receive attention alongside environmental challenges. Such an approach aligns with the holistic ethos of the SDGs, which call for "leaving no one behind" and advancing social inclusion as part of sustainable development. Educators can draw on international frameworks like UNESCO's Education for Sustainable Development, which emphasize interdisciplinary learning and critical thinking about both local and global sustainability issues [16]. By broadening the scope of SDG coverage in curricula, universities can produce graduates who not only understand climate science or urban planning for sustainability, but also appreciate the socio-economic contexts and human dimensions of these challenges.

On a policy level, the findings also suggest that national or regional higher education bodies in Turkey could play a supportive role by providing guidelines or standards for sustainability in curricula. In some countries, higher education accreditation agencies or ministries have begun to encourage or require the integration of sustainable development into academic programs [6]. While Turkey currently lacks a formal mandate for SDG education, incorporating sustainability criteria into program accreditation or quality assurance processes could motivate a wider range of institutions to take action. Additionally, fostering networks or partnerships among universities (both within Turkey and internationally) can facilitate the sharing of best practices and resources.

For example, universities in Ankara might collaborate on joint curriculum development workshops or student projects aligned with SDGs, thereby pooling expertise and building a community of practice around sustainability education.

In conclusion, this study provides important insights into the state of SDG integration in higher education within Ankara, Turkey, and by extension highlights issues likely prevalent in similar contexts. The uneven distribution of sustainability courses, the dominance of certain SDGs (4, 11, 13) over others, the overrepresentation of environmental content relative to social aspects, and the predominance of elective offerings together paint a picture of early-stage engagement that is enthusiastic but not yet comprehensive. These findings are consistent with the international literature that depicts sustainability in higher education as a work in progress—significant strides have been made, but much remains to be done to embed sustainability deeply into the fabric of university education [5],[3]. By reflecting on our results in light of global patterns, we see that Ankara's universities face familiar challenges of breaking silos, overcoming curricular inertia, and extending sustainability beyond niche programs. Yet, there is also a clear opportunity here: with targeted reforms in curriculum policy and institutional strategy, universities in Turkey can leap forward in mainstreaming the SDGs. Embedding sustainability into core curricula, promoting interdisciplinary collaboration, and ensuring a more balanced treatment of all SDGs would not only improve educational outcomes but also enhance the universities' contributions to national and global sustainability goals. Ultimately, integrating the SDGs into undergraduate education is both a challenge and a necessity – a challenge because it requires rethinking traditional curricula and overcoming resistance to change, but a necessity because the complex problems of the 21st century demand graduates who are equipped with the knowledge, skills, and values to drive sustainable development. As the 2030 Agenda deadline approaches, higher education institutions have a responsibility to accelerate their efforts, ensuring that every student – regardless of discipline – gains exposure to sustainability principles. This study's evidence from Ankara underscores that while progress has begun, a more concerted and systemic approach is essential. By learning from international experiences and heeding the gaps identified, universities in Ankara and elsewhere can better align their educational mission with the imperatives of sustainable development, producing not just skilled professionals, but informed and responsible global citizens.

Overall, with respect to the research question posed, the findings indicate that SDG integration in Ankara's undergraduate curricula is present but remains limited and uneven in scope. In concrete terms, sustainability-related offerings make up only about 5–10% of courses on average, are concentrated as electives in certain departments, and tend to emphasize a few goals (most notably Quality Education, Sustainable Cities, and Climate Action) while many other SDGs receive little attention. Thus, although all 21 universities have begun incorporating sustainability content, this integration is far from comprehensive or uniform across institutions. In short, the SDGs are only partially embedded in Ankara's higher education curricula, existing more as isolated initiatives than as a fully mainstreamed component of undergraduate education.

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