part 3: the history of sustainability: education in action

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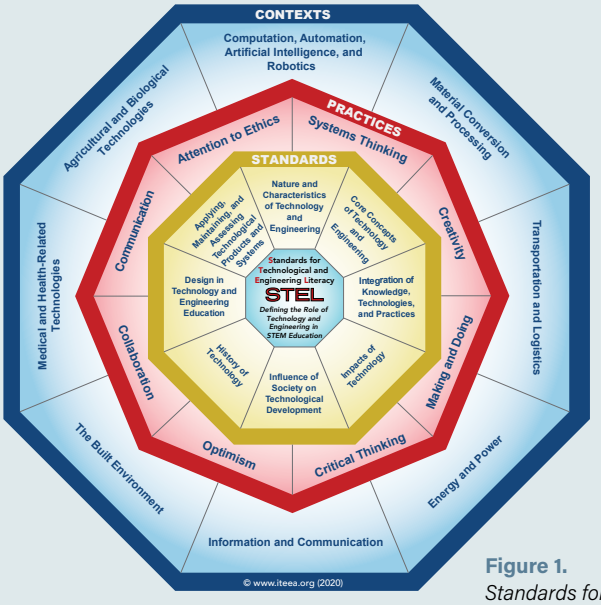
Education on sustainability must be interdisciplinary, incorporate diverse perspectives, and occur across all learning contexts.

Sustainability and sustainable design remain an open concept with myriad interpretations and context-specific understandings. The "motivations behind sustainability are often complex, personal, and diverse" (University of Alberta, 2013, p. 1). Ultimately, sustainability comes down to the kind of future we are leaving for the next generation, along with the guidance to continue it. Sustainability as a value is shared by "many individuals and organizations who demonstrate this value in their policies, everyday activities, and behaviors (Glasser, 2007). For this article, the authors will follow the precedent established by Purvis, Mao, & Robinson (2019) so as not to attempt to distinguish between the competing language of "sustainability" and "sustainable development," as the two are often so intertwined in the literature that they remain difficult to differentiate.

This article is a concise, comprehensive overview of the history of sustainability and sustainable design. The goal is to provide a ready-made lesson plan on the history of sustainability in its many forms: development, conservation, energy, manufacturing, design, agriculture, business, cultural/societal, and environmental science. As stated in previous Sustainability Education in Action: Falls Church City Public Schools series of articles, and *Standards for Technological and Engineering Literacy* (ITEEA, 2020), "now is the time for the field of technology and engineering education to clearly, concisely, and accurately define core disciplinary Standards for Technological and Engineering Literacy." As such, the articles in this series demonstrate a means by which multiple Technology and Engineering Core Contexts (Figure 1) can be integrated simultaneously.



International Technology and Engineering Educators Association (ITEEA), (2020)

Figure 1. *Standards for Technological and Engineering Literacy*

History of Sustainability Initiatives

"While the concept of sustainability is a relatively new idea, the movement as a whole has roots in social justice, conservationism, internationalism and other past movements with rich histories" (University of Alberta, 2013, p. 1).

United Nations Conference on Human Environment

The beginning of the sustainability movement as we now know it took root during the 1972 United Nations Conference on Human Environment held in Stockholm. The conference assisted in "establishing a number of national environmental protection agencies and, more importantly, for developing the UN Environmental Programme (UNEP)" (Biermann, 2000). UNEP is responsible for

coordinating responses to environmental issues within UN member nations. Some of the issues include climate change, disasters and conflicts, ecosystem management, environmental governance, and resource efficiency.

Brundtland Commission

Former Norwegian Prime Minister Gro Harlem, through the United Nations' new World Commission on Environment and Development, led the Brundtland Commission. It is widely credited with popularizing the concept of "sustainable development" by introducing international policy discourse. Four years later, the Brundtland Commission released its final report, *Our Common Future (*World Commission on Environment and Development, 2009). It famously provided the widely-held definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Blowers & Glasbergen, 1995, as cited in World Commission on Environment and Development, 2009). For the first time, the commission was arguably able to successfully unify environmentalism with social and economic concerns on the world's development agenda.

Rio Declaration and Agenda 21

During the United Nations Conference on Environment and Development (UNCED), commonly referred to as the 1992 Rio Summit, 178 governments adopted three key initiatives: the Rio Declaration on Environment and Development, the Statement of Forest Principles, and Agenda 21. To oversee the implementation of the initiatives, the United Nations established the Commission on Sustainable Development (CSD).

The Rio Declaration on Environment and Development, referred to simply as the Rio Declaration, was signed by over 500 countries and consisted of 27 principles intended to guide countries in future sustainable development. The Statement of Forest Principles served as a "non-binding authoritative statement of forest principles for a global consensus on the management, conservation and sustainable development of all types of forests" (Royal Zoological Society of New South Wales, 1992, p. 1). Agenda 21 was adopted in Rio during 1992 on the "premise that humanity stands at a defining moment in history, confronted with a perpetuation of disparities, a worsening of poverty, and the continuing deterioration of ecosystems" (Caruana & Pace, 2018, p. 1). Although there have been many concerns with the agenda over the year, the basic tenet was "to work on an action plan for sustainable development, starting from government level, and moving down to regional and local authorities, and community groups" (Caruana & Pace, 2018, p. 2). Of the three initiatives, Agenda 21 has had the most impact on the sustainability movement through its articulation of distinct social, economic, and environmental aspects of sustainable development.

Millennium Development Goals

The 1997 Kyoto Conference on Climate Change saw limited progress towards Agenda 21 Goals from the UN's point of view (Kostoska & Kocarev, 2019). However, three years after the Kyoto Conference, the United Nations launched the eight Millennium Development Goals (MDGs) (Figure 2) out of the 2000 UN Millennium Declaration that committed the world leaders:

- To eradicate extreme poverty and hunger.
- To achieve universal primary education.
- To promote gender equality and empower women.
- To reduce child mortality.
- To improve maternal health.
- To combat HIV/AIDS, malaria, and other infectious diseases.
- To ensure environmental sustainability.
- To develop a global partnership for development. (UN 2012a).

The goals were supposed to be completely achieved throughout the global community in 2015.

Adapted from United Nations (2012). Millennium Development Goals. United Nations, New York. www.un.org/millenniumgoals/

Figure 2.
Millennium Development Goals (MDGs)

Adapted from United Nations (2016). About the Sustainable Development Goals. United Nations, New York. https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Figure 3.
The Global Goals for Sustainable Development

UN Sustainable Development Summit

In 2012, the United Nations Conference on Sustainable Development met to discuss and develop a new set of goals to work toward, growing out of the Millennium Development Goals (MDGs) that claimed many successes. At the UN Sustainable Development Summit three years later, the world leaders adopted a new 2030 Agenda for Sustainable Development, which stated "a plan of action for people, planet, and prosperity" designed to "shift the world onto a sustainable and resilient path" (United Nations, 2015a). Far more ambitious than the Millennium Development Goals (MDGs), the new Sustainable Development Goals (SDGs) framework contained several bold objectives including the 17 global goals, partnerships, and international campaigns, all to be achieved by the year 2030.

The United Nations Global Goals for Sustainable Development

The Sustainable Development Goals (SDGs), commonly referred to as the Global Goals (Figure 3), were integrated to create a balance between the three facets (*economic, social, and environmental*) of sustainable development (Kostoska & Kocarev, 2019). Sustainability literature may center around the UN's more diverse set of sustainable development goals (SDGs), but the three pillars themselves were explicitly embedded in their formulation (UN 2012b) (Figure 4). The 17 global goals are further divided into 164 associated targets and 232 indicators. It is at this level that local schools and communities can begin to effectively integrate the SDGs with a focus on the specific targets within the 17 global goals. As of 2021, the SDGs, associated targets, and indicators serve as the primary resources and common language used for almost all current sustainability-related initiatives around the world.

Application

As described above, the history of sustainable development illustrates the complex nature of sustainability and the need to work towards solutions. It describes how human activity impacts the Earth and its systems through science, technology, and engineering education as well as the broader sustainable development goals that promote learning about sustainability within multiple technology and engineering core contexts. These sustainable development goals are relevant from the perspective of addressing current needs to foster STEM, civic, and career-relevant learning to all learners, but especially those marginalized populations such as Indigenous, Black, and People of Color, and those living in poverty. Teachers may design and develop learning activities that require students to explain how human activities that occurred during the agricultural, industrial, scientific, and digital revolutions had an impact on the Earth and its systems. Students could then examine how these activities affected the social and economic health of communities. Case studies could be compiled by students as they examine issues within their communities as well as adjacent communities.

Education on sustainability must be interdisciplinary, incorporate diverse perspectives, and occur across all learning contexts. This approach acknowledges the interdependent and interdisciplinary contexts in which people learn about sustainability and ways to implement it in our dynamic society. Figure 4 lists 17 sustainable development goals separated into three dimensions—economic, environmental, and social. Since the 17 goals are divided into 164

Kostoska, O., & Kocarev, L. (2019). A Novel ICT Framework for Sustainable Development Goals. *Sustainability*, 11(7), 1961.

Figure 4.
Sustainable Development Goals Separated Into Three Dimensions

associated targets and 232 indicators, teachers can integrate the goals with a focus on specific targets based on local issues and interests of their students. Technology and engineering education teachers, along with their colleagues in other content areas, can work together to help students design community-based projects that address a specific target. The goal would be to illustrate how the interdependency of regional and local authorities, along with community groups, may want to collaborate and form partnerships to work toward solutions on local issues.

Conclusion

Discussions about sustainable development began in the 1970s (see Table 1) because people realized that it is critical to ensure sustainable development for the future of humanity. Whether for food, air quality, or biodiversity, there is a need to protect and preserve our world for future generations. The process of responsibly meeting the social, economic, and environmental needs of today in such a way as to not compromise the ability of future generations to meet theirs is imperative. The development of future engineering, technology, design, energy, biotechnology, and environmental science programs must focus on advocating for a more sustainable future.

To ensure these programs are successful in their efforts, community members need to understand how the knowledge and skills in the sciences and engineering work to secure the sustainability of resources. Community members also need to understand how the practices of science, technology, and engineering work to manage them. This knowledge will empower and guide local communities

Timeline of the world community adopting sustainable development

1979 - First World Climate Conference opens up the science of climate change
1987 - Brundtland Report consolidates decades of work on sustainable development
1992 - Rio Earth Summit rallies the world to take action and adopt Agenda 21
1997 - Kyoto Protocol takes the first step toward stopping dangerous climate change
2000 - Millennium Development Goals, social justice meets public health and environmentalism
2006 - Al Gore brings climate change to the mainstream with *An Inconvenient Truth*
2012 - Rio+20 takes stock on 2+ decades of efforts at sustainable development
2015 - UN Sustainable Development Summit, adopted a new 2030 Agenda for Sustainable Development and presentation of The Global Goals for Sustainable Development

Partially adapted from University of Alberta (2013)

Table 1.
Timeline of Sustainable Development

as they take action to conserve and protect our natural resources for current and future generations. Now is the time for educators, community leaders, and partners to put into place educational programs to benefit current and future learners.

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