

COMMENT

Open Access



Networking and collaborating: the role of partnerships across sectors to achieve educational goals in sustainability

Gillian Bowser¹, Susie S. Ho², Angela Ziebell^{3*} and Jasmina Lazendic-Galloway⁴

How can partnerships for sustainable development enhance educational outcomes for students and lifelong learners? The higher education arena has changed dramatically in the past five years in response to global challenges including geopolitical and economic instability, the COVID-19 pandemic, Artificial Intelligence, and the escalating climate crisis. A generation of students face major disruptions as educational systems struggle to keep pace with emerging and established challenges. At the same time, students' views and expectations of education have shifted. Students are rightfully demanding an education that enables them to develop solutions through real-world collaborations with society. Students understand that, in a globalized and digital world, knowledge and capability are no longer held by individuals but by collaborative networks of actors and knowledge repositories [1, 2]. They see collaboration as the foundation to achieving the Sustainable Development Goals (SDGs) and crucial in today's networked knowledge economy [3]. Given this - *How can Higher Education deliver contemporary programs that are responsive to a changing world through using networked knowledge systems to prepare future leaders to approach the complex socio-ecological and geopolitical issues associated with sustainable development?*

Today, partnerships that bridge higher education and wider society are crucial to provide learners with the critical perspectives, contemporary skills, and social networks they require to shape a positive future. Partnerships enable learners to become an active part of a collaborative global knowledge system. Furthermore, they ensure curricula are solutions-focused through converging on contemporary issues that span different regions of the world in addition to the community, public and private sectors [4]. Today's learners must be immersed in an array of cross-sectoral, cross-cultural, and transdisciplinary perspectives in order to grapple with complexity. In doing so, they will develop the capacity to accelerate social transformations [5].

Quality Education (SDG 4) is recognized as the most potent tool at our disposal for realizing the SDGs [12]. Target 4.7 focuses on ensuring that all learners acquire the 'knowledge and skills needed to promote sustainable development' with 'global citizenship and appreciation of cultural diversity' [13]. Therefore, SDG 4 closely intersects with SDG 17: Partnerships for the Goals, which positions global cooperation as the foundation for developing solutions to secure Earth's life support systems and ensure human well-being [14]. The 2030 Roadmap on Education for Sustainable Development (ESD) by the United Nations Education, Scientific and Culture Organisation [15] reinforces this conceptualisation of education, stressing that solutions-focused programs are developed by 'harnessing partnership and collaboration'. ESD uses transformative learning environments and action-oriented pedagogy to develop probably learners' 'knowledge, skills, values and agency' to underpin cooperative action [16]. Partnerships occur not only at

*Correspondence:

Angela Ziebell
a.ziebell@deakin.edu.au

¹Colorado Water Center, Colorado State University, Fort Collins, CO, USA

²Office of the Deputy Vice Chancellor (Education), Monash University, Melbourne, VIC, Australia

³School of Life and Environmental Science, Deakin University, Melbourne, Australia

⁴TU/e innovation Space, Eindhoven University of Technology, Eindhoven, The Netherlands



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

the multilateral, national and sub-national level but also through the engagement of a breadth of actors across sectors. This allows students to navigate alternative viewpoints and challenge their own assumptions [17–18], increasing their capacity to work in diverse teams to approach complex issues like sea-level rise, inequities in extreme heat exposure, and climate justice. In essence, ESD is transformative and impactful when it leverages rich and diverse educational communities that extend well beyond the academy's walls [19–20].

Here we argue that a networked approach to *Learning Sustainability* reflects the goals of ESD and is required to immerse future leaders in the complexities of sustainability to meet the global commitments of the SDGs. Tomorrow's leaders require the skills, mindsets, and networks to facilitate equitable, inclusive, and complex transformation (Fig. 1). It is only through participatory partnerships that universities will hold the capacity and contemporary knowledge to prepare learners for our changing climate, the evolving landscape of sustainable development, and

the realities of their dynamic careers [6–9]. Therefore, higher education programming must evolve to actively involve industry, government bodies, community stakeholders, non-governmental organizations (NGOs) and international collaborators. The teaching must evolve to be part of a complex network. A curriculum that is designed and delivered through a network of partners enables learning *with and for* society and builds local to global capacity.

Global partnerships for the goals

The 17 interrelated SDGs, which embody a global commitment to address critical societal and environmental challenges [10], envision a future of equity, justice and prosperity within environmental limits. This can only be achieved by cooperation across developed and development contexts. SDG 17 calls for the revitalization of global cooperation, recognising that it is imperative to innovative technological development, policy coherence, equitable trade, and market access, particularly for

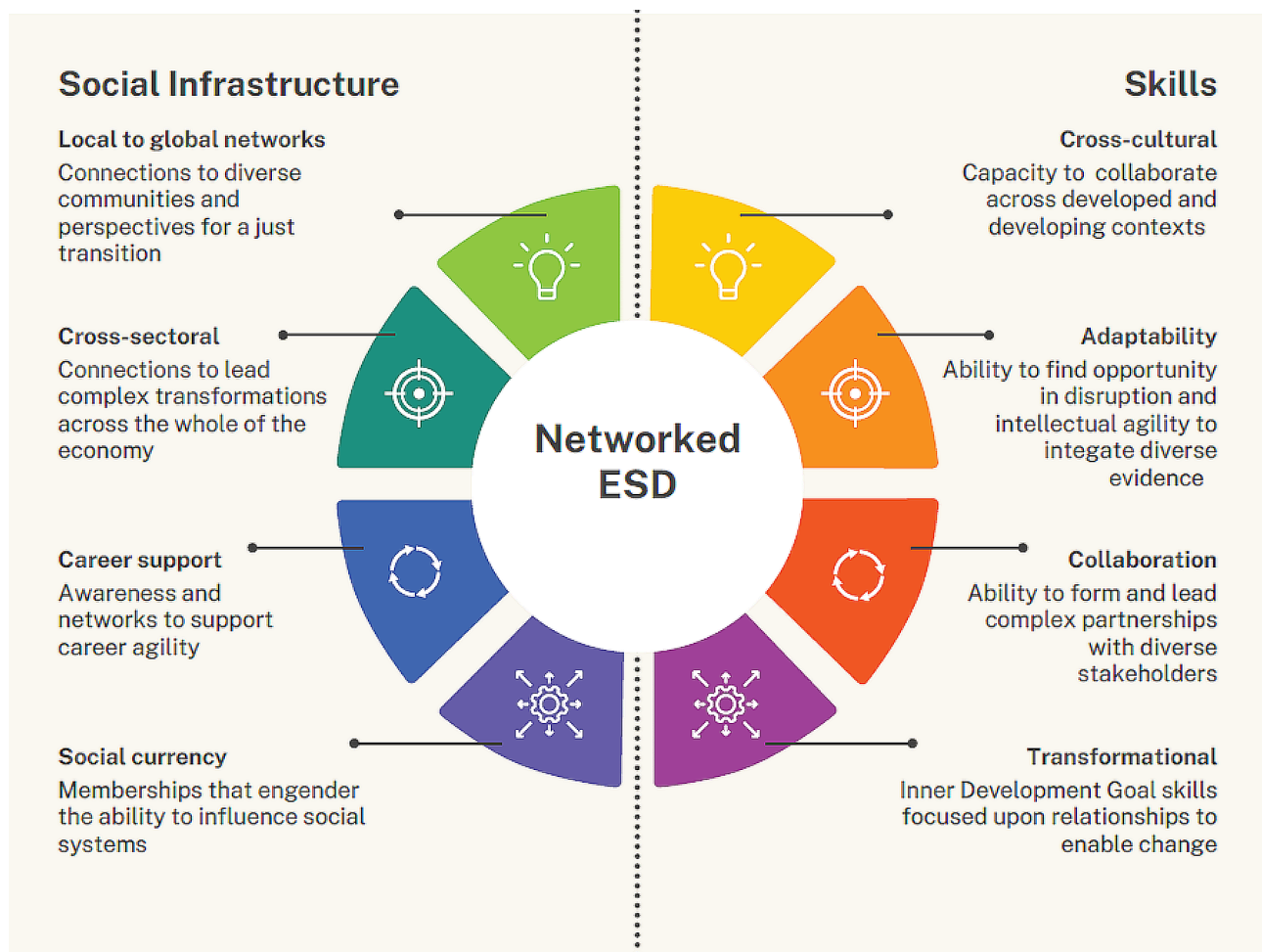


Fig. 1 Networked education for sustainable development sees educators using networks to develop the skills, mindsets, and networks to facilitate equitable, inclusive, and complex transformation

developing nations [14]. As emphasized by the UNFCCC [21], global cooperation is also key to a just transition that recognises human rights, with governments, civil society, industry, and not-for-profit organizations (NPOs) each playing a pivotal role. Equitable partnerships across borders generate shared understanding, innovative solutions, and sustainable development for all.

One example of a cross-cultural network in education is the Global Immersion Guarantee (GIG) at Monash University, Australia [22]. This fully-funded program engages students from 93 disciplinary backgrounds with community projects in eight different countries and brings community leaders, including local conservation groups, ‘artists’ and faith groups, together with students to work on local issues within local contexts [22]. Another example is the European Universities Initiative (EUI) which aims to promote cross-cultural cooperation through alliances between universities from all across Europe [23]. The goal is to enable the creation of diverse knowledge-creating teams and multidisciplinary living labs for civic initiatives [24]. A third example of a cross-cultural education community is the Youth Environmental Alliance in Higher Education (YEAH) funded through the National Science Foundation of the United States (YEAH-net.org). YEAH consists of 15 institutions in four countries and engages undergraduate and graduate learners from science, policy, anthropology, and law in virtual classrooms and youth summits to accelerate the SDGs [25]. YEAH trains students in global climate diplomacy and provides a platform for their involvement in inter-governmental negotiations through youth presentations to national dignitaries, policymakers and UN agencies at the annual United Nations Climate Change (UNFCCC) Conference of the Parties (COP) [26–27]. These three networks are models for how co-curricular and curricular programs can operate as collaborative networks that can meet the goals of ESD while also promoting intercultural learning among higher education institutions.

Cross-sectoral learning

Since all 17 SDGs intersect, from quality education to climate action, gender equality, and poverty reduction [11], solutions must simultaneously recognise and improve multiple SDGs; this requires cross-sector collaboration. The higher education sector often falls short of fostering the cross-sectoral partnerships targeted in SDG 17 [28]. This shortfall results in a ‘curriculum lag’, wherein educational programming fails to keep pace with the evolving strategies and insights of local industry, social enterprises, government, and civil society [29]. When working with partners some systemic institutional lag may still exist but educators are linking in with changes in practice and thinking, removing one reason for curriculum lag.

Curriculum that is co-developed with multiple sectors will encourage students to approach problems from multiple stakeholder perspectives using diverse methodologies, responding to the demand by employers for graduates with the depth and breadth of skills and perspectives to implement sustainability solutions in real-world contexts. Climate change and sustainability education should not be constrained within academic and disciplinary confines, or it risks overlooking the multifaceted nature of sustainability solutions within local cultural, socioeconomic, and political contexts. Furthermore, cross-sectoral learning provides students with adaptability in a disrupted labour market. Today’s graduates are predicted to have 10–14 different careers, with 60–80% employed outside research and academia [30], and graduates require a breadth of understanding to have the ability to shift among sectors.

Tertiary institutions are only beginning to develop the social infrastructure required to provide career impact and agility through developing T-shaped professionals with the depth and breadth of expertise to collaborate for the SDGs [31]. One such approach is the Monash University Master of Environment and Sustainability degree program, which focuses on developing the collaboration skills and integrated breadth of knowledge to drive positive social, economic, and environmental impact. Students learn how to work across government, corporations, science, policy, NPOs and international development organisations [32]. Alumni from this program now serve as a global cross-sector network that supports each node to enable local implementation of sustainability initiatives [33]. The Technische Universiteit Eindhoven innovation Space [34] is another example that uses a co-learning hub enabling a full ecosystem approach where academics, industry and other societal stakeholders collaborate to provide education that “*focuses on creating lifelong learners who are knowledgeable about their discipline, but also have broader views, as well as focus on environmentally and socially responsible consumption and production*” [35]. Another example is the MIT Solve extracurricular program, which uses a marketplace approach to provide seed funding and leadership training to social and environmental enterprises worldwide to encourage tangible impacts on global challenges [36].

Partnerships for change agency

In a rapidly shifting and uncertain world, disruption and change will be a feature of all students’ careers. The 2023 World Economic Forum [30] reports that 44% of workers’ skills will be disrupted in the next 5 years and that the largest job creation and destruction will result from environmental, technological, and economic trends, with ongoing disruption from economic, health and geopolitical trends. Therefore, today’s employers almost

universally demand adaptable lifelong learners who can use their academic training in diverse contexts, whilst adapting to change and driving innovation [38]. For example, the World Economic Forum's top 10 skills of 2025 allude to adaptability, collaboration, resilience and innovation [39]. Within higher education we must focus on developing those skills that enable students to respond appropriately to change, empowering them to become adaptable professionals who find opportunity in disruption.

Sustainability leaders require a broad variety of change management and interpersonal skills to effectively act as pioneers of change within their fields and communities, institutions and sectors. Driving transformation requires a range of human skills that are not always incorporated into a traditional learning environment. There has been an historical focus on disciplinary content and structural rigidity in degrees, problematic given the inherently social and political nature of implementation and adaptation. There are no guidelines for grappling with issues like climate change, geopolitical tension, and gender inequality; these must be approached within the nuanced specificities of a particular local community with consideration of the contexts and cultures of the workplace. Therefore, best-practice education must incorporate cognate knowledge but also socio-emotional and behavioral learning and include people skills and leadership skills, which are at the heart of personal and collective agency [37]. This is represented by the Inner Development Goals [40], which are transformational skills for sustainable development. These focus upon relationship to self, cognitive skills, caring for others and the world, social skills and enabling change.

An example of a program that is focused on relational skills, mindsets and behaviours is the Monash Innovation Guarantee, which enables students from 93 degrees to collaborate with 50 different industry partners, including NPOs, government and UN agencies, startups and small to medium and large corporations [41]. This program builds 14 employability, innovation and collaboration skills related to entrepreneurship, partnerships, and human-centered design. Students are immersed in the realities of stakeholder relations, change management and dynamic trade-offs between economic, social, and environmental outcomes. They work with host organizations such as UNITAR, Microsoft, major consultancies, banks and Indigenous startups, to drive transformations and create social and environmental good within the workplace.

Networks and social currency

Forming collaborative networks requires disrupting many common approaches to education, especially in higher education institutions worldwide. For example,

a collaborative curriculum could introduce students to real-world challenges and diverse perspectives through the networked partner organizations that represent sectors within and outside of academic institutions (Fig. 2). To foster problem-solving, cross-cultural, and cross-sectoral awareness, actors from those sectors could contribute directly to the curriculum by introducing new concepts not typically covered in educational curriculum. How different corporations approach sustainable development, for example, could be explored through the incorporation of a broad spectrum of networks of partner organizations and stakeholders that students may be unfamiliar with such as supply chain networks and transportation organizations. Other networks may include government and private actors such as when agricultural systems partner with forestry stakeholders or agencies. Such complex arrangements need to be included in student training, so they are exposed to the complex relationships and partnerships needed to achieve the global goals.

Co-developed curriculum is a collaborative process that involves multiple stakeholders and creates network structures with different nodes that provide links across different areas of the network. These nodes act as important connectors across knowledge systems, whether they are institutional, community-based, or otherwise. The power of the network nodes—connection points or organizations that link different sections of networks together—which may represent knowledge repositories or actors, contributes to not only how curricula are designed, but also the background knowledge and memberships needed for students to use their education to work effectively in diverse teams across sectors like industry, government, and research. This is important since most sustainability professionals will need to work in cross-sectoral teams and to move between different career paths. Such networks need to have a variety of diverse nodes representative of disciplines, organizational types, cultures, or geographic references, all associated with achieving global sustainability.

What do students gain by learning from educational networks with diverse nodes? They gain the intellectual agility needed to integrate different perspectives on sustainability [42]. They also gain membership into different types of communities. Membership within diverse communities enhances social currency, and the ability to influence social systems and drive forward change. Influential social networks can also provide vast opportunities including access to social support, learning opportunities, career pathways, mentorship and sponsorship, and policy influence. Educating through such networks is an important new mechanistic approach still being developed within academic institutions. For example, networks of education institutions could expose students

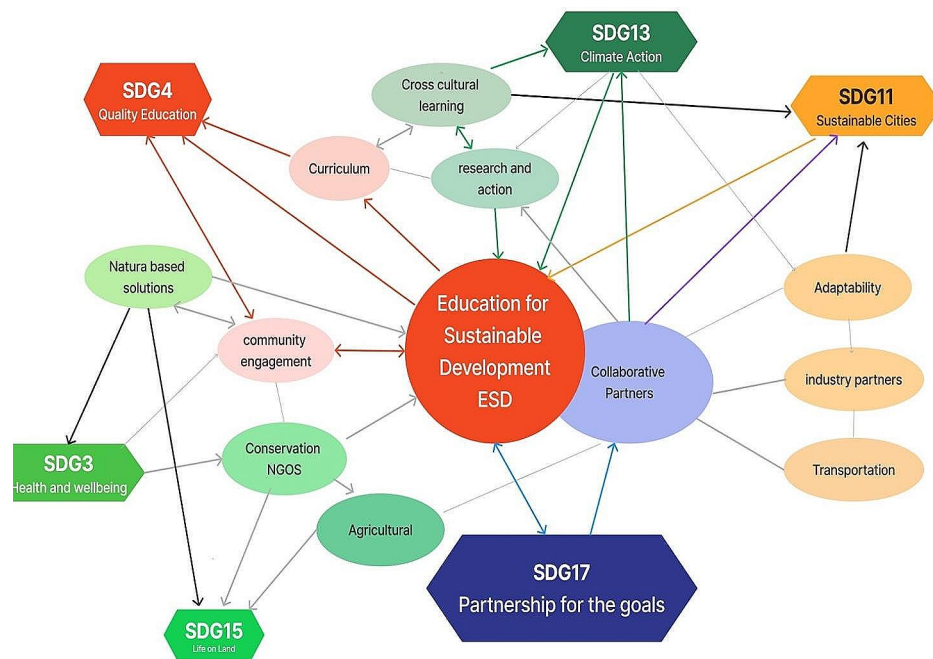


Fig. 2 Education for Sustainable Development requires networks of collaborative partners. Different types of partners, from industry, conservation NGOs, and communities all act as nodes that broaden the learning network available to students. In addition, these different network partners can tie students learning to individual SDGs. For example, Health and Wellbeing (SDG 3), Sustainable Cities (SDG 11), Climate Action (SDG 13), and Life on Land (SDG 15) all connect to different networks that contribute to ESD and strengthen SDG 4 (Quality Education). Colors in the network diagram match the overarching SDGs (in hexagons) with individual partners represented in ovals. Strength of arrows indicates direct ties while directional arrows map the flow of information among different elements in the network

to different cultural values, ethos, evidence bases and associated timeframes that different actors operate within, as well as the collaboration skills required to navigate and operate within multi-dimensional social and environmental dialogues. These networked approaches can directly contribute to the development of graduates who excel in diverse teams, leveraging their disciplinary training alongside insights from other disciplines, sectors and cultures. In other words, students gain the social infrastructure, skills and knowledge to be able to form complex partnerships in their future.

Defining the community

Defining dynamic community boundaries and understanding different types of communities requires agility and global perspectives that may include entities that cross the boundaries of different communities with unique identities. Educational institutions, and associated partners, may be more dynamic than a local or culturally-based community and may challenge more geographically centered ideas of a community as a local entity within a defined physical space [43]. Such issues of community boundaries become more complex when combining social or human communities with ecological ones, both of which are responding to changing climates in fundamentally different ways with wholesale

movement across perceived community boundaries for both human communities as well as ecologically defined ones. Here the movement of organisms, either through their own agency or through human activities, can fundamentally change the definition of a particular ecological community with implications for the human community [42].

The Action for Climate Empowerment or ACE agenda (Article 12 of the Paris Agreement and Article 6 of the United Nations Framework Convention on Climate Change) is a complex example of defining a community [44]. ACE focuses in part on educational outcomes where national policies and strategies, collaboratively designed curricula and approaches to improving public literacy and engagement are fundamental to achieving ACE within countries' Nationally Determined Contributions (NDC) and thus give university leaders and education specialists an additional layer of framing within their country [44, 45].

Barriers versus enabling action

Learning sustainability is synonymous with collaborative networks. While networking events are common in many sectors such as conservation agencies and academic institutions, in our experience these network experiences are usually one-off affairs. There is limited discussion

of applying cross-sector networking within the curriculum to support interactions of a deeper nature between faculty, students and industry leaders. In the examples provided above, such as the YEAH network, external funding sources allow for actively connecting students to communities outside of the classroom whether those communities are local, regional, or global. Internal barriers such as sharing educational materials among partners and allowing network-based curriculum to exist within the educational curriculum are more complicated. Simple tools such as course credits shared among partner universities or opening curriculum systems using a network of institutions can be a significant barrier without external support to provide access to educational materials for participating partners or stakeholders.

Secondly, the dynamic nature of modern industries in the era of sustainable development, at a time of challenging environmental extremes, requires agility to break down barriers to collaborations. Whilst the benefits of Partnering for the Sustainable Development Goals (SDG 17) are clear, there are some structural and cultural challenges to overcome as we move towards a more future-focused and socially relevant curriculum. Agile curriculum development requires nimble partnerships across institutions and sectors coupled with exposing students to those partnerships as part of the curriculum. Scant time is allocated within educational workloads for the rapid and iterative collaborative enhancements required for the curriculum to keep pace with the global challenges of our time. Learning sustainability translates to disruptions and agility that, when combined, can enable the action needed to achieve sustainable development goals and global partnerships.

Conclusion

Collaborative curriculum development involving networks of universities, industry, government, communities, and NPOs constitutes a mutually beneficial proposition that is agile but also disrupts the current education paradigms. As the challenges of climate change and extreme environmental events increase, ESD embodies the goals of SDG 17 in being grounded in the partnerships that are needed to equip students with the skills and mindsets to address SDG challenges. ESD requires defining a community whether to focus on particular goals or in practice for learning outcomes. These communities once defined enrich the ESD significantly, foster innovation, strengthen industry and community ties, and advance society toward a more sustainable future [46]. ESD that uses collaborative networks as part of defining communities is critical to help students align with real-world sustainability practices.

Collaborative networks face barriers that need to be disrupted to enable action. Building networks that cross

sectors is one action to disrupt barriers by connecting students through network partners representative of the community and whole of the economy to bring new voices into the academic setting. Graduates of ESD-focused institutions can make a difference by learning how to leverage their disciplinary training in concert with a much broader range of skills within complex and authentic industry and community contexts. As academic institutions increasingly adopt ESD approaches, they become global catalysts for positive change by accelerating SDG achievement on multiple fronts. We call upon academic institutions to use education for sustainable development at global, regional and local scales; while defining and forging educational networks and communities of practice that can guide students towards climate action. To do so means to not only recognize the tremendous societal value that can be unlocked through networks and partnerships, but also to disrupt current curriculum models focused on the academy and on single disciplines and to promote and model cooperative climate action through education. We understand the challenges and issues with trust that exist among different sectors and partners; however, the benefits of training future leaders in sustainability cannot be ignored.

Abbreviations

SDGs	Sustainable Development Goals
MIG	Monash Innovation Guarantee
GIG	Global Immersion Guarantee
EUI	European Universities Initiative
ESD	Education for Sustainable Development
NGOs	Non-government organisations
UNFCCC	United Nations Framework Convention on Climate Change
YEAH	Youth Environmental Alliance in Higher Education
COP	Conference of the Parties
NPO	Not-for-profit
ACE	Action for Climate Empowerment
NDC	Nationally Determined Contribution

Acknowledgements

Not applicable.

Author contributions

AZ and SH came up with a related idea for a commentary piece on the general importance of bringing higher education educators together with industry partners for the sake of education. JLG then joined due to her professional interest but the real focus of the article as it stands came when GB joined and SH and GB used an SDG lens and their ecology background to focus the paper in its current state. All authors were involved throughout with refining ideas and structuring the piece.

Funding

Not applicable.

Data availability

Not applicable.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

All authors consent, there were no participants to consent.

Competing interests

The authors declare no competing interests.

Received: 6 November 2023 / Accepted: 26 February 2024

Published online: 01 June 2024

References

- Castells M. The Rise of the Network Society. Wiley-Blackwell (2009). Accessed October 15, 2023. <https://doi.org/10.1002/9781444319514>.
- World Economic Forum. (2022). https://www3.weforum.org/docs/WEF_Future_Focus_2025.pdf.
- Peña P, Lim D. (2019). Learning with friends: a theoretical note on the role of network externalities in human capital models for the new industry. SSRN (2019).
- UNESCO Accessed October 10, 2023. <https://en.unesco.org/themes/education/sdgs/material/17>.
- Sinakou E, Donche V, Boeve-de Pauw J, Van Petegem P. Designing powerful learning environments in Education for Sustainable Development: a conceptual Framework. Sustainability. 2019;11(21):5994. <https://doi.org/10.3390/su11215994>.
- Cash DW, Clark WC, Alcock F, Dickson NM, Eckley N, Guston DH, Jäger J, Mitchell RB. Knowledge systems for sustainable development (2003). Proceedings of the National Academy of Sciences, 100(14), 8086–8091. <https://doi.org/10.1073/pnas.1231332100>.
- Kerkhoff Lv, Lebel L. Annu Rev Environ Resour. 2006;31(1):445–77. <https://doi.org/10.1146/annurev.energy.31.102405.170850>. Linking knowledge and action for sustainable development.
- Oyinola M, Whitehead T, Abuzeinab A, Adefila A, Akinola Y, Anafi F, Farukh F, Jegede O, Kandan K, Kim B, Mosugu E. Bottle house: a case study of transdisciplinary research for tackling global challenges. Habitat Int. 2018;79:18–29. <https://doi.org/10.1016/j.habitatint.2018.07.007>.
- Nix E, Paulose J, Shrubsole C, Altamirano-Medina H, Belesova K, Davies M, Khosla R, Wilkinson P. Participatory action research as a framework for trans-disciplinary collaboration: a pilot study on healthy, sustainable, low-income housing in Delhi, India. Global Challenges. 2018;3(4):1800054. <https://doi.org/10.1002/gch2.201800054>.
- Sachs JD, Schmidt-Traub G, Kroll C, Lafortune G, Fuller G, Woelm F. Sustainable development report 2020 (2021). <https://doi.org/10.1017/9781108992411>.
- Pradhan P, Costa L, Rybski D, Lucht W, Kropp JP. A systematic study of sustainable development goal (SDG) interactions. Earths Future. 2017;5(11):1169–79. <https://doi.org/10.1002/2017ef000632>.
- Tabucanon AS, Sahavacharin A, Rathvivoon S, Lhaettee H, Pakdeesom D, Xue W, Charmondut K. Investigating the critical issues for enhancing sustainability in higher education institutes in Thailand. Int J Sustainable Dev Plann. 2021;16(3):503–14. <https://doi.org/10.18280/ijstdp.160311>.
- The Global Goals. Goal 4: Quality education. The Global Goals. (2022a). Accessed July 5, 2023. <https://www.globalgoals.org/goals/4-quality-education/>.
- The Global GoalsGoal 17: Partnerships for the goals, The Global Goals. (2022b) Accessed July 5. <https://www.globalgoals.org/goals/17-partnerships-for-the-goals/>.
- UNESCO Education for sustainable development: a roadmap. (2020) Accessed August 23. <https://unesdoc.unesco.org/ark:/48223/pf0000374802>.
- Rieckmann M. Education for sustainable development goals: learning objectives. UNESCO publishing; 2017.
- Howlett C, Ferreira J, Blomfield J. Teaching sustainable development in higher education. Int J Sustain High Educ. 2016;17(3):305–21. <https://doi.org/10.1108/ijsh-07-2014-0102>.
- Brudermann T, Aschemann R, Füllsack M, Posch A. Education for sustainable development 4.0: lessons learned from the university of Graz, Austria. Sustainability. 2019;11(8):2347. <https://doi.org/10.3390/su11082347>.
- Ohta R, Yata A, Sano C. Students' learning on sustainable development goals through interactive lectures and fieldwork in rural communities: grounded theory approach. Sustainability. 2022;14(14):8678. <https://doi.org/10.3390/su14148678>.
- Costa JM, Swatuk LA, Lopes AF. Identifying stakeholders and discussing a strategy for the participatory management of a protected area: the case of Engenho Pequeno, in Rio De Janeiro state, Brazil. Environ Dev Sustain. 2022;24(11):13260–81. <https://doi.org/10.1007/s10668-021-01989-7>.
- UNFCCC. 2023. Accessed Sept 30. <https://unfccc.int/documents/624596>.
- Global Immersion Guarantee - Flagship Rich Educational Experiences. Accessed Oct 26. <https://www.monash.edu/flagship-rich-experiences/gig>.
- Maassen P, Stensaker B, Rosso A. The European university alliances—an examination of organizational potentials and perils. High Educ. 2022. <https://doi.org/10.1007/s10734-022-00951-4>.
- The European Universities alliances in action. Accessed: 20. October 2023. <https://education.ec.europa.eu/education-levels/higher-education/european-universities-initiative/about?>
- YEAH. Youth Environmental Alliance in Higher Education (YEAH). Accessed 20 October 2023. www.yeah-net.org.
- Bowser G, Green SA, Ho SS, Templar PH. Educating students in solutions-oriented science 2020. Frontiers in Ecology and the Environment <https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/fee.2198>.
- Bowser G, Cid CR. Knowing Your Field Community: Elevating the Human Dimension in Ecological Research and Teaching (2023). Integrative and Comparative Biology, Volume 63, Issue 1, July 2023, Pages 128–135, <https://doi.org/10.1093/icb/icad036>.
- Partnerships for the SDGs.: Accessed Oct 1 2023. <https://sustainabledevelopment.un.org/partnerships/actionnetworks>.
- Desha C, Hargroves K, Smith M. Addressing the time lag dilemma in curriculum renewal towards engineering education for sustainable development. Int J Sustain High Educ. 2009;10(2):184–99. <https://doi.org/10.1108/14676370910949356>.
- World Economic Forum Accessed Sept 20., 2023. https://www3.weforum.org/docs/WEF_Future_of_Jobs_2023.pdf.
- Conley SN, Foley RW, Gorman ME, Denham J, Coleman K. Acquisition of T-shaped expertise: an exploratory study. Social Epistemology. 2017;31(2):165–83. <https://doi.org/10.1080/02691728.2016.1249435>.
- Abbonizio JK, Ho SSY. Students' perceptions of Interdisciplinary Coursework: an Australian case study of the Master of Environment and sustainability. Sustainability. 2020;12(21):8898. <https://doi.org/10.3390/su12218898>.
- Monash. 2019 Accessed 25 Oct 2023. <https://www.monash.edu/science/news/current/master-of-environment-and-sustainability-wins-banksia-foundation-award>.
- TU/e Innovation Space Accessed 4. July 2023. <https://www.tue.nl/en/education/tue-innovation-space>.
- Reymen IMMJ, Bruns M, Lazendic-Galloway J, Helker K, Valencia Cardona AM, Vermunt JD. Creating a learning ecosystem for developing, sustaining, and disseminating CBL - the case of TU/e Innovation Space. In: Vilalta-Perdomo E, Membreillo-Hernández J, Michel-Villarreal R, Lakshmi G, Martínez-Acosta M, editors. The Emerald Handbook of Challenge Based Learning. Emerald Group Publishing Ltd; 2022. pp. 13–33. <https://doi.org/10.1108/978-1-80117-490-920221002>.
- MIT Solve| A Marketplace for Social Impact Innovation. Accessed Sept 25., 2023. MIT SOLVE. <https://solve.mit.edu>.
- Gretel U, EB Davis G, Bowser J, Jiang M, Brown, RMSSN Summer Academy. Creating Global Leaders with Sustainability Mindsets– Insights from the (2013). J. of Teaching and Tourism. Volume 14 pages 164–187. <https://doi.org/10.1080/15313220.2014.907958>.
- Kwon JE. Work Volition and Career Adaptability as predictors of Employability: examining a Moderated Mediating process. Sustainability. 2019;11:7089. <https://doi.org/10.3390/su11247089>.
- World Economic Forum These are the top 10 job skills of tomorrow– and how long it takes to learn them. (2020). Accessed 30 Jul 2023. <https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-tomorrow-how-long-it-takes-to-learn-them/>.
- Inner Developmental Goals. Accessed 4 Nov 2023 <https://www.innerdevelopmentgoals.org/>.
- Monash. Accessed 11 Oct 2023. <https://www.monash.edu/flagship-rich-experiences/mig>.
- Kolenick P. Regional centres of expertise (RCEs), green economies and education for sustainable development (ESD) as dialogue: who is expert? J Educ Sustainable Dev. 2018;12(1):11–27. <https://doi.org/10.1177/0973408218773255>.
- Bowser G, Cid CR. Knowing Your Field Community: Elevating the Human Dimension in Ecological Research and Teaching. Integr Comp Biol. 2023;63(11):128–135. <https://doi.org/10.1093/icb/icad036>. PMID: 37204039.
- UNFCCC Accessed 29 Oct. 2023. Nationally Determined Contributions Registry, <https://unfccc.int/NDCREG>.

45. Action for Climate Empowerment. 2023. New York, NY: United Nations. <https://bit.ly/3JHmYsR>. Viewed 20 October 2023.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.