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Exploring the Indirect Effects of a Sustainable Development Goals-Focused Curriculum on Architectural Design Studio

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Abstract: The worsening climate crisis, depletion of natural resources, and global economic uncertainties have reshaped development paradigms and brought the United Nations' Sustainable Development Goals (SDGs) to the forefront of higher education agendas. Architectural education, due to its direct influence on the built environment and social life, plays a strategic role in advancing sustainability-oriented thinking. This study was conducted at Abdullah Gül University (AGÜ), which integrates the SDGs into its mission, vision, and departmental curricula. All undergraduates are required to complete five sustainability-focused courses before their senior year, providing a structured foundation for subsequent design education. The research examines how this prior exposure to SDG-focused learning influences other departmental courses, with particular attention to a third-year design studio held in Fall 2022 in the Architecture Department. The studio, located in Divriği, a historic town in Sivas recognized as an urban conservation site, was not explicitly centered around the SDGs but structured around a social responsibility theme that implicitly aligns with them. Through thematic and content analysis of thirty-three students' project briefs, the study explores which SDGs were addressed and how they were translated into design strategies. Findings indicate varying levels of engagement, suggesting that earlier coursework may implicitly inform students' ability to express sustainability concerns in culturally sensitive contexts.

Keywords: Architectural education; Architectural design studio; Sustainable Development Goals; Vernacular architecture; Design research.

Introduction

The focus of sustainability on ecological concerns was expanded with the proclamation of the 2030 Agenda for Sustainable Development in 2015, which introduced the 17 Sustainable Development Goals (SDGs) and emphasized the essential role of education in achieving them (UN, 2015). Sustainable development is a dynamic concept that seeks to balance economic growth, social progress, and

environmental protection, aiming to improve the quality of life for both present and future generations. The fact that this agenda requires collective effort at global, national, and individual levels has made its integration into higher education unavoidable. The Talloires Declaration of 1990 marked the first higher education charter to stress the leadership role of universities in advancing sustainability (ULSF, 1990). This vision was institutionalized through the Decade of Education for Sustainable Development (DESD) from 2005 to 2014, during which UNESCO underlined the need for universities to act not only as transmitters of knowledge but also as agents of transformation (UNESCO, 2005). Within this expanding framework, architectural education directly tied to the production of the built environment has emerged as a strategic domain for conceptualizing and implementing sustainability goals (Lozano, 2006; Barth, 2013). In this context, the SDGs have been approached both as a conceptual framework and as a practical guide for rethinking curricula and design pedagogy.

Since architecture addresses the intersection of social needs, environmental constraints, and cultural values, it provides fertile ground for engaging students with the multidimensional character of sustainability. Recent studies have shown that schools of architecture have introduced explicit courses on sustainability, restructured their curricula to align with the SDGs, or developed studios directly framed around selected goals (Burton & Salama, 2023; Hendawy et al., 2024). Raising SDG awareness within the profession through the educational sector has also been reinforced by architectural accreditation frameworks, such as the National Architectural Accrediting Board (NAAB) criteria in the United States (NAAB, 2020), the Royal Institute of British Architects (RIBA) validation in the United Kingdom (RIBA, 2020), the UNESCO-International Union of Architects (UIA) Charter for Architectural Education (UNESCO-UIA, 2023), and, more recently, the Architecture Accreditation Board (MIAK) in Türkiye (Akgün et al., 2024). While these initiatives demonstrate growing awareness, they also reveal limitations: evaluation often remains descriptive, specific goals such as “SDG 11: Sustainable Cities and Communities” dominate the discussion, and the indirect influence of prior sustainability-oriented coursework on studio performance has received little attention. This gap motivates this study, which explores how architecture students at Abdullah Gül University (AGÜ), where five sustainability-focused courses, named Global Courses (GLB), are embedded across the curriculum, implicitly transfer their knowledge into an architectural design studio not formally structured around the SDGs.

Founded in 2010 with the mission of aligning all its processes and activities with the principles of social contribution and sustainable development, through educational, scientific, technological, economic, cultural, and social engagement in close collaboration with industry, public institutions, and civil society, AGÜ has sought to embed sustainability across every stage of its educational framework. This institutional focus is reflected not only in governance and operations but also through extracurricular initiatives, external partnerships, faculty research, and the curricula of all academic programs. Guided by its Sustainability Office, AGÜ has developed an SDG-oriented approach that earned it first place in Türkiye and 37th place worldwide in the 2024 Times Higher Education Impact Rankings. To support this framework, GLB courses are designed for all students, starting in the first year, with two foundational courses: GLB101, which covers the first seven SDGs, and GLB102, focusing on the remaining goals. In the second year, students choose two GLB2XX courses focused on specific SDGs, allowing for deeper thematic engagement. In the third year, they complete the final GLB3XX course, which involves collaboration with NGOs and community-based fieldwork projects.

The architectural design studio examined in this study corresponds to the first semester of the third year, at which point students have already completed four sustainability-oriented GLB courses and are concurrently enrolled in the final NGO-collaborative course. Having

previously engaged with global challenges, investigated selected SDGs in depth, and developed skills of research, critical reflection, and interdisciplinary collaboration, students enter the studio with a layered but partly unspoken knowledge base. To move beyond a purely descriptive reading of the studio outcomes, the analysis is therefore framed through tacit knowledge and learning transfer. As proposed by Polanyi (1966), tacit knowledge refers to forms of understanding that are demonstrated through action rather than explicit articulation. Schrijver (2021) extends this into architectural design reasoning, highlighting its reliance on intuitive, situated modes of knowing. In educational terms, this aligns with learning transfer, the unconscious application of previously acquired knowledge to new contexts (Perkins & Salomon, 1992; Bransford & Schwartz, 1999). Accordingly, students' incorporation of sustainability principles into their Divriği studio proposals is interpreted as tacit transfer, referring to the implicit use of knowledge gained through GLB coursework in a studio that is not formally centered on the SDGs.

Before this study, the same studio had been examined through a social-responsibility lens, focusing on how students translated local context and community needs into spatial strategies through gathering-space proposals (Metin et. al., 2025). Without revisiting that scope, the present study instead investigates how sustainability-related knowledge was tacitly transferred into the design process. Accordingly, thematic and content analysis of student briefs was conducted to identify which SDGs were addressed and to what extent they guided the projects. The findings were then compared with students' prior coursework to reveal potential connections between their educational background and studio.

Literature Review and Theoretical Background

The integration of the UN SDGs into architectural education has attracted growing scholarly attention, reflecting efforts to align design teaching with global sustainability efforts. The literature shows that SDGs are being recognized more as a comprehensive agenda that includes social, cultural, and economic aspects, not just environmental concerns (Burton & Salama, 2023; Lozano, 2006, Herrera-Limones et al., 2021). This change encourages architectural programs to go beyond just "green design" and to make sustainability a core skill across all areas. However, current research highlights considerable differences in how architecture schools adopt and implement SDGs, from formal curriculum mapping to selective integration within design studios.

Several studies examine curriculum-wide approaches. Survey-based research in Egypt, for example, highlights students' increasing familiarity with SDGs but also points out difficulties in turning this awareness into practical design choices, especially when sustainability is seen as an abstract idea (El-Kholei & Yassein, 2023). Similar studies stress the importance of systematic integration, suggesting that without structured pedagogical tools, student engagement with SDGs may stay superficial (Bertone et al., 2024; El-Kholei, Amer & Yassein, 2025). Herrera-Limones et al. (2021) also measure how architecture and engineering curricula contribute unevenly to different SDGs, with environmental goals often given priority over social equity or cultural heritage.

Case studies of design studios offer another perspective. When studios explicitly frame their briefs around SDGs, students tend to show a more integrated and holistic understanding. For example, Akgün, Doğrusoy, and Özsöyler (2024) report that second-year studios focused on SDG targets encouraged students to connect building performance with urban resilience and social inclusion. Erkarslan and Akgün (2022) similarly describe a graduation studio where SDG integration promoted critical engagement with global challenges, while Tawfik, El Sayed, and Emad (2024) illustrate how a design exercise reimagining Cairo's Giza Zoo helped students place architectural interventions within broader sustainability narratives. However, most of these studies tend to remain descriptive, with limited attempts at systematic evaluation.

Where quantification is used, emphasis is often placed on a narrow set of goals, most notably "SDG 11: Sustainable Cities and Communities," while other goals receive less explicit attention.

Complementary studies also explore alternative pedagogical strategies. Mahgoub (2024) illustrates how extracurricular activities, rather than formal coursework, can create meaningful opportunities to internalize sustainability values. Similarly, research on international and regional collaborations indicates that dialogue-based initiatives support the contextual adaptation of SDGs in architectural training, fostering cross-cultural exchange and inclusivity (Granato, 2023). These examples highlight that SDG integration does not have to be limited to curriculum design alone but can be reinforced through informal or transdisciplinary learning modes.

Taken together, the literature suggests that embedding SDGs in architectural education can contribute to raising student awareness and supporting broader sustainability perspectives. Existing studies, however, primarily address explicitly SDG-oriented curricula or studio settings, while less is known about the indirect influence of prior sustainability-related coursework on later design studios. This study explores that aspect by examining the final project briefs of third-year architecture students, who complete several sustainability-focused courses before this senior design studio. The aim is to consider how SDGs appear in project narratives and to what extent earlier coursework may have shaped design reasoning in a studio not directly framed around the SDGs.

Methodology

This study employed a mixed-methods research design based on thematic and content analysis techniques. It focused on the Fall 2022 third-year Architectural Design Studio 3 at AGÜ. Thirty-three students participated in the studio, which was held in Divriği, a historic town in Sivas Province designated as an urban conservation site. The design brief asked students to propose new "gathering spaces" in the urban core, guided by three principles: social responsibility, inclusive design, and the use of natural building materials and techniques. Projects were also expected to include open or semi-open spaces and landscape features that integrate with the town's natural and productive landscape.

The main data for the study consisted of the final project briefs prepared by students. Each project brief was coded against the 17 SDGs using thematic analysis. Instead of searching for direct mentions, the coding process focused on identifying all words and word groups in the student texts that could potentially relate to the SDGs and their targets. The coding was conducted in Microsoft Excel using a matrix structured around the SDGs as the first step. All relevant expressions used by students that reflected the SDG targets were included in the column corresponding to the related SDG.

To validate the manual coding process, an additional verification step was performed using OpenAI. First, a comprehensive table listing all 17 SDGs and their targets was created. Then, both this table and the students' project briefs were uploaded to the OpenAI interface, and the system was prompted to generate a table by selecting all potentially related words and word groups from the texts and matching them with the appropriate SDGs. The manually created and AI-generated coding were then compared to assess classification consistency and strengthen the validity of the analysis. Through this coding process, the expressions used by each student for each SDG were identified. Additionally, the sustainability-focused GLB courses completed by students served as a secondary reference for the interpretation process. Unlike the GLB courses in the first (GLB101 and GLB102) and third years (GLB3XX), which are compulsory for all students, the second-year elective courses (GLB2XX) were specifically chosen for interpretation since they allow students to select from different SDG-related themes. The findings were then discussed based on the themes covered in these elective GLB2XX courses to evaluate whether the issues emphasized in earlier coursework were reflected in the students' design proposals. The

content analysis method was also used to identify the frequency of SDG-related expressions, as well as the diversity of GLB course themes (Figure 1). These evaluations were conducted both on a thematic level and an overall level, and the project briefs were not linked to individual students' elective course histories. Instead, the analysis focused on broader patterns and trends among students, in line with the study's goal to provide a general interpretive framework rather than causal insights at the individual level.

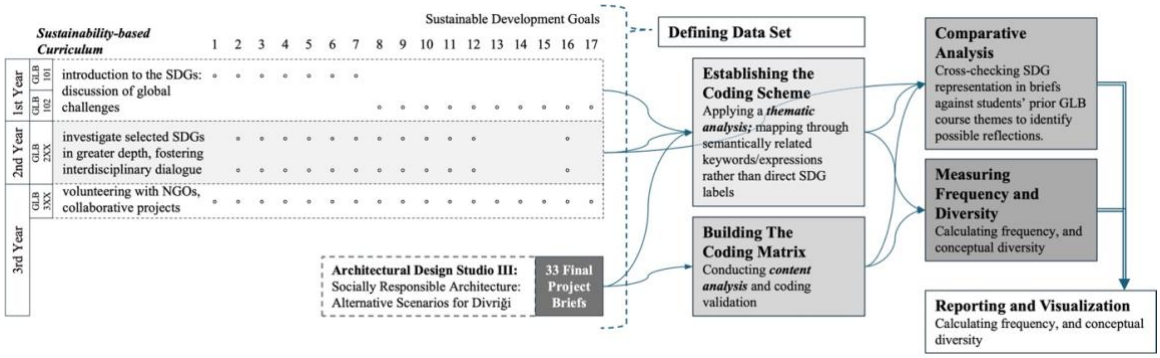


Figure 1: *Research design structure*

Findings and Discussion

The findings were first evaluated based on the SDG-related expressions and their frequencies found in the students' project briefs, as well as their connection to the elective GLB courses focusing on different SDGs completed in the second year, as shown in Figure 2.

Before analyzing the distribution of SDG-related expressions in the design proposals, the students' second-year elective GLB course choices offer an important contextual background. Except for the GLB courses taken in the first and third years, an analysis of students' second-year elective GLB course choices, shown in Table 1, based on their personal interests, revealed that 36% chose courses related to "SDG 3: Good Health & Well-being," 27% to "SDG 11: Sustainable Cities & Communities," 24% to "SDG 12: Responsible Consumption & Production," 21% to "SDG 5: Gender Equality," 12% to "SDG 10: Reduced Inequalities," 9% to "SDG 2: Zero Hunger," 6% to "SDG 7: Affordable & Clean Energy," and 3% to "SDG 6: Clean Water & Sanitation." It was also noted that no specific courses linked to the remaining SDGs were selected.

In their project briefs, students primarily focused on "SDG 9: Industry, Innovation & Infrastructure (94%)" and "SDG 12: Responsible Consumption & Production (94%)," followed by "SDG 11: Sustainable Cities & Communities (88%)" in second place. "SDG 8: Decent Work & Economic Growth (79%)" and "SDG 15: Life on Land (79%)" ranked third, with "SDG 4: Quality Education (73%)" following. "SDG 2: Zero Hunger (30%)," "SDG 3: Good Health & Well-being (27%)," "SDG 10: Reduced Inequalities (27%)," "SDG 5: Gender Equality (24%)," and "SDG 13: Climate Action (21%)" were less frequently mentioned, while "SDG 16: Peace, Justice & Strong Institutions (9%)," "SDG 6: Clean Water & Sanitation (3%)," and "SDG 17: Partnerships for the Goals (3%)" had very limited representation in the design proposals. Conversely, "SDG 1: No Poverty," "SDG 7: Affordable & Clean Energy," and "SDG 14: Life Below Water" were not addressed at all.

Figure 3 illustrates the diversity of expressions students used in their project briefs. The analysis revealed that the most diverse range of concepts was linked to "SDG 9: Industry, Innovation & Infrastructure" and "SDG 12: Responsible Consumption & Production," followed by "SDG 11: Sustainable Cities & Communities" and "SDG 8: Decent Work & Economic Growth" with similar levels, and

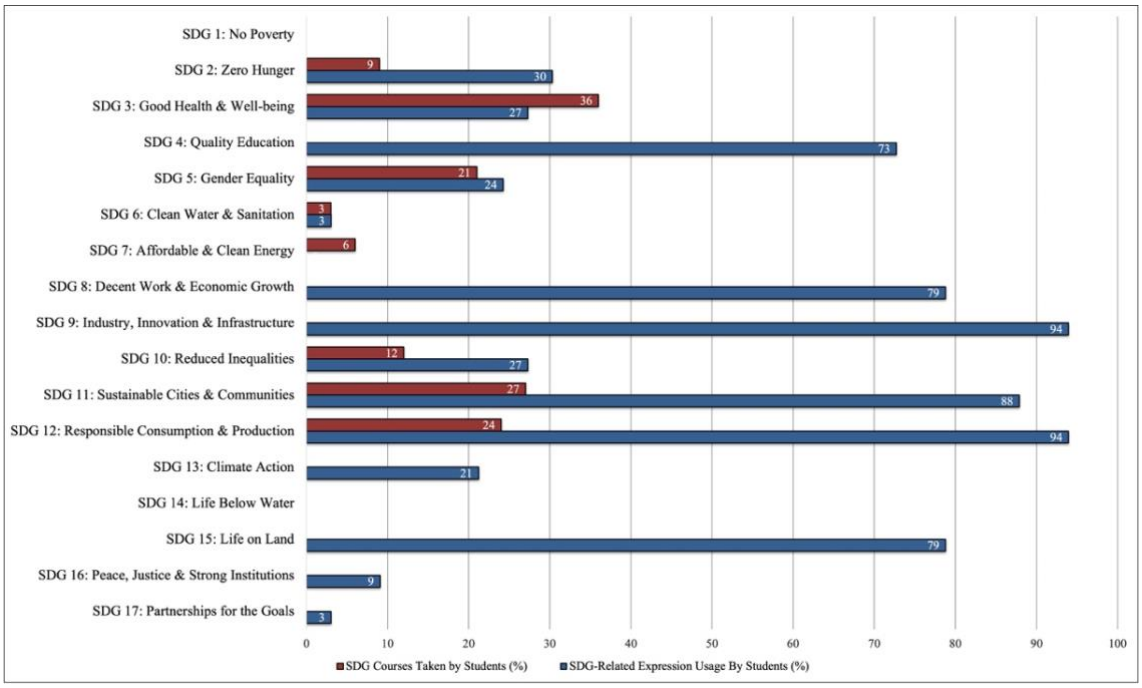


Figure 2: *SDG-related expression usage and the SDG courses taken by students (%)*

Table 1: *Elective GLB2XX courses taken by Divriği studio students and related SDG contents.*

GLB Courses	**Related SDGs**
GLB201	SDG 2: Zero Hunger
GLB202	SDG 5: Gender Equality
GLB203	SDG 3: Good Health & Well-being
GLB205	SDG 11: Sustainable Cities & Communities
GLB206	SDG 6: Clean Water & Sanitation
GLB207	SDG 12: Responsible Consumption & Production
GLB210	SDG 10: Reduced Inequalities
GLB270	SDG 7: Affordable & Clean Energy

"SDG 4: Quality Education" at a slightly lower level. These were then followed by "SDG 15: Life on Land," "SDG 2: Zero Hunger," and "SDG 3: Good Health & Well-being," while a smaller range of concepts was seen for "SDG 10: Reduced Inequalities," "SDG 13: Climate Action," "SDG 5: Gender Equality," "SDG 16: Peace, Justice & Strong Institutions," "SDG 17: Partnerships for the Goals," and "SDG 6: Clean Water & Sanitation." No expressions were used for "SDG 1: No Poverty," "SDG 7: Affordable & Clean Energy," or "SDG 14: Life Below Water." Some examples of SDG-related expressions used by Divriği studio students are provided in Table 2.

In the students' design briefs, "SDG 12: Responsible Consumption & Production" and "SDG 11: Sustainable Cities & Communities," which emerged as the main focus areas, also aligned with the most frequently chosen elective courses in their second-year elective

GLB studies. The range of expressions associated with these two SDGs followed a similar pattern, proposing a connection between prior coursework and the students' design reasoning. This suggests that students were able to articulate these goals through a broad vocabulary of design concepts. By contrast, no such pattern was observed for the other SDGs, reflecting the selective influence of earlier learning. Furthermore, the frequency of references and the diversity of expressions displayed a largely proportional relationship, with only minor differences in ranking.

At the same time, the nature of the design brief itself shaped the thematic orientation of the students' proposals. Themes such as "social responsibility," "inclusive design," and "the use of natural building materials and techniques" were expected to be addressed in the architectural design proposals, which are inherently linked to specific SDGs, even if not explicitly named. Consequently, certain expressions in the project briefs may reflect the requirements of the brief rather than prior coursework. For example, the emphasis on "social responsibility" aligns with "SDG 8: Decent Work & Economic Growth" and "SDG 17: Partnerships for the Goals," while "inclusive design" relates to "SDG 4: Quality Education," "SDG 5: Gender Equality," "SDG 6: Clean Water & Sanitation," "SDG 10: Reduced Inequalities," "SDG 11: Sustainable Cities & Communities," and "SDG 12: Responsible Consumption & Production," based on the expressions used by students. Similarly, the theme of "the use of natural building materials and techniques" connects to material- and technology-focused goals, such as "SDG 9: Industry, Innovation & Infrastructure" and "SDG 15: Life on Land" in the project briefs. However, since the students used expressions that extend beyond these three themes across the relevant SDGs, it can be argued that their project briefs not only relate to the expectations of the studio brief but also draw on tacit forms of knowledge gained throughout their broader learning experiences related to the SDGs.

In light of these findings, the following discussion highlights how students addressed the SDGs in their design concepts and solutions within the framework of the given project brief and the specific context of Divriği, presented in the order of the most frequently emphasized SDGs.

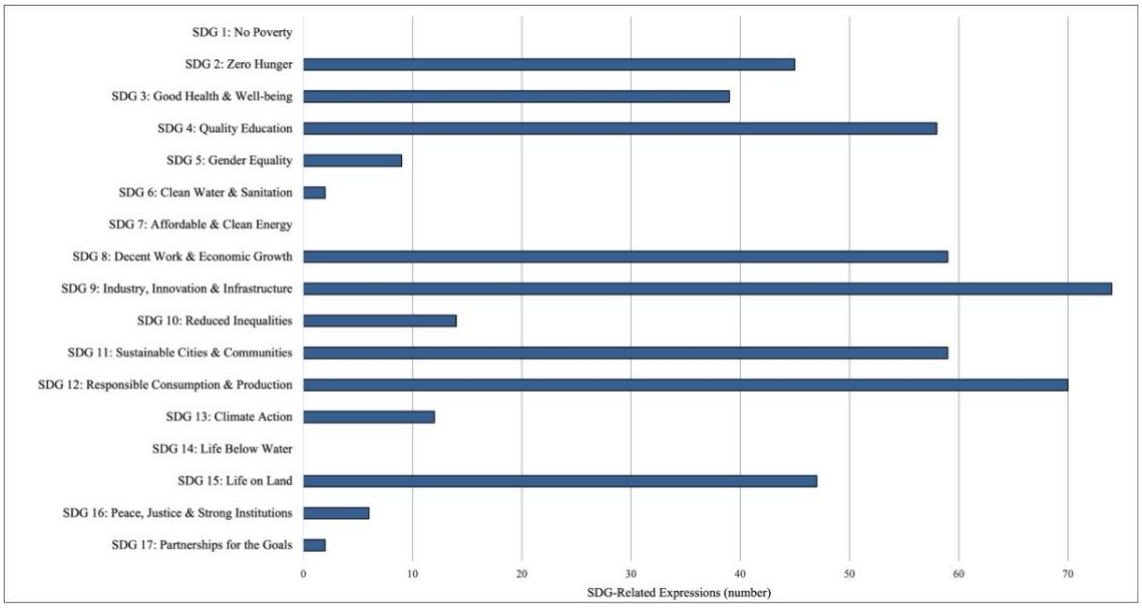


Figure 3: *Diversity of expressions related to each SDG*

Table 2: *Examples of SDG-related expression used by students*

SDGs	SDG-related expression examples
SDG 1: No Poverty	*not available*
SDG 2: Zero Hunger	bread making, canned food, collected plants processed, culinary school, cultural food, gardening traditions, local dishes, local products, open kitchen service, winter food preparation…
SDG 3: Good Health & Well-being	alternative medicine, apitherapy, aroma therapy, hydrotherapy, meditation studios, music therapy, psychological and spiritual health, preventative and complementary treatment, phytotherapy, therapy studios, yoga halls…
SDG 4: Quality Education	classes for continuous works, design workshop, extra-curricular courses, gain experience from elders, learning by cooking, master-apprentice relationship, trainings for children, specialized workshops…
SDG 5: Gender Equality	accessibility of all people, considering disadvantaged groups, genders, inclusive design…
SDG 6: Clean Water & Sanitation	pool…
SDG 7: Affordable & Clean Energy	*not available*
SDG 8: Decent Work & Economic Growth	branding knife production, clothes production, community-based tourism movement, exhibition and fair areas, herbal markets, production of ceramics, provide a network to the producers, support hand skills and creativity…
SDG 9: Industry, Innovation & Infrastructure	activity square, administration building, facility, materials specific to the natural region, modern application, patterns and textures analyzed and reproduced, processing of local products, technology and art combined…
SDG 10: Reduced Inequalities	appeals to all age groups, appeals to people from all walks of life, communication, different cultures brought together, inclusive design, socialization, user profiles considered…
SDG 11: Sustainable Cities & Communities	accessibility, active open area, agricultural street, continuity of historical texture, cultural continuity, green areas, landscape elements, public greenery, public participation, squares and courtyards…
SDG 12: Responsible Consumption & Production	biodegradable, climatic design priorities, natural products, production processes, production techniques, raw materials produced and processed, recycling of ceramics, seed to plate, use of local materials…
SDG 13: Climate Action	climatic design, efficient operations, open drying area, processing crops, production processes, storage of plants, sustainability of the designed area…
SDG 14: Life Below Water	*not available*
SDG 15: Life on Land	beekeeping, clay, endemic culture, endemic plants, gardens, landscape, local crops, maple and plane tree leaves, medicinal plant gardens, natural building materials, plants dried, plants harvested, sage leaves…
SDG 16: Peace, Justice & Strong Institutions	materials grown by local people, organic production…
SDG 17: Partnerships for the Goals	network to the producers, socially responsible architects…

- "SDG 9: Industry, Innovation & Infrastructure" emerged as the most frequently mentioned and strongly associated goal among students, expressed through a diverse range of expressions. Although they did not take an elective GLB course specifically focused on this SDG, its prominence may reflect both the university's innovation-oriented approach and the broad thematic exposure provided by first-year GLB courses covering all SDGs. In their design proposals, students developed innovative solutions by focusing on local development and local products. They integrated traditional building materials and techniques into their designs, reinterpreting these methods through contemporary, innovative, and modern approaches. Additionally, they provided spatial solutions for production and processing facilities, as well as income-generating areas like workshops and studios, market and sales buildings, and gathering squares and courtyards.

- "SDG 12: Responsible Consumption & Production" was also addressed through a wide variety of expressions, and nearly a quarter of the students had taken an elective GLB course specifically related to this topic. This background may have been reflected in their design proposals, in which they developed spatial solutions emphasizing the production-consumption cycle, promoting local and sustainable production, and encouraging collective production and sharing. Aligned with these intentions, they further developed these ideas into various spatial solutions, including production and processing facilities, craft workshops, culinary culture areas, cultural preservation rooms, recycling workshops, and exhibition and sales spaces.

- The richness of expressions related to "SDG 11: Sustainable Cities & Communities" can be interpreted in relation to the fact that it was the second SDG for which students most frequently took a related elective GLB course, as well as its strong relevance to the field of architecture. Within this framework, students developed spatial and landscape solutions focused on accessibility, inclusivity, and cultural continuity while emphasizing the historical and cultural significance of Divriği. These design intentions are then reflected in the spaces within their projects, such as squares, courtyards, inclusive gathering areas, gardens, green landscapes, indoor-outdoor integrated spaces, cultural continuity zones, art and craft revival areas, agricultural streets, market courtyards, and environments that blend with nature.

- Although students did not enroll in a specific elective GLB course related to "SDG 8: Decent Work & Economic Growth," this goal appeared prominently in many of their design briefs. The students' focus on site-specific production and economic activities, along with community and social aspects, can be understood in relation to the broader socio-cultural characteristics of Divriği, which may have aligned with the themes they emphasized in their proposals. Translating these ideas into spatial solutions, their proposals included spaces that enhance local economic vitality, such as production workshops, markets, and sales areas, integrated production-sale units, industrial production halls, and community-based tourism facilities.

- "SDG 15: Life on Land" is another goal for which students did not take a specific elective GLB course related to it. However, several characteristic features rooted in Divriği's traditional and vernacular architecture, as well as its local craft practices, appeared in the design proposals. These projects used natural and sustainable building materials and incorporated local plant species into landscape designs. Additionally, several proposals focused on agricultural and beekeeping activities, *reflecting students' engagement with* the use of local and natural materials in craft-making. These design ideas then evolved into spatial solutions, including endemic and medicinal gardens, natural building workshops, craft and cultural production spaces, plant processing and drying units, textile and wool workshops, beekeeping and bee-product facilities, and community garden revival zones.

- "SDG 4: Quality Education" appears in project proposals through functions that highlight local cultural, artistic, and creative activities, serving as community and social hubs. Although the

students did not take a specific elective GLB course related to this SDG, the design brief, along with the local cultural context and its tradition of intergenerational knowledge transfer, *may be related to the* community-oriented educational functions that appeared in their design proposals, which aligned with this goal. Following these motivations, their projects articulated learning-centered environments such as workshops, design studios, training rooms, production units, music and performance venues, interactive learning areas, socialization courtyards, craft ateliers, and recording and broadcast rooms.

- Although no specific requirements directly related to "SDG 2: Zero Hunger" were identified at the project site, the students addressed this goal through spatial solutions emphasizing local food production and processing, gardening, culinary culture and traditions, as well as organic and herbal products. This outcome can be understood in relation to the fact that a small number of students had taken an elective GLB course related to this SDG. Nevertheless, their projects expanded these ideas into places that support such spaces, such as gardens, bazaars and market areas, eating and tasting spaces, and cultural food production units.

- "SDG 3: Good Health & Well-being" was the goal for which students most frequently selected a related elective GLB course. Reflections of Divriği's local healing traditions appeared in their design proposals, which included solutions related to alternative and complementary treatments, the use of natural products for self-care, and spaces created for relaxation and stress relief. In response to these, they designed therapy studios, meditation spaces, music and dance workshops, relaxation zones, massage and spa rooms, herbal health production units, ceremonial areas, yoga halls, and apitherapy spaces.

- "SDG 10: Reduced Inequalities" and "SDG 5: Gender Equality" were among the goals for which a considerable number of students enrolled in related elective GLB courses. Similar ideas appeared in their proposals, especially highlighting inclusive and accessible design solutions that promote social equity and gender-sensitive spatial approaches. Reflecting these concerns, the projects included spatial solutions such as inclusive gathering areas, step-free circulation routes, accessible squares, multi-age activity zones, socialization courtyards, and intercultural community spaces.

- Within the scope of "SDG 13: Climate Action," the design proposals focus on climate-conscious design strategies and efficient operations, along with climate-friendly production approaches, which can be aligned with promoting mechanisms for effective climate change planning and management targets. Although the students did not take a specific elective GLB course directly related to this SDG, climate action themes appeared in their proposals, reflecting the broad presence of climate action-*related topics* across all SDGs. Aligned with these priorities, several projects included climate-responsive spaces such as processing units, drying terraces, and efficient operation zones, while also incorporating sustainable building systems into their design proposals.

- "SDG 16: Peace, Justice & Strong Institutions" was linked to design solutions that highlight site-specific and local production practices respectful of nature and the environment. The students engaged with this SDG only to a limited extent, mainly through references to strengthening institutions and building local capacities. Although the students did not take a dedicated elective GLB course on this SDG, themes promoting collaboration and social cohesion also appeared in the proposals, which is consistent with the collective production traditions rooted in Divriği's local culture. Reflecting these themes, several projects included spatial solutions such as agricultural cultivation gardens, organic production areas, endemic plant gardens, community production gardens, and demonstration gardens.

- "SDG 6: Clean Water & Sanitation" is reflected in design proposals that emphasize the use of natural water sources by making them

accessible to local people through highlighting the healing traditions of Divriği with spaces that incorporate functions focused on these themes. Although only a small number of students had taken an elective GLB course related to this SDG, these outcomes are consistent with Divriği's architectural and cultural heritage, shaped by its historical connection to water and its related practices. Aligned with these interpretations, some proposals introduced inclusive and water-oriented environments, such as landscape spaces shaped around water elements and therapeutic or hydrotherapy pools.

- Within the scope of "SDG 17: Partnerships for the Goals," design proposals rarely addressed this goal, with only one student incorporating it in a limited way, focusing on collaboration and collective responsibility. In that proposal, these themes appeared through spatial ideas such as community producer-network interaction areas and participatory co-production environments. Additionally, since none of the students had taken an elective GLB course related to this SDG, this minimal representation likely reflects a general awareness of cooperation and shared responsibility.

- "SDG 1: No Poverty," "SDG 7: Affordable & Clean Energy," and "SDG 14: Life Below Water" are goals that were neither directly addressed in the design briefs nor supported by any related coursework. Although students cannot reasonably be expected to cover every SDG in detail, some of these goals could still have been incorporated, considering the characteristics of the project site. Moreover, a few students had taken a course related to "SDG 7: Affordable & Clean Energy," but this was also not explicitly reflected in their design proposals. This situation may be understood in relation to the design brief's emphasis on passive design strategies, within which energy-related themes tended to appear in the design proposals in more implicit rather than explicit forms.

Conclusion and Implications

This study shows that elements of sustainability-oriented coursework can be observed in the ways students approach design problems, even when the design studio is not explicitly structured around the SDGs. The analysis of the Divriği Studio project briefs revealed that students were most actively engaged with "SDG 9: Industry, Innovation & Infrastructure," "SDG 12: Responsible Consumption & Production," and "SDG 11: Sustainable Cities & Communities." These outcomes reflect both the university's innovation-oriented approach and the influence of earlier sustainability-focused GLB courses, which collectively shaped students' ability to express design ideas aligned with the SDGs.

Beyond these main focuses, "SDG 8: Decent Work & Economic Growth," "SDG 15: Life on Land," and "SDG 4: Quality Education" were also meaningfully addressed through proposals that highlighted local development, the use of natural materials, and the creation of community-centered educational and productive spaces. Goals related to food production, health and well-being, gender equality, reducing inequalities, and climate action appeared less often but still showed students' awareness of the social and environmental aspects of sustainability. More limited attention was given to "SDG 16: Peace, Justice & Strong Institutions," "SDG 6: Clean Water & Sanitation," and "SDG 17: Partnerships for the Goals," while "SDG 1: No Poverty," "SDG 7: Affordable & Clean Energy," and "SDG 14: Life Below Water" were not directly addressed. These absences can be partly explained by the nature of the design brief and the contextual limitations of the project site, where certain SDG themes were less relevant or indirectly covered.

Overall, the findings suggest that elements of prior coursework were reflected in the ways students approached sustainability principles within their design reasoning, while the contextual and cultural characteristics of Divriği appeared to relate to how these principles were spatially and socially interpreted. Through this approach, this study builds on earlier research that examined how social responsibility and vernacular contexts can be integrated into architectural education through project-based learning. By shifting the

focus toward sustainability and SDG-oriented knowledge transfer, it demonstrates how implicit forms of learning, arising from both coursework and site-based experiences, can shape students' design thinking. The detailed examination of design proposals shows that spatial solutions provided based on each SDG reveal the depth and diversity of their tacit engagement with the sustainability concept. This suggests that SDG-related learning does not solely manifest as abstract design intentions but becomes materially embedded in the architectural proposals themselves.

The results highlight the importance of integrating SDG-focused and context-responsive learning throughout the architectural curriculum to develop more holistic, critical, and place-aware approaches to sustainable design. Consequently, these findings emphasize the importance of architectural design education curricula that provide ongoing and intentional exposure to SDG themes through coursework, community engagement, and studio pedagogy to strengthen students' ability to translate sustainability principles into spatial strategies.

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