

Review

Engaging SDGs Agenda in Design Thinking Module

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Abstract: We explored how to integrate Sustainable Development Goals (SDGs) into the design thinking module education. By merging the principles of design thinking with SDGs, educators can empower students to address complex societal challenges creatively and responsibly. Through a structured framework, we proposed strategies for aligning SDGs with design thinking by incorporating case studies to promote project-based learning and collaboration. Ethical and sustainable design is emphasized to encourage continuous engagement. By adopting this approach, educators can equip students with the skills, mindset, and motivation needed to become agents of positive change in their communities.

Keywords: Sustainable Development Education, Design Thinking, Inclusive Education

1. Introduction

The Sustainable Development Goals (SDGs) represent a universal call to action to end poverty, protect the planet, and ensure prosperity for all by 2030 (Brown 2010). SDGs include a wide range of issues, including poverty, hunger, health, education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, and strong institutions, and partnerships. Each goal has specific targets and indicators to measure progress to achieve them. Adopted by all United Nations Member States in 2015, SDGs were constructed upon the success of the Millennium Development Goals (MDGs) while expanding their scope to encompass a broader range of social, economic, and environmental challenges. SDGs serve as a comprehensive global framework for sustainable development, playing several critical roles (Kolko 2015).

SDGs apply to all countries, regardless of their level of development, recognizing that sustainable development is a shared responsibility that requires collective action at the global, regional, national, and local levels (Brown 2010). By setting common goals and targets, SDGs promote global solidarity and cooperation in addressing shared challenges. SDGs recognize that sustainable development encompasses economic, social, and environmental dimensions, as well as the need for peace and justice (Anonymous 2015a). By integrating these interconnected aspects, SDGs promote a holistic approach to development that acknowledges the complex and interdependent nature of global issues. SDGs aim to leave no one behind, prioritizing the needs of the most vulnerable and marginalized populations, including women, children, persons with disabilities, indigenous peoples, and refugees (Anonymous 2022). By promoting inclusivity and equity, SDGs strive to create a more just and equitable world where everyone can thrive. SDGs set ambitious targets to address a wide range of global challenges, including poverty, hunger, health, education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, and strong institutions, and partnerships for the goals (Anonymous 2020). By setting clear objectives and measurable targets, SDGs provide a roadmap for action and accountability.

SDGs recognize the interconnectedness of different sustainable development issues and the need for integrated solutions. For example, efforts to eradicate poverty (SDG 1) are closely linked to goals related to education (SDG 4), health (SDG 3), gender equality (SDG 5), and sustainable economic growth (SDG 8) (Anonymous 2023). By addressing these goals in a coordinated manner, SDGs promote synergies and maximize impact. SDGs represent a transformative agenda that seeks to catalyze profound changes in policies, practices, and systems to achieve sustainable development (Anonymous 2015b). By promoting innovation, collaboration, and systemic thinking, SDGs encourage new approaches and partnerships to drive positive change at all levels. SDGs serve as a comprehensive and inclusive global framework for sustainable development, embodying a shared vision of a more equitable,

resilient, and prosperous world for present and future generations. By guiding collective action and fostering partnerships, SDGs offer a pathway towards a sustainable and inclusive future for all.

2. Introduction SDGs to Design Thinking for Human-Centered Problem-Solving

SDGs represent a bold vision for a more sustainable, equitable, and prosperous world by 2030. At their core lies the recognition of the interconnectedness of social, economic, and environmental challenges, and the imperative to address them holistically (Leong 2024a). To effectively tackle these complex issues, innovative approaches are needed. Design thinking offers a powerful framework for problem-solving that is inherently human-centered, iterative, and collaborative. By integrating SDGs into design thinking, we can harness the power of creativity, empathy, and innovation to drive meaningful progress towards sustainable development.

Design thinking is a human-centered approach to innovation that places the needs and experiences of people at the forefront of the design process. It begins with empathizing with end-users to gain a deep understanding of their needs, aspirations, and challenges (Leong, 2023). Through a process of ideation, prototyping, and testing, Design thinking encourages iterative experimentation and refinement to develop solutions that are both effective and meaningful. With the concept of SDGs, design thinking becomes a powerful tool for addressing complex societal challenges holistically and inclusively. By prioritizing the voices and experiences of those most affected by these challenges, design thinking enables us to develop solutions that are contextually relevant, culturally sensitive, and sustainable over the long term. Moreover, design thinking fosters a mindset of collaboration, creativity, and continuous learning, which are essential for navigating the uncertainties and complexities of sustainable development (Leong 2023b). By embracing ambiguity and iteration, design thinking allows for approaching problems with openness and curiosity, novel insights, and innovative solutions.

In this paper, we explored the potential synergies between SDGs and design thinking and proposed a framework for integrating the two. We examined how design thinking principles such as empathy, ideation, prototyping, and iteration address the diverse and interconnected challenges related to SDGs. Through case studies, examples, and practical strategies, we proposed how educators, practitioners, and policymakers can harness the power of design thinking to advance the SDGs agenda and create positive change in our communities and beyond.

3. Literature Review

Design thinking, a problem-solving methodology, is rooted in human-centered design, and SDGs, a global agenda for sustainable development adopted by all United Nations Member States, represent two powerful frameworks for addressing complex societal challenges. Integrating these two approaches has the potential to foster innovation, collaboration, and social impact (Kolko 2015, Anonymous 2015a). This history and literature review aims to explore the evolution of design thinking and the emergence of SDGs, as well as existing research and practices related to their integration.

Design thinking traces its roots back to the early 20th century influenced by engineering, psychology, and design. However, it gained prominence in the late 20th and early 21st centuries through the work of design firms like IDEO and academic institutions such as the Stanford d.school. Design thinking emphasizes empathy, ideation, prototyping, and iteration as key principles for problem-solving. It has been widely adopted across various industries, including technology, healthcare, and education, as a method for fostering creativity, innovation, and user-centered design.

SDGs were formally adopted by the United Nations in 2015 as a successor to the Millennium Development Goals (MDGs). SDGs consist of 17 interconnected goals and 169 targets to address pressing global challenges, including poverty, inequality, climate change, and environmental degradation. Unlike the MDGs, which are focused on developing countries, SDGs apply universally to all countries and emphasize the importance of partnerships, inclusivity, and sustainability in achieving sustainable development. The integration of SDGs and design thinking represents a natural convergence of two frameworks that share common principles, such as empathy, collaboration, and innovation. Several studies and initiatives have explored the potential synergies between these two approaches:

Brown and Wyatt (2010) and Kolko (2015) highlighted the role of design thinking in addressing complex social and environmental challenges. IDEO.org and the UN Development Programme (UNDP) demonstrated how design thinking methodologies can be applied to advance SDGs-related initiatives, such as improving access to healthcare, education, and clean water. Educational programs and initiatives, such as the SDG Academy and the design for the UNICEF Challenge, integrated SDG education and design thinking to engage students in addressing real-world problems and driving social impact. While the integration of SDGs and design thinking holds promise for addressing global challenges, they also present challenges and opportunities. SDGs encompass a wide range of interconnected issues, making it challenging to identify and prioritize areas for intervention (Leong 2024c). Design thinking processes often rely on intensive human-centered research and prototyping, which may not always be scalable to large-scale SDG implementation. The integration of design thinking processes and SDG initiatives is inclusive and equitable as it prioritizes the needs of marginalized and vulnerable populations for sustainable development (Agusdinata 2022).

The integration of SDGs and design thinking represents a promising approach to addressing complex societal challenges and advancing sustainable development (Leong 2023b, Leong 2023c, Kumar 2023a). While there is still much to learn and explore in terms of best practices, methodologies, and impact assessment, the synergy between these two frameworks offers a compelling pathway toward a more sustainable, equitable, and prosperous future for all.

4. Present Social, Economic, and Environmental Challenges

Social, economic, and environmental challenges are considered complex issues because they involve interconnected systems, diverse stakeholders, and often conflicting priorities (Leong 2023d). Social, economic, and environmental challenges are rarely independent. They are interconnected and influenced by various factors, such as policy decisions, cultural norms, market dynamics, and ecological processes. For example, poverty (a social challenge) requires consideration of economic factors including job opportunities and access to education, as well as environmental factors like natural resource management and climate change resilience. Complex issues involve a wide range of stakeholders with different perspectives, interests, and levels of influence. These stakeholders include governments, businesses, civil society organizations, communities, and individuals. It is challenging to coordinate and align these diverse actors toward common goals, especially when there are competing priorities or power dynamics at play.

Social, economic, and environmental challenges often involve trade-offs and competing priorities. For example, efforts to promote economic growth may conflict with environmental conservation goals or policies, which shows social inequality and resistance from various interests. Balancing these competing priorities while striving for sustainable solutions requires careful consideration and negotiation. Design thinking offers a problem-solving approach that is well-suited to address the complexity of these challenges. The following is how creativity, empathy, and innovation inherent in Design thinking can help solve social, economic, and environmental issues.

Design thinking encourages out-of-the-box thinking and the generation of novel ideas. Creative approaches can lead to innovative solutions that challenge traditional paradigms and address complex problems in new ways. For example, affordable and sustainable housing solutions for low-income communities may require creative design techniques and materials to meet both social and environmental needs. Empathy is a core principle of design thinking, involving a deep understanding of the needs, experiences, and perspectives of stakeholders affected by the issue at hand. By empathizing with diverse stakeholders, designers can develop solutions that are more inclusive, responsive, and effective. For instance, designing healthcare interventions that consider the cultural beliefs and preferences of different communities can lead to better health outcomes and greater acceptance of the intervention.

Design thinking fosters a culture of experimentation and iteration, enabling continuous improvement and innovation. By prototyping and testing solutions iteratively, designers can quickly identify what works and what does not, refining their ideas based on feedback from stakeholders. This iterative approach is particularly valuable when dealing with complex issues where there are no straightforward solutions. For example, innovative business models for renewable energy projects may require iterative testing and adaptation to local contexts and market dynamics. Design thinking offers a holistic and human-centered approach to addressing the complexity of social, economic, and environmental challenges. By leveraging creativity, empathy, and innovation, design thinking enables the development of solutions that are more responsive, inclusive, and sustainable.

5. Framework for Integrating SDGs and Design Thinking

Integrating SDGs with design thinking can be a powerful solution for global challenges while promoting sustainability and innovation. Figure 1 shows the 17 SDGs and their associated targets and indicators. It is needed to understand the interconnectedness of these goals and how they relate to our project or problem space. Design thinking is used for empathy mapping, problem framing, and stakeholder analysis to identify specific challenges or opportunities related to SDGs. Local and global contexts, as well as the perspectives of diverse stakeholders are considered.

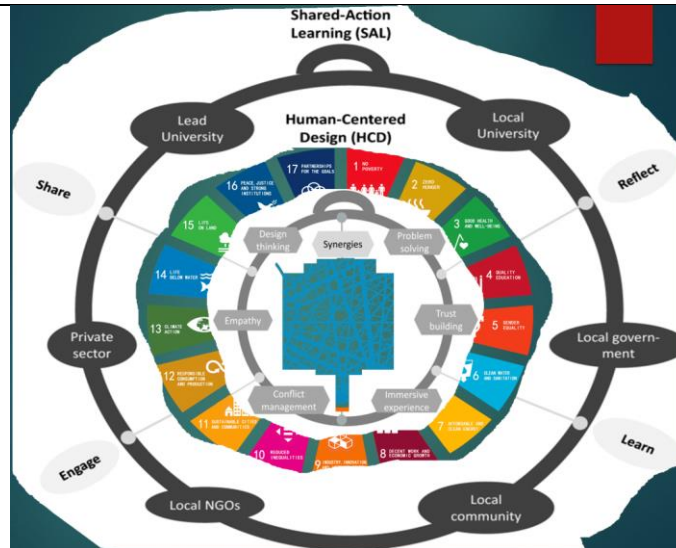


Fig. 1. Framework of integrating SDGs education into design thinking module.

Based on the understanding of the problem space and SDGs, clear goals and objectives need to be defined to align with one or more SDGs and solve specific targets or indicators. It is demanded to engage stakeholders to gain insights into their needs, values, and behaviors related to the problem. Using interviews, observations, and co-creation workshops, creative ideas and challenges are identified to foster empathy and understanding and contribute to SDGs. Divergent thinking is encouraged to explore a wide range of possibilities for incremental improvements and disruptive innovations. Ideas can be developed and tested by stakeholders to gather feedback and iterate. Prototyping techniques are used to iterate and refine the solutions based on real-world insights. The potential impact of solutions on SDGs can be formulated using relevant metrics and indicators. Short- and long-term effects as well as unintended consequences must be considered to iterate on such solutions based on the evaluation findings.

Once solutions are validated and demonstrate their effectiveness, a plan is developed for scaling and implementation. Collaborating with partners and stakeholders, resources are mobilized to build capacity and change systems. It is important to share experiences, learnings, and successes to inspire action and raise awareness of SDGs. Storytelling, media, and advocacy campaigns are used to engage broader audiences and catalyze positive change. The process and outcomes need to continuously be reflected on, seeking opportunities for learning and improvement. The approach based on feedback and new insights needs to be iterated with the principles of sustainability and social impact. By integrating SDGs with design thinking, we can create innovative solutions that not only address pressing challenges but also contribute to a more sustainable and equitable world.

6. Case Study: Rural Communities-Design Thinking to Clean Water Access (SDG 6)

Figure 2 shows three classes of 150 students who took design thinking with SDGs integrated. Four groups were assigned to resolve the 17 SDG-related issues. One of the case studies highlighted was on empowering Rural Communities. In many rural communities world, access to clean and safe drinking water remains a challenge, causing health problems, economic hardship, and environmental degradation (Leong 2023e, Kumar 2023b, Choo 2018, Leong 2024b, Mohankumar 2016). This case study demonstrated how a design thinking approach was employed to address this pressing issue and advance Sustainable Development Goal 6 (SDG 6): Clean Water and Sanitation.

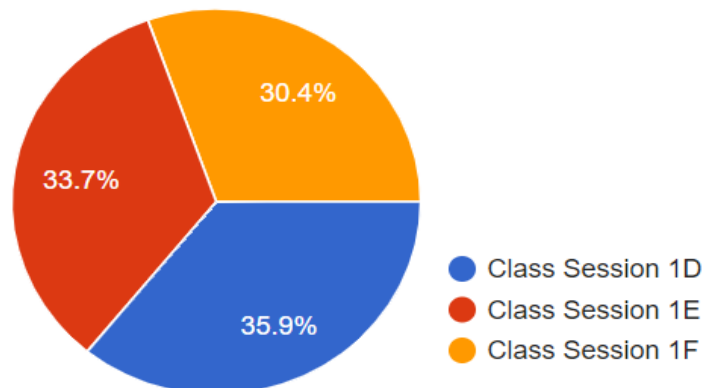


Fig. 2. Three classes of students taking design thinking module with SDGs.

The community of Kalungi, located in a remote area of Uganda, lacked access to clean water sources, forcing residents to travel long distances to fetch water from contaminated rivers and wells. This not only poses health risks but also burdens women and children, who are primarily responsible for water collection, limiting their opportunities for education and economic participation. In a design thinking process, contacted residents through interviews, observations, and participatory activities to understand their daily experiences, needs, and aspirations. They discovered that the lack of access to clean water was not only a health issue but also a barrier to education, economic development, and gender equality. Based on insights obtained during the empathy phase, designers reframed the problem statement to improve access to clean water for more community needs and aspirations. The goal became to design a sustainable water solution that is accessible, affordable, and culturally appropriate, while also empowering women and promoting community resilience.

Designers had brainstorming sessions with community members, local leaders, and experts to generate ideas and solutions. They explored various approaches, including rainwater harvesting systems, community water kiosks, and water purification technologies, considering factors such as affordability, scalability, and environmental sustainability. Designers developed prototypes of potential solutions, including a prototype rainwater harvesting system made from locally available materials and a community-managed water kiosk powered by solar energy. They tested prototypes with community members to gather feedback and refine designs based on user input and feasibility considerations.

Prototypes were fabricated in collaboration with the community, local NGOs, and government agencies. Designers monitored the implementation process, gathered feedback from users, and assessed the impact of the interventions on water access, health outcomes, and socio-economic empowerment. The rainwater harvesting system provided clean water to over 200 households in Kalungi, reducing waterborne diseases and improving health and well-being. The community-managed water kiosk provided women with opportunities for entrepreneurship and income generation, as well as time for education and other productive activities. The project also fostered community resilience and social cohesion, as residents collaborated in the design, implementation, and maintenance of the water solutions.

This case study illustrates how design thinking can be applied to address complex challenges such as access to clean water in rural communities while also achieving SDG 6. By prioritizing empathy, collaboration, and innovation, designers were able to develop sustainable solutions that meet the immediate needs of the community and promote long-term social, economic, and environmental resilience. The student evaluation of the design thinking project is shown in Fig. 3.

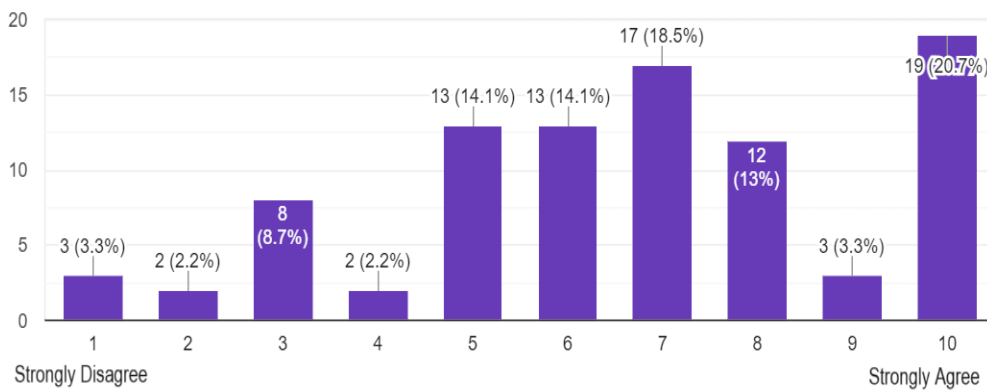


Fig. 3. Students’ satisfaction on design thinking and their expectations.

7. Conclusions

Integrating SDGs and design thinking is a powerful framework for addressing complex societal challenges while fostering innovation, collaboration, and social impact. Design thinking, rooted in human-centered design principles, emphasizes empathy, creativity, and iteration in problem-solving. SDGs, a global agenda for sustainable development, provide a comprehensive framework for addressing pressing issues such as poverty, inequality, and environmental degradation. By integrating SDGs and design thinking, practitioners can leverage the strengths of both approaches to develop innovative solutions that are contextually relevant, inclusive, and sustainable. This integration involves understanding the interconnectedness of SDGs, reframing problems through a human-centered lens, and engaging stakeholders in co-creating solutions. By following this integrated approach, practitioners can address complex challenges holistically and inclusively, driving positive change toward achieving SDGs and creating a more sustainable and equitable society. Overall, integrating SDGs and design thinking offers a promising pathway for advancing SDGs, fostering innovation, and empowering communities to address pressing global challenges effectively.

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