



Teaching Resources for Sustainability

Do you have a resource to suggest? Please email it to Chad Raphael (craphael@scu.edu).

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Sustainability Across the Curriculum Workshop
Center for Sustainability, Santa Clara University

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All Disciplines

[AASHE Curriculum Hub](#) - Search for materials in your discipline. If your university is an AASHE member ([check whether they are a member here](#)), you can create an account using your university e-mail to access “members only” materials.

[Disciplinary Associations Network for Sustainability \(DANS\)](#) - AASHE’s collection of links to resources on sustainability in all disciplines.

[SCU Public Curriculum Repository](#) - example lesson plans and syllabi taught at SCU (available to anyone).

[SCU Curriculum Repository](#) - a slightly larger version that includes syllabi that we don't have permission to share beyond SCU (only available to SCU participants logged into your SCU Google accounts).

[InTeGrate Teaching Materials](#) - Search for materials in your discipline or for interdisciplinary resources. Especially strong on geosciences and STEM, but also how they can be integrated into other fields.

[Sustainable Development Goals - Resources for Educators](#) - UNESCO. “A collection of pedagogical resources, ideas for classroom activities, multimedia education resources and good practices for each of the 17 SDGs, as well as [global SDG resources](#) designed for three education levels.” Also, a fun way to connect to individual actions: [Good Life Goals](#).

ESD Expert Net (n.d.). [Teaching the Sustainable Development Goals](#). Bonn: Engagement Global. Learning objectives and case studies related to each SDG.

[The United Nations Sustainable Development Goals Project](#) - Sources on how to teach the SDGs using inquiry-based and project-based learning.

[Teaching Resources for Faculty](#) - Santa Clara University Center for Sustainability page of resources, including 24 ways to integrate sustainability into your courses, student project ideas, and other resources on teaching sustainability.

[Compass Education](#) - A global movement of educators for a sustainable world. Provides tools to promote systems thinking, experiential learning pedagogy, global systems, and sustainability.





[Teaching and Learning Environmental Justice](#) - teaching materials, curricula, and other resources on environmental justice and related topics—like indigenous environmentalism, ecofeminism, EJ and health, community engagement, and environmental racism—for both K-12 and higher education.

[Environmental Justice Activity Collection](#) - lesson plans and assignments for teaching environmental justice across the disciplines, like English and especially geography, at the university level. The website also provides other teaching materials for teaching sustainability through workshops and webinars.

[Teaching Sustainability and Environmental Justice in the Humanities and Social Sciences](#) - how to incorporate materials from the geosciences in humanities and social science courses at the university level.

[Environmental Justice in the Context of Sustainability](#) - includes many ideas for teaching environmental justice in the sciences with examples and guidance for different approaches at the university level.

[Online learning opportunities: A guide to digital environmental justice education in the age of COVID-19](#) - Created by West Harlem Environmental Action, this guide includes lessons for grades 9-12, some of which can be adapted for introductory college courses.

[How to construct an environmental justice lesson plan](#) - guide created by Pitzer College students includes some common class exercises used to teach EJ at the high school level or above. This may be particularly applicable to introducing environmental justice outside of the sciences.

[Equitable Sustainability Literacy Guide](#) - Learning tools and resources for teaching introductory environmental justice, including environmental racism, Indigenous rights, ecofeminism, climate migration, and food justice aimed at the both institutions and companies

[United States Environmental Protection Agency Learning Center](#) - training portal with online resources to build the capacity of EPA's partners to advance environmental justice, including instruction in how to use EPA's tools and databases like mapping and data tools, community focused tools, and guides to EPA grant applications.

[21 Day Catholic Enviro Justice Challenge](#) - Lessons and links on EJ and integral ecology, incorporating spiritual exercises, created by the Ignatian Solidarity Network. Can be used in a course or in informal learning contexts, such as student or faculty/staff organizations.

See also: Environmental Justice and Integral Ecology; K-12 Education





Air Quality

Melamed, M. L., Schmale, J., & von Schneidemesser, E. (2016). [Sustainable policy—Key considerations for air quality and climate change](#). *Current opinion in environmental sustainability*, 23, 85-91. “To facilitate including the link between air pollution and climate change in the policy process, three key considerations (1) mix of emissions, (2) lifetime, and (3) benefits and trade-offs should be taken into account. These three key considerations will help decision makers understand how proposed policies may impact the emissions of air pollutants and greenhouse gases and their resulting impacts on climate, human health, and ecosystems, thus reducing unintended consequences and likely resulting in additional economic and environmental benefits.”

Abrams, R. F., Malizia, E., Wendel, A., Sallis, J., Millstein, R. A., Carlson, J. A., ... & Naumann, R. B. (2012). [Making healthy places: designing and building for health, well-being, and sustainability](#). Island Press.

Nemet, G. F., Holloway, T., & Meier, P. (2010). [Implications of incorporating air-quality co-benefits into climate change policymaking](#). *Environmental Research Letters*, 5(1), 014007. “We present an analysis of the barriers and opportunities for incorporating air quality co-benefits into climate policy assessments. It is well known that many strategies for reducing greenhouse gas emissions also decrease emissions of health-damaging air pollutants and precursor species, including particulate matter, nitrogen oxides, and sulfur dioxide.” Under-valuation results in part from uncertainty in climatic damages, valuation inconsistency, and institutional barriers. Because policy debates are framed in terms of cost minimization, policy makers are unlikely to fully value air quality co-benefits unless they can be compared on an equivalent basis with the benefits of avoided climatic damages. While air quality co-benefits have been prominently portrayed as a hedge against uncertainty in the benefits of climate change abatement, this assessment finds that full inclusion of co-benefits depends on—rather than substitutes for—better valuation of climate damages.”

Anthropology

Alexander, W. L., Wells, E. C., Lincoln, M., Davis, B. Y., & Little, P. C. (2021). [Environmental justice ethnography in the classroom: Teaching activism, inspiring involvement](#). *Human Organization*, 80(1), 37-48. “In this era of industry deregulation, gutting of environmental protections, and science denial, environmental justice applied anthropology is more important than ever. There is growing ethnographic research into the ways people organize themselves





and take action to protect their families and communities from toxins while demanding accountability from polluting industries and the state. When students encounter this literature in university curricula and when service-learning projects are part of coursework, the experiences they gain can inform their personal lives long after the semester ends. Five anthropologists share experiences teaching environmental justice ethnography courses. Their pedagogy addresses critical questions of ethical research and student positionality.”

Cruz, A. R., Selby, S. T., & Durham, W. H. (2018). [Place-based education for environmental behavior: a ‘funds of knowledge’ and social capital approach](#). *Environmental Education Research*, 24(5), 627-647. “In this paper we suggest that a new theoretical framework is needed within environmental education in the discussion of rural, underserved communities in Latin America. We argue that a community-resources approach, comprised of funds of knowledge and social capital, should be incorporated into contemporary research on place- and community-based education and environmental behavior. The model we present builds upon previous research in the areas of education, anthropology, social capital, and environmental education. These perspectives are discussed in accordance with their relevance to high school students in one of the most bio-diverse regions of Central America: the Osa Peninsula of Costa Rica. In this context, we suggest that promoting environmental behavior is both contextualized by and dependent upon social and community interactions, or ‘mediations,’ after Lev S. Vygotsky. We believe that the framework presented here may contribute to increased socio-economic, academic, and environmental benefits for underserved, Latin American communities.”

Architecture

See also: Urban Planning

Mohamed, K. E. (2021). [The Implementation Model of integrating the three sustainability aspects into the undergraduate architectural design studio](#). *Journal of Green Building*, 16(1), 217-238. “The concept of sustainability in design is meant to ensure that the product of the design is in harmony with humans and nature by taking into consideration the three aspects of sustainability: environmental, social and economic. The objective of this experiment was to integrate the three aspects of sustainability principles into the architectural design studio to train future architects to be able to design sustainable buildings.”

Grover, R., Emmitt, S., & Copping, A. (2020). [Critical learning for sustainable architecture: Opportunities for design studio pedagogy](#). *Sustainable Cities and Society*, 53, 101876. “This research identifies opportunities to enhance learning for sustainability within a design studio pedagogy. The design studio is the primary means of educating architects in Europe, however,





integrating holistic and critical approaches to sustainability is often neglected. The research adopted a qualitative approach in which a leading RIBA Part 2 architecture programme in the UK was chosen as a case study. Prolonged engagement revealed underlying pedagogic barriers and opportunities for sustainability integration ... The findings show that although students exhibited motivation for sustainability, implicit architectural values undermined holistic approaches to sustainability. However, the studio presented opportunities to overcome these barriers including: mainstreaming sustainability within assignments; embracing critical pedagogies; grounding learning in existing experiences; and focussing on the process of design. The research has significance for all design led pedagogies. It provides transferable recommendations to design educators as well as providing insights for the wider profession to enhance sustainable practice.”

Dabaieh, M., El Mahdy, D., & Maguid, D. (2018). [Living labs as a pedagogical teaching tool for green building design and construction in hot arid regions](#). *Archnet-IJAR: International Journal of Architectural Research*, 12(1), 338-355. “This paper discusses a living lab teaching experience which investigates the roles of learning through doing and hands-on building experimentation to root an understanding of sustainability in architectural education. The design studio at the centre of this paper was focused on passive, low-cost and energy efficient approaches suitable for a hot arid climate.”

Donovan, E. (2018). [Sustainable architecture theory in education: how architecture students engage and process knowledge of sustainable architecture](#). In *Implementing Sustainability in the Curriculum of Universities* (pp. 31-47). Springer, Cham. “This paper aims to outline and suggest an alternative pedagogy approach for teaching sustainable architecture theory within a studio-based environment, utilising the pedagogical methods for solving complex problems and applying ‘designerly thinking.’ Emphasising the qualities of a hybrid approach of electives and integration in an architectural education framework. It will reflect on understandings of architectural pedagogy and the integration of sustainability into architectural theory education.”

Arts

[AASHE Curriculum Hub](#) - Fine and Performing Arts resources, case studies, lesson plans.

Trott, C. D., Even, T. L., & Frame, S. M. (2020). [Merging the arts and sciences for collaborative sustainability action: A methodological framework](#). *Sustainability Science*, 15(4), 1067-1085. “This manuscript explores the possibilities and challenges of art–science integration in facilitating collaborative sustainability action in local settings. To date, much sustainability education is prescriptive, rather than participatory, and most integrated art–science programming aims for content learning, rather than societal change. What this means is that





learners are more often taught “what is” than invited to imagine “what if?” In order to envision and enact sustainable alternatives, there is a need for methods that allow community members, especially young people, to critically engage with the present, imagine a better future, and collaboratively act for sustainability today. This manuscript introduces a methodological framework that integrates the arts and sciences to facilitate: (1) transdisciplinary learning, focusing on local sustainability challenges; (2) participatory process, bringing experience-based knowledge into conversation with research-based knowledge; and (3) collaborative sustainability action, inviting community members to envision and enact sustainable alternatives where they live. The transformative potential of this framework is examined through international case studies from countries representing the richest and poorest in the Western hemisphere: a multi-site research study and after-school program for climate change education and action in collaboration with children in the Western US; and a multi-cycle research study and community arts center course for environmental photography and youth-led water advocacy in Southern Haiti. Despite many shared characteristics, case studies diverge in important ways relative to the sustainability challenges they sought to address, the specific context in which activities took place, and the manner in which art–science integration was practiced. Across cases, however, art–science integration facilitated participants’ learning, connection, and action for sustainability. Framed by the shared aims of transdisciplinary approaches, this manuscript discusses methodological hurdles and practical lessons learned in art–science integration across settings as well as the transformative capacity of alternative pedagogical and research practices in building a sustainable future.”

Deng, H. (2019, October). [Research on the Application of Sustainable Concept in the Teaching of Environmental Art Design](#). In *2019 International Conference on Advanced Education, Service and Management* (Vol. 3, pp. 742-745). The Academy of Engineering and Education. “The sustainable concept is the principle of sustainable authentic based on Ecological Cybernetics, which covers nature, society, environment, economy, science and technology and other aspects, so as to achieve the goal of coordinated development for human living environment. Environmental art design includes landscape, architecture, city, ecology and other contents which is related to environment and design, even promotes sustainable development from the creation of ideal and pleasant living environment, has the development relationship of natural beauty and artistic beauty. Therefore, it is of great practical significance to explore the innovation of the teaching method for environmental art design with the concept of sustainable development.”

Raphael, C. (2019). [Engaged scholarship for environmental justice: A guide](#). Santa Clara, CA: Santa Clara University. An overview and guide to designing community-engaged, participatory research and arts projects. See the section on storytelling, history, and community arts, and the section on photovoice and participatory media.

Marteel-Parrish, A., & Harvey, H. (2019). [Applying the principles of green chemistry in art: design of a cross-disciplinary course about ‘art in the Anthropocene: greener art through greener chemistry’](#). *Green Chemistry Letters and Reviews*, 12(2), 147-160. “This cross-disciplinary course bridging the disciplines of art and chemistry provides an exceptional environment in which first-year students and beyond are engaged and challenged in new ways.





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This dual lab/studio-based course, titled “Art in the Anthropocene: Greener Art through Greener Chemistry,” enables students to use their imagination, creativity, and innovation to respond to environmental issues and concerns through art. Students are asked to reflect on the nature and implications of the actual physical materials that artists use and to achieve a renewed sense of social and ethical responsibility through the content of their artwork. The curriculum is designed so that teachers guide students on how chemical processes are used to make art materials in an environmentally friendly way. The overall goal is to apply green chemistry principles in the making of artworks that can be crafted with reclaimed, recycled, and naturally available materials, non-toxic solvents and paints, and using sustainable forms of energy while keeping ethical values in mind.”

Inwood, H., Heimlich, J., Ward, K., & Adams, J. (2016, June 16). [Leveraging environmental arts for education and sustainable futures](#) [blog post]. *The Nature of Cities*. Overview of major sustainability-focused visual and performing arts projects and arts activism in cities.

Hunter, M. A., Aprill, A., Hill, A., & Emery, S. (2018). [Education, arts and sustainability: Emerging practice for a changing world](#). Springer. “Drawing on critical education theory and precepts of creativity, curiosity and change, [this book] documents a series of case examples that demonstrate how five principles of Education for Sustainability - critical thinking, systems thinking, community partnership, participation, and envisioning better futures - are found at the heart of much arts practice in schools.”

Metcalf, A. (2018, February). [Art, social change, and a vision of sustainability](#) (special issue). *Journal of Sustainability Education*.

Quam, A. (2016). [Integrating Sustainability Literacy into Design Education](#). Lloyd, P. and Bohemia, E. (eds.), *Future Focused Thinking - DRS International Conference 2016*, 27 - 30 June, Brighton, United Kingdom. “This paper will look at a logical framework for instructors to introduce sustainability into design curriculum in a manner that shifts from looking at sustainability competencies, to a more profession-specific vision for sustainable literacy. An argument for the need, approach and opportunity for sustainability literacy, as well as a case study in which this framework was applied to a graphic design studio class will be shared.”

Inwood, H. J., & Taylor, R. W. (2012). [Creative approaches to environmental learning: Two perspectives on teaching environmental art education](#). *International Electronic Journal of Environmental Education*, 2(1), 65-75. “This article describes two different approaches to the design of courses in this emerging field from the perspectives of both science and art educators, in hopes of providing direction on the development of curricula and pedagogy in environmental art education to other educators.”

Nurse, K. (2006). [Culture as the fourth pillar of sustainable development](#). Unpublished Paper. Influential argument for why culture (broadly defined) ought to be considered as important a pillar of sustainable development as environment, economy, and social development.



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Astronomy

Blaaha, C., Goetz, J., & Johnson, T. (2011, September). [Sustainable Astronomy](#). In *Earth and Space Science: Making Connections in Education and Public Outreach* (Vol. 443, p. 219). “Through our International Year of Astronomy outreach effort, we established a sustainable astronomy program and curriculum in the Northfield, Minnesota community. Carleton College offers monthly open houses at Goodsell Observatory and donated its recently “retired” observing equipment to local schools. While public evenings continue to be popular, the donated equipment was underutilized due to a lack of trained student observing assistants. With sponsorship from NASA’s IYA Student Ambassador program, the sustainable astronomy project began in 2009 to generate greater interest in astronomy and train middle school and high school students as observing assistants. Carleton physics majors developed curricular materials and instituted regular outreach programs for grades 6-12. The Northfield High School Astronomy Club was created, and Carleton undergraduates taught high school students how to use telescopes and do CCD imaging. During the summer of 2009, Carleton students began the Young Astronomers Summer Experience (YASE) program for middle school students and offered a two-week, astronomy-rich observing and imaging experience at Goodsell Observatory. In concert with NASA’s Summer of Innovation initiative, the YASE program was offered again in 2010 and engaged a new group of local middle school students in hands-on scientific experiments and observing opportunities. Members of the high school astronomy club now volunteer as observing assistants in the community and graduates of the YASE programs are eager to continue observing as members of a public service astronomy club when they enter the Northfield High School. These projects are training future scientists and will sustain the public’s interest in astronomy long after the end of IYA 2009.”

Biology

**See also: Public Health and Healthcare*

Dunne, H., Jones, A., & Okorie, M. (2023). [Combatting climate change using education and training in pharmacology and therapeutics](#). *British Journal of Clinical Pharmacology*. “The climate crisis has implications for the physical and mental health of people worldwide, while, paradoxically, healthcare itself contributes significant greenhouse gas emissions. Healthcare professionals need to be prepared to both mitigate the impacts of climate change and also manage the health effects of the climate crisis. Widespread adoption of sustainable healthcare models is required, with sustainability-driven improvements in clinical pharmacology intrinsically linked to this. Recognizing that education and training are essential steps to equip medical professionals with the knowledge to face the unprecedented challenges that the climate crisis presents, here, with reference to pharmacology and therapeutics, we discuss how the theme of





Education for Sustainable Healthcare (ESH) can be integrated into undergraduate and postgraduate teaching programmes and how barriers to successful implementation can be tackled. We support the use of the Principles of Sustainable Clinical Practice as a framework to guide educational interventions and draw upon examples of our own practice at Brighton and Sussex Medical School where ESH has become a core component of medical education in our undergraduate curriculum.”

Timmis, K. (2023). [A road to microbiology literacy \(and more\): An opportunity for a paradigm change in teaching](#). *Journal of Microbiology & Biology Education*, 24(1), e00019-23. “Microbial activities pervasively impact the wellbeing of all organisms, including humans, and the functioning of the planet itself. In order for society to form informed opinions and take effective actions related to its welfare, it must be able to understand the causes of issues of importance and to appreciate the range of possible responses and their likely effectiveness. Society must become microbiology literate. The International Microbiology Literacy Initiative is creating a comprehensive range of teaching resources that will constitute a child-centric school curriculum of societally relevant microbiology. The core of the teaching resources, the lessons, are somewhat unusual in that each one is designed to be essentially stand-alone, so courses can be individually structured by teachers according to their perception of what is interesting and important for their charges. Moreover, the lessons deal not only with societally pertinent microbial activities, but also discuss and propose discussion of their relevance to sustainable development, of their impact on policies and decisions (personal, community, and national), and of issues of stewardship and stakeholder responsibilities. The class lessons are complemented by other child-centric teaching resources whose functions are to add value, to stimulate pupil imagination and excitement in discovery, to engage pupil interest and enthusiasm for topics like sustainability, climate change, international cooperation, citizen science, etc., and to empower pupils as stakeholders in their microbiology education and as educators and multipliers.”

Moubareck, C. A. (2022). [The effectiveness of project-based learning on Emirati undergraduate students in a microbiology course](#). *Learning and Teaching in Higher Education: Gulf Perspectives*, 18(2), 95-106. “A composting project was introduced into an undergraduate microbiology course, to evaluate its efficacy against traditional lecturing for teaching environmental sustainability ... The project and lecture groups showed significant increases in average test-scores, with the post-project increase (20.9 points) being higher than the post-lecture increase (12.3 points). The questionnaire revealed that nonorganic waste recycling was practiced irregularly, while food waste was reused as livestock feed by 38% of the students. Composting was not common, but 23% of the students in the project group started household composting during the project. The students who were most satisfied with the project outcomes were willing to spend higher prices for a composting box ($p = 0.036$), showing a high correlation between awareness raising and environmental sustainability practices. The project-based





learning approach had more impact than the traditional lecture in teaching environmental sustainability to the students. The project succeeded in improving students' composting knowledge and increased their interest in continuing the composting practices at home. The study is the first attempt to measure the direct impact of composting education on Emirati students' knowledge of, and interest in environmental sustainable practices, vis-à-vis composting.”

Biotechnology and Bioengineering

Membrillo-Hernández, J., Molina-Solís, E. G., Lara-Prieto, V., & García-García, R. M. (2019, September). [Designing the Curriculum for the 4IR: Working the Case of Biology and Sustainable Development in Bioengineering Courses](#). In *International Conference on Interactive Collaborative Learning* (pp. 306-315). Springer, Cham. “The Fourth Industrial Revolution (4IR) is a widely discussed concept even at levels such as the World Economic Forum (WEF). The need for higher education to respond to this is urgent, since the power of new 4IR technologies on positive social impacts or devastating damage to the environment is already upon us. Substantial changes to the science and technology curriculum are required to allow students to develop skills in the specific areas of Biotechnology, Genomics, Data Science, Artificial Intelligence, Robotics, Sustainability and Nanomaterials. Biotechnology and Sustainability are gaining more interest in all sectors, including education.”

Hoyos, C. M., & Fiorentino, C. (2016). [Bio-utilization, bio-inspiration, and bio-affiliation in design for sustainability: Biotechnology, biomimicry, and biophilic design](#). *International Journal of Designed Objects*, 10(3), 1-18. “A post-industrial society requires novel design strategies. A possible scenario is the development of bioinspired and biophilic technologies as avenues for a new type of post-industrial design, focused towards ecology and sustainable development. Within this framework and from the point of view of design, biotechnology can have negative environmental implications (such as bio-utilization, or simply exploiting organisms to produce materials or substances for human consumption). However, biotechnology can also have positive environmental implications too, when used adequately within DfS objectives (for example, biodegradable and compostable materials from natural renewable sources). Main conclusions of the paper are that biological approaches can have both negative as well as positive environmental and social impacts. However, imitation of 1) form, 2) function, 3) process and 4) systems from nature, as well as adequate use of biological design approaches can help designers to develop projects which are more sustainable.”

Von Geibler, J., Liedtke, C., Wallbaum, H., & Schaller, S. (2006). [Accounting for the social dimension of sustainability: experiences from the biotechnology industry](#). *Business Strategy and*





the Environment, 15(5), 334-346. “Our case study on biotechnology illustrates that the dialogue with internal and external stakeholders enabled the creation of a key performance indicator (KPI) set to account for social sustainability in the early design stages of biotechnological processes and product development. Indicators for eight aspects are identified for the social assessment: health and safety, quality of working conditions, impact on employment, education and training, knowledge management, innovation potential, customer acceptance and societal product benefit, and social dialogue.”

Verstraete, W. (2002). [Environmental biotechnology for sustainability](#). *Journal of Biotechnology*, 94(1), 93-100. “In the post-industrial society, waste management is integrated in the concepts of responsibility, reliability and continuity. Therefore industry and public office are obliged to implement the concepts of structured environmental management systems more and more strictly. Such advanced waste management requires considerable energy input. It thus may come in conflict with current concerns about CO₂-emissions and the Kyoto agreements. Innovative approaches to combine waste management and the International Climate Change Partnership (ICCP) directives, for instance by implementing biological carbon sequestration, are therefore warranted. Biotechnology has a major role to play particularly in terms of advanced treatment down to ng/l-levels and in terms of validating the quality of the environment by means of powerful and intelligent bio-monitoring devices.”

Business

[Aspen Institute Center for Business Education](#) - Teaching materials and current events articles organized by discipline, industry, topic and region. [Ideas Worth Teaching](#) are weekly bulletins that are easily incorporated into courses.

[Ignited](#) - Teaching materials organized by topic (e.g., Accounting & Finance, Economics, etc.), material type (case study, exam, data set, etc.), and students (undergraduate, graduate, etc.). Created for and by Jesuit Business School educators, but applicable to non-Jesuit educators too.

[Page Prize Database](#) - Award-winning syllabi and modules from University of South Carolina's Darla Moore School of Business.

Fang, J., & O'Toole, J. (2023). [Embedding sustainable development goals \(SDGs\) in an undergraduate business capstone subject using an experiential learning approach: A qualitative analysis](#). *The International Journal of Management Education*, 21(1), 100749. “Universities have an important role in ensuring that business school graduates can address issues regarding





sustainable development and the achievement of the UN Sustainable Development Goals (SDGs) by 2030. While business schools have been progressively growing understanding of the SDGs, many have an unclear conception of their importance to business or how to effectively embed them into their curriculum. This paper explores the outcomes of one university in applying the SDGs as a learning framework for understanding global sustainability. Qualitative methodology was used to explore student perceptions regarding the efficacy of industry collaboration and Experiential Education Project-based Learning (EEPBL) methods, to integrate learning of SDGs into a university course. Through thematic analysis of 375 reflective essays and 18 semi-structured interviews, students reported an enhanced awareness and knowledge of SDGs, acquisition of key employability skills and development of new global perspectives. They found value in industry collaboration and EEPBL for acquiring a comprehensive understanding of the SDGs in a business context, and many developed an appreciation of their own agency for sustainability action in the future. This research can be presented as an example of one approach to both teaching students about the SDGs and embedding sustainability into their business curriculum.”

Accounting

Lee, W. E., & Perdana, A. (2023). [Effects of experiential service learning in improving community engagement perception, sustainability awareness, and data analytics competency](#). *Journal of Accounting Education*, 62, 100830. “This study examines if and how incorporating an experiential service learning intervention within an accounting course, beyond the traditional lecture, could impact students’ community engagement perception, sustainability awareness, as well as their data analytics competency. We conduct a quasi-experimental investigation with a group of 103 accounting students from a large public U.S. university. Results show that, in comparison to a group with only lecture intervention, students exhibited improved community engagement perception, sustainability awareness, and data analytics competency in both Tableau and Power BI, following the lecture plus experiential service learning intervention. Using Kolb’s four-stage experiential learning cycle as the underlying conceptual framework, further analyses of the feedback from both students and host partners illuminate the ways in which experiential service learning has helped to impact learning. Our findings suggest the value relevance of leveraging experiential service learning within an accounting course toward improving students’ development in areas outside the core curriculum. Results of this study could be of interest to accounting educators as they contemplate the efficacies of incorporating experiential-based service learning projects to elevate students’ proficiencies in the increasingly important areas of sustainability, civic awareness and data analytics.”





Frizon, J. A., & Eugénio, T. (2022). [Recent developments on research in sustainability in higher education management and accounting areas](#). *The International Journal of Management Education*, 20(3), 100709. “The purpose of this study is to investigate recent developments in sustainability in higher education, seeking to understand what is happening in the areas of Management and Accounting. This study seeking to identify the scientific research production for the period of 2014–2020 in journals ranked in the Scimago Journal Rank (SJR). Bibliometric analysis was used to describe the sample of articles and used systematic review methodology to answer the research questions. The bibliometric network analysis allowed to identify the journals that published more and seven clusters showed the influential authors by citation and co-citations. By systematic review, universities in different countries are well represented and the objects of analysis most focused were Curricular content, Teachers, and Students. Most studies have a qualitative approach and employ content analysis. This study adds to the previous literature with two main contributions: the first lies in the reported evidence on the state of the sustainability theme in Management and Accounting as a contemporary field. The second maybe a useful starting point in this area, as it offers perspectives and reflections for future research, given that literature reviews on sustainability in higher education are not typically situated in the context of management education. This study provides a contribution to the development of the research area on sustainability in higher education as well as having potential implications for educators as it is useful for educational purposes.”

Pippin, S., Stallings, M., Weber, J., & Wong, J. (2021). [Integrating sustainability into the accounting curriculum: Meeting an emerging student demand](#). *The CPA Journal*, 91(8/9), 14-16. “As sustainability becomes an integral part of business strategies, the accountant’s role in society is broadening. Accounting academics must meet the challenges presented by the dynamic environment of the accounting profession. Accounting curricula can help students develop skills that keep them relevant and desired by employers. Student demand for sustainability accounting instruction in the classroom will likely increase as they become more aware of the increasing demand in the accounting workforce. As educational materials on sustainability are becoming more readily available, colleges and universities should take advantage and incorporate this topic into their curricula. Several courses are particularly well-suited to integrate sustainability topics, starting with introductory financial and managerial accounting courses. We hope this survey will motivate educators to integrate sustainability into the accounting curriculum, in order to prepare accounting graduates for their broader role in the business world.”

Quinton, E. (2019). [Developing a framework to assess renewable energy options for higher education institutions: Values-based recommendations for Portland State University](#). “Taking voluntary action to increase renewable use is necessary for higher education institutions to meet carbon reduction goals. Options for increasing renewable energy are largely defined by





state-level utility regulation as well as local and institutional electricity providers. This project contained three major stages: 1) determine renewable energy procurement and development options available to Portland State; 2) evaluate these options using a values-based assessment; and 3) develop recommendations and next steps for University stakeholders. Final recommendations include pursuing the Portland General Electric green tariff, directly sourcing renewable energy through PSU's direct access contract, and more.”

Onyango, S., Muchina, S. W., & Ng'ang'a, S. I. (2018). [Accounting Education: The Role of Universities in Imparting Sustainability Accounting Knowledge to the Stakeholders through Industry Linkages](#). *International Business and Accounting Research Journal*, 2(1), 1–12. “There is need to develop sustainability accounting knowledge through university industry linkages that will further the realization of sustainability agenda. The paper is based on business sustainability model which looks at sustainability accounting issues. [...] Concrete knowledge has to be created by universities that conduct research by linking with industries and disseminate the knowledge to the stakeholders for awareness through stakeholder conferences and publications. The university curriculum need therefore, to incorporate the sustainability issues and passing to the learners too.”

Bebbington, J., Russell, S., & Thomson, I. (2017). [Accounting and sustainable development: Reflections and propositions](#). *Critical Perspectives on Accounting*, 48, 21-34. “This paper emerges from an invitation to reflect upon the achievements of social and environmental accounting as well as to identify the challenges that lie ahead as the field continues its engagement with the goal of sustainable development. [...] This paper seeks to provide points of provocation and encouragement to social and environmental accountants, critical accounting scholars and to those seeking to understand sustainable development scholarship and action.”

Dyball, M. C., Thomson, I., & Wilson, R. M. S. (2013). [Sustainability in Accounting Education](#) [Special issue], *Accounting Education*, 22(4). Topics in this special issue includes: commentaries and reviews of four articles: Gray, R. (2013). [Sustainability + accounting education: The elephant in the classroom](#). *Accounting Education*, 22(4), 308-332.; Owen, G. (2013). [Integrated reporting: A review of developments and their implications for the accounting curriculum](#). *Accounting Education*, 22(4), 340-356.; Wynder, M., Wellner, K. U., & Reinhard, K. (2013). [Rhetoric or reality? Do accounting education and experience increase weighting on environmental performance in a balanced scorecard?](#). *Accounting Education*, 22(4), 366-381.; and McPhail, K. (2013). [Corporate responsibility to respect human rights and business schools' responsibility to teach it: Incorporating human rights into the sustainability agenda](#). *Accounting Education*, 22(4), 391-412.

Mohammad, N. (2012). [Need to Implement the Environmental Accounting Education for Sustainable Development: An Overview](#). *World Academy of Science, Engineering and Technology, International Journal of Social, Behavioral, Educational, Economic, Business and*





Industrial Engineering, 6, 354-361. “Environmental accounting is a recent phenomenon in the modern jurisprudence... But it is often identified that it is ignored due to some reasons such as unconsciousness, lack of ethical education etc. At present, the world community is very much concerned about the state of the environmental accounting and auditing systems as it bears sustainability on the mother earth for our generations. [...] This study will provide an overview of the environmental accounting education consisting of 25 respondents based on the primary and secondary sources.”

Business Ethics

See also: *Business and Religious Studies*

Dziubaniuk, O., & Nyholm, M. (2020). [Constructivist approach in teaching sustainability and business ethics: a case study](#). *International Journal of Sustainability in Higher Education*, 22(1), 177-197. “This paper aims to explore methods of teaching sustainability and business ethics, relevant to the modern demand for student’s skills and knowledge. The study explores the challenges of teaching a business school undergraduate-level course and argues that a constructivist pedagogy is a suitable epistemological approach for designing a course unit concerning sustainability and ethics.”

Akrivou, K., & Bradbury-Huang, H. (2015). [Educating integrated catalysts: Transforming business schools toward ethics and sustainability](#). *Academy of Management Learning & Education*, 14(2), 222-240. “Joining the sharpening critique of conventional university-based business school education, we argue that educating students to be integrated catalysts is necessary to meet current sustainability challenges. The key feature of moving toward the integration required at the individual level is focusing on developing students’ capacity for moral and cognitive maturity. To effect this, the practice of genuine dialogue is the focus of our interpersonal method for educating management students. In supporting such education, business schools must, however, first transform themselves. As transformative social enterprises, they model critical questioning as well as improve the impact and relevance of management on flourishing wider society and an ethically oriented economy. We offer practical suggestions and implications for future business education reform.”

Entrepreneurship and Social Entrepreneurship

Karatas-Ozkan, M., Ibrahim, S., Ozbilgin, M., Fayolle, A., Manville, G., Nicolopoulou, K., ... & Tunalioglu, M. (2023). [Challenging the assumptions of social entrepreneurship education and repositioning it for the future: Wonders of cultural, social, symbolic and economic capitals](#). *Social*





Enterprise Journal, 19(2), 98-122. “Social entrepreneurship education (SEE) is gaining increasing attention globally. This paper aims to focus on how SEE may be better understood and reconfigured from a Bourdieusian capital perspective with an emphasis on the process of mobilising and transforming social entrepreneurs’ cultural, social, economic and symbolic resources. Drawing on qualitative research with a sample of social entrepreneurship educators and mentors, the authors generate insights into the significance of challenging assumptions and establishing values and principles and hence that of developing a range of capitals (using the Bourdieusian notion of capital) for SEE. The findings highlight the significance of developing a range of capitals and their transformative power for SEE. In this way, learners can develop dispositions for certain forms of capitals over others and transform them to each other in becoming reflexive social agents. The authors respond to the calls for critical thinking in entrepreneurship education and contribute to the field by developing a reflexive approach to SEE. The authors also make recommendations to educators, who are tasked with implementing such an approach in pursuit of raising the next generations of social entrepreneurs.”

Addae, A. E., & Ellenwood, C. (2022). [Integrating Social Entrepreneurship Literature Through Teaching](#). *Entrepreneurship Education and Pedagogy*, 5(2), 225–244. “As boundaries between the business and social sectors dissolve, social entrepreneurship has emerged as a phenomenon that bridges two worlds previously divided. Now, social entrepreneurs embrace market-based tools to address society’s greatest challenges. Coinciding with the growth of the sector, students and researchers have sought to understand development, growth strategies, and the practical challenges related to social entrepreneurship. In turn, universities have bolstered social entrepreneurship education by creating academic offerings that emphasize business, social impact, and innovation. Still, social entrepreneurship education remains in its infancy. Courses are as varied as the field itself, and instructors routinely rely on their professional backgrounds and networks to develop curricula that explore the field’s multifaceted character. Thus, social entrepreneurship courses are diverse across disciplines, and the academic literature theorizing the phenomenon is similarly emergent. As social entrepreneurship courses combine theoretical insights with experiential learning in a myriad of ways, aligning theoretical insights with necessary core competencies presents a challenge. To address this dilemma, we highlight the importance of employing theory-driven concepts to develop core competencies in social entrepreneurship students. In doing so, we review key threshold concepts in the social entrepreneurship literature and suggest how instructors might link theoretical insights to practical skill sets.”

Dodd, S., Lage-Arias, S., Berglund, K., Jack, S., Hytti, U., & Verduijn, K. (2022). [Transforming enterprise education: sustainable pedagogies of hope and social justice](#). *Entrepreneurship & Regional Development*, 34(7-8), 686-700. “Building on Alistair Anderson’s work, this paper proposes transforming enterprise education to deeply address questions of sustainability, social





justice and hope in our time of multiple and complex crises. New pedagogies, practices, vocabularies and connections help us to enact crises in entrepreneurial, ethical and creative ways, enabling us to remain hopeful in the face of unknown horizons. Drawing from critical pedagogies, from Epistemologies of the South, and from the wisdoms of Alistair Anderson, the paper outlines how transforming to a more, hopeful, socially just and sustainable enterprise education could move us beyond present alternatives. We suggest that transforming enterprise education (TrEE) would better facilitate students as ethical change-makers when they engage with their worlds, and its unseen future horizons. TrEE emphasizes the time needed for questioning dominant meanings and space for experimenting with new ones. It invites re-placing us in the margins and with the excluded. It takes an expansive view of the ecosystem, and places enterprise within its wider context. It focuses students, teachers, entrepreneurs and various other stakeholders in learning together with the non-human and relies on sustainable stewardship, social justice and hope at the core of transforming enterprise education.”

Igwe, P. A., Madichie, N. O., Chukwuemeka, O., Rahman, M., Ochinanwata, N., & Uzuegbunam, I. (2022). [Pedagogical approaches to responsible entrepreneurship education](#). *Sustainability*, 14(15), 9440. “This article explores innovations in and pedagogical approaches to Responsible Entrepreneurship Education (REE), with a specific focus on how to advance responsible entrepreneurial competencies (“know-how”) and entrepreneurial practices (“know-that”). Consequently, this article proposes the “4Rs” framework (re-imagining, reconfiguring, reshaping, and reforming) to guide entrepreneurship educators’ actions. Firstly, it is necessary to “re-imagine” the intended and enacted curriculum to develop a contemporary awareness and knowledge of social and environmental enterprises. Secondly, it is essential to “reconfigure” teaching pedagogies to problematize the entrepreneurship environment and outer world. Thirdly, it is required for educators to “reshape” the attained curriculum with the stakeholders to offer learners co-curricular and extracurricular experiences. Finally, pedagogical “reforms” provide an opportunity to incorporate innovations into the discovery of new knowledge and paths of responsibilities. These pedagogical approaches support entrepreneurial learning as “processes” and entrepreneurship as a “process” aligned to the achievement of responsible entrepreneurial behavior.”

Cui, J. (2021). [The impact of entrepreneurship curriculum with teaching models on sustainable development of entrepreneurial mindset among higher education students in China: the moderating role of the entrepreneurial climate at the institution](#). *Sustainability*, 13(14), 7950. “There has been considerable attention on the role of entrepreneurship education and outcomes from students’ sustainable development, predominantly entrepreneurial intentions. However, research has tended to overlook novel and promising, yet under-examined areas, such as the entrepreneurial mindset (EM), its link with entrepreneurship education, and the contextual factor. Drawing on social cognitive and teaching model theory, we aimed at addressing these gaps by





examining the impact of entrepreneurship curriculum (EC) with different teaching models (supply, demand, competence) on EM, as well as the moderating role of the entrepreneurial climate of the higher education institution. Using a cross-sectional survey design, data were collected in 15 higher education institutions in China. A sample of 739 students were used to test our hypotheses. The results suggest that all the entrepreneurial teaching models and mindset are positively related (though the demand model is the strongest predictor). Furthermore, the results establish that the entrepreneurial climate at the institution plays a moderating role between EC and EM, though it is the strongest for the competence teaching model. This paper contributes to the theoretical conceptualization of the EC–EM relationship and the deep understanding on “how” and “when” the teaching models in EC influence EM. Our study also expanded social cognitive theory (SCT) application in the context of higher entrepreneurship education by combining and confirming educational (specific teaching models), cognitive (EM), and institutional factors (entrepreneurial climate). Our research implies that universities and entrepreneurial program developers should pay attention to the selection of the right teaching models and provide a supportive entrepreneurial climate to optimize students’ EM, thus promoting their sustainable development.”

Jacques, M., & Fortier, D. (2021). [Updating the business curriculum: Reaching sustainability through social entrepreneurship](#). In *INTED2021 Proceedings* (pp. 3369-3377). IATED. “Given that planetary resources are being stretched to their limits, there is a call for organizations to engage in environmental sustainability to mitigate the consequences of climate change. Hence, universities have a duty to educate future leaders to reach society’s sustainable development goals. Teaching traditional business skills is no longer sufficient. Accordingly, business schools must adapt their curriculum and provide students with a social entrepreneurship education that prioritizes sustainability knowledge so they can identify social and environmental opportunities. As such, we argue that education for environmental sustainability should go beyond the traditional classroom. In this paper, we discuss guidelines for an improved curriculum, one that is grounded in a multidisciplinary approach to foster improved understanding of sustainable development problems. Indeed, by generating in-class discussions about sustainability from multiple perspectives, students are likely to discover innovative solutions. Moreover, teaching sustainability for social entrepreneurship should be carried out within a concentric model via a four-pronged approach combining innovation, social knowledge, experiential learning and the required leadership knowledge. More specifically, this would mean focusing on business archetypes that support a circular economy, maximizing interactions with key stakeholders in the context of field-trips, thus providing students with opportunities to apply knowledge gained in the classroom and collaborate with industry leaders. The ultimate goal is to ensure that future leaders have the tools to integrate environmental sustainability in business, therefore strengthening the competitive advantage and resiliency of their organizations while making sure they are better equipped to face personal challenges along the way. Such a framework would





contribute to creating ventures aiming to reach sustainable development goals, thus resulting in the creation, delivery and capture of social value on our way to environmental and social justice.”

Foucrier, T. (2020). [Training future entrepreneurs—developing and assessing sustainability competencies in entrepreneurship education](#) (Doctoral dissertation, Arizona State University). “Employee-owned businesses, benefit corporations, social enterprises, and other sustainability entrepreneurship innovations are responding to challenges such as climate change, economic inequalities, and unethical business behavior. Academic programs to date, however, often fall short in sufficiently equipping students with competencies in sustainability entrepreneurship – from a coherent set of learning objectives, through effective and engaging pedagogies, to rigorous assessment of learning outcomes. This dissertation contributes to bridging these gaps. The first study proposes a process-oriented and literature-based framework of sustainability entrepreneurship competencies. It offers a general vision for students, faculty, and entrepreneurs, as well as for the design of curricula, courses, and assessments. The second study presents an exploration into the nature of sustainability entrepreneurship courses, with a focus on teaching and learning processes. Using pioneering courses at Arizona State University, the study analyzes and compares the links between learning objectives, pedagogies, and learning outcomes. Based on document analysis and semi-structured interviews with course instructors, the study identifies cognitive apprenticeship from input processing to experimentation, constructive alignment from learning objectives to assessments, and curriculum-level coordination across courses as key success factors of sustainability entrepreneurship education. The result of this study can inform instructors and researchers in applying and further substantiating effective educational models for future entrepreneurs. The third study addresses the key question of competence assessment: what are reliable tools for assessing students’ competence in sustainability entrepreneurship? This study developed and tested a novel tool for assessing students’ competence in sustainability entrepreneurship through in-vivo simulated professional situations. The tool was in different settings and evaluated against a set of criteria derived from the literature. To inform educators in business and management programs, this study discusses and concludes under which conditions this assessment tool seems most effective, as well as improvement for future applications of the tool.”

Shu, Y., Ho, S. J., & Huang, T. C. (2020). [The development of a sustainability-oriented creativity, innovation, and entrepreneurship education framework: A perspective study](#). *Frontiers in Psychology*, 11, 1878. “Innovation can include creativity, innovation mechanisms, and entrepreneurship. The ability to innovate is an important indicator of economic and social development, and creativity is an educational indicator of learning effectiveness. This article explores creativity and innovation from an educational perspective and proposes a





sustainability-oriented creativity, innovation, and entrepreneurship education framework that uses creative problem solving. This framework contains four layers and three dimensions. The first layer concerns the thinker and basic structure, and the second layer contains the catalyst of sustainable development goals (SDGs). The third layer is the advanced structure of cultivating SDG thinkers. The final layer is the generation of students who will attempt to start up social enterprises. The three aspects apply the creative nature of diffuse thinking to social innovation; apply demand expansion to extend individual needs to societal needs; and apply educational goal development to encourage sustainability. We expect this framework, which can turn thinkers into doers through creativity and social innovation, to apply to different disciplines. This article provides suggestions for (1) designing curriculum in creativity, innovation, and entrepreneurship education (CIE) for different education level and (2) transitioning technical and vocational education in developing economies on the road to sustainable development.”

Halberstadt, J., Schank, C., Euler, M., & Harms, R. (2019). [Learning sustainability entrepreneurship by doing: Providing a lecturer-oriented service learning framework](#). *Sustainability*, 11(5), 1217. “Due to its growing practical relevance, sustainability entrepreneurship receives a high degree of academic attention. However, literature on how to educate sustainability entrepreneurs remains scarce. A promising didactical approach in this context is service learning. We ask if service learning is an effective way to educate sustainability entrepreneurs, and which framework conditions impact those educators. First, we draw on an established sustainable entrepreneurship capability framework and provide direct evidence from entrepreneurship educators about the effectiveness of service learning. Second, based on grounded theory, qualitative interviews with those educators reveal a framework composed of personal and institutional factors that they have to navigate when provide service learning. Our findings contribute to the interface of service learning and sustainability entrepreneurship by highlighting its effectiveness and the framework conditions for educators.”

Foucrier, T., & Wiek, A. (2019). [A process-oriented framework of competencies for sustainability entrepreneurship](#). *Sustainability*, 11(24), 7250. “Employee-owned businesses, benefit corporations, and other efforts in sustainability entrepreneurship are responding to prevalent challenges such as climate change, economic inequalities, and unethical business behavior. Universities, however, often fall short in sufficiently equipping students with competencies in sustainability entrepreneurship. One reason is that none of the existing frameworks links competencies to the actual processes of entrepreneurship, from discovery to consolidation. If graduates are to successfully start and run sustainability-oriented enterprises, the real-world entrepreneurship processes should provide the main orientation for training and learning. The present study proposes such a framework. We first conducted a qualitative literature review on competencies for entrepreneurs, sustainability professionals, social entrepreneurs, and sustainability entrepreneurs. We clustered the identified competencies according to conceptual





similarities. On this basis, we describe sustainability entrepreneurship competencies along the entrepreneurial process model. The result is a process-oriented and literature-based framework of sustainability entrepreneurship competencies. It is intended to be used as a general vision for students, faculty, and entrepreneurs, as well as for the design of curricula, courses, and assessments.”

Cincera, J., Biberhofer, P., Binka, B., Boman, J., Mindt, L., & Rieckmann, M. (2018). [Designing a sustainability-driven entrepreneurship curriculum as a social learning process: A case study from an international knowledge alliance project](#). *Journal of Cleaner Production*, 172, 4357-4366. “Integrating Education for Sustainable Development (ESD) in higher education curricula requires innovative ideas and approaches how to combine educational, sustainability and disciplinary knowledge, skills, experiences, and motivations. Curriculum developers are challenged to be open to new concepts in their discipline regarding what should be taught and how it can be taught to facilitate learning processes to prepare students for shaping a sustainable future. The European project ‘Competencies for A Sustainable socio-Economic development’ (CASE) follows a participatory, inter- and transdisciplinary approach to design a Master’s program on sustainability-driven entrepreneurship. This study presents an analysis of the social learning process that has taken place in the interdisciplinary, intercultural CASE team during the participatory development process of the new Master’s program. The methodological design of the study is based on qualitative, participative evaluation research. The process of learning is discussed based on how the group reflected on and developed their “action theories” on how to design a supportive learning environment in which a Master’s program with innovative scopes and goals can be created. The findings highlight the importance of sharing and processing the experiences, mental models and interpretations concerning concepts, ideas, perspectives and new input within the group. This seems crucial for developing the capacity of the group to bring together diverse knowledge and perspectives for innovative, feasible solutions and ideas as well as to cooperate and collaborate effectively as a team. The implications of a culture of dialogue, participation and learning in diverse teams as important principles for developing innovative ESD-based curricula in different disciplines are discussed. It is emphasized that not only students, but also curriculum developers have to acquire the corresponding ESD-related competencies.”

Kickul, J., Gundry, L., Mitra, P., & Berçot, L. (2018). [Designing with purpose: Advocating innovation, impact, sustainability, and scale in social entrepreneurship education](#). *Entrepreneurship Education and Pedagogy*, 1(2), 205–221. “Social entrepreneurship is an emerging and rapidly changing field that examines the practice of identifying, starting, and growing successful mission-driven for-profit and nonprofit ventures, that is, organizations that strive to advance social change through innovative solutions. For educators teaching in this field, we advocate for a design thinking approach that can be integrated into social





entrepreneurship education. Specifically, we believe that many of the design thinking principles are especially suitable and useful for educators to facilitate student learning as they create and incubate social ventures. We also advance a broader conceptual framework, which we describe as the four main *mega-themes* in social entrepreneurship education, namely innovation, impact, sustainability, and scale. We offer ways in which the design thinking steps can be integrated and applied to each of these themes and accelerate the social venture creation process. We conclude by discussing and presenting how design thinking can complement an overall systems thinking perspective.”

Environmental, Social, and Corporate Governance (ESG)

[United Nations Environment Programme Finance Initiative](#) - A valuable source of information on Environmental, Social, and Governance (ESG) criteria for investors, banks, and financiers. See their [finance sector tools](#) for incorporating ESG criteria into financial practices and decisions, which students could use.

[Markkula Center for Applied Ethics](#) - the Center’s Ethics and ESG Resource Center includes ethics cases and commentaries on ESG issues.

Liao, H. T., Pan, C. L., & Zhang, Y. (2023). [Collaborating on ESG consulting, reporting, and communicating education: Using partner maps for capability building design](#). *Frontiers in Environmental Science*, 11, 298. “Given the rising demand for environmental, social, and governance (ESG) talents, this study aims to provide a multidisciplinary outlook of specific capability requirements for ESG talents, focusing on the use of ESG and carbon information, thereby providing a roadmap for ESG education. Following design science framework conventions and running design workshops that integrate design thinking of “how might we” design questions, literature analysis, and expert interviews across disciplines, this study presents findings regarding three main activities—consulting, reporting, and communicating. Based on the iterations of design workshops that adopt a circular economy-based partner map design canvas for stakeholder analysis with procedures such as expert interviews and literature analysis, three partner/capability maps were generated to map stakeholders and explore the capabilities needed. ESG and carbon information digital and data skills emerged as the core capability to complete all the three tasks. A conceptual framework—a Smart System of ESG and Carbon Information—is proposed to summarize planning, operating, and communicating with ESG and carbon information, along with high-level organizational actions and talent capabilities. It identifies the building blocks of an ESG operating system within an enterprise to engage various stakeholders for value-creation collaboration. Despite the limitation of a lack of comprehensive review and limited geographic and disciplinary representation, this study





provides a roadmap for enterprises and universities to explore and define talent requirements and create specific education and training programs.”

Bell, G. G., & Patt, B. S. (2022). [A content guide to environmental, social and governance investing for faculty and students](#). *Journal of Business Ethics Education*, 19, 169-192.

“Environmental, Social, and Governance (ESG) investing is increasingly popular (Giese, Lee, Melas, Nagy, & Nishikawa 2019), and is now percolating into sustainability textbooks and pedagogy. This is problematic because many faculty teaching sustainability do not have a background in finance, and thus find teaching ESG challenging. This paper develops pedagogical resources to teach the fundamentals of ESG investing, be that in a Foundations of Sustainable Management course or a Business Ethics course. We do this by developing four learning objectives: (1) Understand the ESG basics, including why ESG investing is important to investors and, for faculty, outlining where it might be appropriately placed in an ethics or introduction to sustainability class, (2) Define ESG Investing and discuss how ESG investing strategies differ from regular investment strategies, (3) Identify the primary methods to choose ESG investments, the related ESG rating systems, and the primary proprietary investment options based on these screening rules, and (4) Identify ESG options available to investors that meet their risk preferences.”

Sheehan, N. T., Fox, K. A., Klassen, M., & Vaidyanathan, G. (2022). [Threshold concepts and ESG performance: teaching accounting students reconceptualized fundamentals to drive future ESG advocacy](#). *Accounting Education*, 1-25.

“Whether corporations voluntarily reduce their negative impacts on the environment and society depends upon management advocacy. As future corporate leaders, accounting students will have a critical advocacy role, but they have been taught that shareholder value should not be sacrificed to reduce the externalized environmental and social costs caused by corporations. We believe accounting students are unable to break through the shareholder value maximization doctrine without understanding threshold concepts of corporate externalized costs and revised conceptualizations of corporate ownership and corporate governance. This paper proposes a new Environmental, Social, and Governance (ESG) Learning Model that accounting instructors can employ to understand the threshold concepts. Threshold concepts are reconstitutive and fundamentally change students’ worldviews so that new understandings may emerge and advocating for ESG initiatives becomes possible. The paper concludes with instructional strategies aligned with three pedagogical modalities to help students absorb the ESG threshold concepts.”

Anastasiadis, S., Perkiss, S., Dean, B.A., Bayerlein, L., Gonzalez-Perez, M.A., Wersun, A., Acosta, P., Jun, H., & Gibbons, B. (2021). [Teaching sustainability: complexity and compromises](#). *Journal of Applied Research in Higher Education*, (13)1, 272-286. “The purpose of this paper is to address the gap in literature from educators’ perspectives on their experiences of introducing





sustainability teaching using specific teaching tools for sustainability.” It “reports on educators' experiences embedding sustainability into their courses through an innovative teaching tool, [WikiRate](#). This paper has implications for reframing how we can approach sustainability education and presents discussion ways to teach complexity without reduction or simplification.”

[WikiRate.org](#) - “An online, crowdsourced database and research tool for asking detailed questions and providing answers on corporate environmental, social and governance (ESG) impacts” (description from the Anastasiadis et. al. article above, p 5). [Click here for more information about this tool.](#)

Dean, B. A., Gibbons, B., & Perkiss, S. (2018). [An experiential learning activity for integrating the United Nations Sustainable Development Goals into business education](#). *Social Business*, 8(4), 387-409. “The purpose of this paper is to evaluate an initiative designed to introduce business students to the United Nations (UN) Sustainable Development Goals (SDGs), through researching, reporting and reflecting on authentic corporate social responsibility (CSR) practices.” It “offers educators a practical way to meet curriculum challenges for teaching students the theory and practical applications of sustainable business.”

Persons, O. (2012). [Incorporating corporate social responsibility and sustainability into a business course: a shared experience](#). *Journal of Education for Business*, 87(2), 63-72. “The author discusses how corporate social responsibility (CSR) and sustainability were incorporated into a business course by using 4 assignments, a project with a CSR question, 7 ethics cases, and 17 ethics scenarios tied to a corporate code of ethics. The author also discusses student evaluation of CSR learning experience, strengths and weaknesses of the assignments, and teaching tips. Because these materials are not discipline-specific, instructors in any discipline may adopt them with minimal modification and preparation time.”

Finance

Saul, K. M., & Perkins, J. H. (2022). [A new framework for environmental education about energy transition: investment and the energy regulatory and industrial complex](#). *Journal of Environmental Studies and Sciences*, 12(1), 149-163. “Modern societies depend upon fossil fuel-based energy systems for energy services, but, despite huge benefits, many negative environmental consequences have resulted from fossil fuels. The most important is climate change, caused by greenhouse gases emitted from production and use of fossil fuels. Over the past 50 years, environmental education has increasingly embraced the need for curriculum on climate change, but these curricular efforts have not delved deeply enough into building student knowledge and analytical skills about energy systems and the imperative transition away from fossil fuels. Based on political-ecological ideas, we propose a new framework for building





environmental curriculum about energy and energy transitions: the Energy Regulatory and Industrial Complex (ERIC) with an embedded Energy Investment Cycle (EIC), a systemic perspective to help students focus on the key role of decision-making about energy investments. ERIC and EIC also bolster recognition of the components of energy systems, how they relate to each other, and the challenges of transforming an energy system. Environmental education involves a large variety of disciplinary and interdisciplinary perspectives among instructors serving students at many levels and from different preparations. Accordingly, we do not attempt to provide exact instructions on how to use ERIC and EIC. Instead, our intention is to help faculty develop curricula for different disciplinary and interdisciplinary courses and degree programs. To that end, we conclude with brief illustrations of possible uses of ERIC and EIC. We argue that our proposed framework will stimulate better understanding of energy-environmental interactions and thereby promote constructive discussions about energy transitions away from fossil fuels.”

Management

[The Globally Responsible Leadership Initiative](#) - GRLI “exists to catalyse the development of globally responsible leadership and practice in organisations and societies worldwide.” See its 50+20 vision and agenda, “Management Education for the World.”

[Principles for Responsible Management Education](#) - “PRME is a United Nations-supported initiative founded in 2007 as a platform to raise the profile of sustainability in schools around the world.”

[Special Issue: Sustainability in Management Education](#) - 2020 special issue of the *Journal of Management Education* addresses evidence-based studies about the effectiveness of different sustainability in management education approaches to help guide future efforts. Articles draw on experiential learning theory, cognitive learning theory, social innovation education, and systems thinking frameworks, etc.

Arevalo, J. A., & Mitchell, S. F. (Eds.). (2017). [Handbook of sustainability in management education: In search of a multidisciplinary, innovative and integrated approach](#). Northampton, MA: Edward Elgar Publishing. Overall topics in this handbook include: Theorizing the field of sustainability in management education (SiME) development in practice, Exploring transformational interventions in SiME, Understanding change agents and reform accelerators’ roles, and Sustaining long term programs through innovation.





Operations Management and Information Systems (OMIS)

Mishra, D., & Mishra, A. (2020). [Sustainability Inclusion in Informatics Curriculum Development. *Sustainability*, 12\(14\), 5769.](#) “Presently, sustainability is a crucial issue for human beings due to many disasters owing to climate change. Information Technology (IT) is now part of everyday life in society due to the proliferation of gadgets such as mobile phones, apps, computers, information systems, web-based systems, etc. The analysis is based on recent ACM/IEEE curriculum guidelines for IT, a rigorous literature review as well as various viewpoints and their relevance for sustainability-oriented curriculum development; it also includes an assessment of key competencies in sustainability for proposed units in the IT curriculum. Sustainability is a critical subject for prospective IT professionals. Therefore, it is imperative to motivate and raise awareness among students and the faculty community regarding sustainability through its inclusion in the Informatics curriculum. This paper focuses on how sustainability can be included in various courses of the Informatics curriculum. It also considers recent ACM/IEEE curriculum guidelines for IT professionals, which assert that IT students should explore IT strategies required for developing a culture of green and sustainable IT. This paper provides guidelines for IT curriculum development by incorporating sustainable elements in courses, so that future IT professionals can learn and practice sustainability in order to develop a sustainable society.”

Pullman, M., & Collins, D. (2013). [Reshaping the Operations and Supply Chain Management Core Class Curriculum to Include Business Sustainability. *Operations Management Education*, 7.](#) “Paralleling the business community, business schools increasingly face pressure from their various stakeholders to address sustainability issues. While sustainability can be delivered as a stand-alone business course, we assert that sustainability topics are a natural fit for the core operations and supply chain management course. Our experience in designing curricula for MBA programs reveals how many traditional and emerging topics in the field offer a natural context in which to address sustainability issues. With the evolution of Operations Management concepts toward systems frameworks such as lean, closed loop supply chains, supplier scorecards, and synergistic networks of production, there is a progression toward including social and environmental perspectives. While many academics know these concepts, they struggle to integrate the sustainability perspective in the classroom. This paper attempts to fill this gap by providing ideas, cases, and article suggestions that are applicable to the core operations and supply chain management classes in an MBA curriculum.”

Sendall, P., Shannon, L. J. Y., Peslak, A., & Saulnier, B. (2011). [The greening of the information systems curriculum. *Information Systems Education Journal*, 9\(5\), 27.](#) “The purpose of this study is related to Green Information Technology (IT), Green Computing, and/or Sustainability





(GITS) curriculum initiatives in institutions of higher education in the US and abroad. The purpose of this study is threefold; 1) to evaluate whether GITS academic programs have been initiated in higher educational organizations; 2) to analyze if GITS programs and/or courses are currently in place; and 3) to investigate the conceptual framework of GITS across campuses.”

Watson, R. T., Lind, M., & Haraldson, S. (2012). [The emergence of sustainability as the new dominant logic: Implications for Information Systems](#). “It is argued that the current customer service dominant logic is being replaced or complemented by a sustainability dominant logic, which reflects the growing concern with environmental issues. The implications for IS scholarship and education are discussed.”

Dwyer, C., & Gomez, E. A. (2009). [Sustainability Course Modules for Information Systems and Interdisciplinary Courses](#). AMCIS 2009 Proceedings, 79. “This workshop will demonstrate how the development of curriculum for sustainability can become a strategic opportunity for IS departments. We will discuss our efforts to introduce modules to existing IS courses that target sustainability and energy literacy. We argue the growing emphasis on sustainability is a strategic opportunity for information systems. Many IS themes are highly relevant to sustainability. There are global, social, technical, and cognitive components that all impact on the use of natural resources. Social behaviors must be changed as a result. For example, an individual’s energy consumption is directly related to their interaction with technologies that both rely on and control energy use.”

Campus as a Living Lab for Applied Learning

**See also: Climate*

Save, P., Terim Cavka, B., & Froese, T. (2021). [Evaluation and lessons learned from a campus as a living lab program to promote sustainable practices](#). *Sustainability*, 13(4), 1739. “Any group that creates challenging goals also requires a strategy to achieve them and a process to review and improve this strategy over time. The University of British Columbia (UBC) set ambitious campus sustainability goals, including a reduction in its greenhouse gas emissions to 33% below the 2007 level by 2015, and 100% by 2050 (UBC, 2006). The University pursued these goals through a number of specific projects (such as major district energy upgrade and a bioenergy facility) and, more generally, through a “Campus as a Living Lab” (CLL) initiative to marry industry, campus operations, and research to drive innovative solutions. The CLL program has achieved significant successes while also demonstrating many opportunities for improvements and lessons learned. The aim of this study was to examine the UBC CLL program, to identify and formalize its operations, to extract key transferable characteristics, and





to propose replicable processes that other universities and municipalities can follow to expand their sustainable practices in similar ways. There was a learning curve with implementing a CLL program at UBC; thus, the goal of this study was to potentially shorten this learning curve for others. The research involved an ethnographic approach in which researchers participated in the CLL process, conducted qualitative analysis, and captured the processes through a series of business process models. The research findings are shared in two parts: 1. generalized lessons learned through key transferrable characteristics; 2. a series of generic organizational charts and business process models (BPMs) culminated with learned strategies through defined processes that illustrate what was required to create a CLL program at UBC. A generalized future improvement plan for UBC CLL programs is defined, generic BPMs about CLL projects are evaluated, and the level of engagement of multiple stakeholders through phases of project life cycle given in the conclusion for future use of other Living Lab organizations.”

Mazutti, J., Londero Brandli, L., Lange Salvia, A., Fritzen Gomes, B. M., Damke, L. I., Tibola da Rocha, V., & Santos Rabello, R. D. (2020). [Smart and learning campus as living lab to foster education for sustainable development: An experience with air quality monitoring](#). *International Journal of Sustainability in Higher Education*, 21(7), 1311-1330. “Purpose – Higher education institutions are widely known both for their promotion to education for sustainable development (ESD) and for their contribution as living labs to urban management strategies. As for strategies, smart and learning campuses have recently gained significant attention. This paper aims to report an air quality monitoring experience with focus on the smart and learning campus and discuss its implications for the university context with regard to ESD and sustainable development goal (SDG) integration. Design/methodology/approach – The air quality monitoring was held at the main campus of University of Passo Fundo and focused on three pollutants directly related to vehicle emissions. The air quality index (AQI) was presented on a website, along with information regarding health problems caused by air pollution, main sources of emissions and strategies to reduce it. Findings – The results showed how the decrease in air quality is related to the traffic emissions and the fact that exposing students to a smart and learning environment could teach them about sustainability education. Practical implications – This case study demonstrated how monitoring air quality in a smart environment could highlight and communicate the impact of urban mobility on air quality and alerted to the need for more sustainable choices, including transports. Originality/value – This paper contributes to the literature by showing the potential of a smart-learning campus integration and its contribution towards the ESD and the UN SDGs.”

Favaloro, T., Ball, T., & Lipschutz, R. D. (2019). [Mind the gap! Developing the campus as a living lab for student experiential learning in sustainability](#). *Sustainability on university campuses: Learning, skills building and best practices*, 91-113. “This chapter develops a new approach to experiential learning for sustainability and will be of interest to those seeking a





baseline for the distinct conceptualizations of experiential learning and their impacts on matriculating (or matriculated) students in the longer term. College campuses are communities unto themselves and, as with communities everywhere, confront the challenges of becoming sustainable. Students attend college to learn and become knowledgeable in their chosen fields, but, perhaps with the exception of research labs, rarely have the opportunity to apply their skills to authentic or “real world” problems—experience that would allow them to become adept at both technical and cognitive process skills needed after graduation. This is especially true for projects focused on sustainability, which require multidisciplinary perspectives and interactions and thus are difficult to launch and complete. We suggest that the college campus is an ideal “living lab” that not only allows students to encounter and think about complex and wicked issues, but also to define actionable opportunities and address really-existing problems through collaborative projects that materially contribute to the sustainability of a real-world system. Pedagogy supporting “experiential learning” can play a critical role in teaching sustainability concepts and practices and thus in bolstering the Campus as a Living Lab agenda. However, we find competing or ambiguous definitions of experiential learning in the literature and no complete framework for its application in sustainability praxis. This chapter reports on research into sustainability pedagogy and assessment of the educational opportunities in experiential learning at the University of California, Santa Cruz, based on campus efforts to become a more integrated sustainable system. Accordingly, we first unpack terminology applied to “experiential learning in sustainability” from multidisciplinary and multi-departmental perspectives. This review of selected literature combined with data accumulated from students and program facilitators compares and contrasts both the historical significance and current practices of experiential learning to provide a more explicit framework for its implementation in sustainability as part of a coordinated network of distinct living lab entities. We then employ this framework to discuss a “critical gap” in college curriculum that was exposed during our investigation into the efficacy of these projects and programs at UC-Santa Cruz that may be inhibiting student preparation and their ability to contribute to the campus achieving sustainability benchmarks. Finally we propose that this lacuna can be mended by working towards a strategic integration of key experiential learning activities earlier in an undergraduate’s career.”

Mouchrek, N., & Krucken, L. (2018). [Living labs in co-creation and sustainability as strategies for design education](#). In Storni, C., Leahy, K., McMahon, M., Lloyd, P. and Bohemia, E. (eds.), *Design as a catalyst for change - DRS International Conference 2018*, 25-28 June, Limerick, Ireland. <https://doi.org/10.21606/drs.2018.267> “Design schools have an important role in promoting innovation and sustainability in society. Didactic and research activities can be oriented to approach societal problems and develop solutions for specific contexts. ‘Living laboratories’ (living labs) offer significant opportunities to investigate everyday practice and collaboratively explore possibilities, by opening a space of encounter between researchers and users. This paper presents the initiative Laboratory of Design, Co-creation, and Sustainability,





aimed at investigating design strategies to promote the culture of sustainability among youth. It included young design students from both university and technical secondary education. Methods involved participatory design-based analysis, context- mapping, and strategy generation. The results emphasize: a. the need to develop competencies in sustainability within design education, promoting critical thinking and ability to implement innovative solutions; b. the potential of co-creation to generate ‘contexts for change’; c. the need for more open and flexible educational approaches, allowing common sharing, engagement, self-reflection, and flexible assessment.”

University Transformation

Coles, C. (2023). [Using interdisciplinary teaching within a Living Lab to embed the UN Sustainable Development Goals into higher education](#). In *Business Teaching Beyond Silos* (pp. 199-203). Edward Elgar Publishing. “This case study outlines an example of interdisciplinary teaching and learning in the context of the national priority of Education for Sustainable Development (ESD). Built on the premise that ESD will require a change of mind set as well as new knowledge and skills, it describes a working example of a Living Lab to encourage a deeper engagement with these crucial issues.”

Campbell, H., Crippen, A., Hawkey, C., & Dalrymple, M. (2020). [A roadmap for building climate resilience at higher education institutions: A case study of Arizona State University](#). *Journal of Green Building*, 15(4), 237-256. “Over the past few years, more and more higher education institutions have pledged to achieve carbon neutrality and designed and adopted Climate Action Plans. Although many higher institutions are adopting climate action plans, few are integrating resilience principles and priorities, which are essential for understanding institutions’ adaptive capacity for dealing with climate change. There is little existing research on how higher education institutions can implement climate resilience programs, behaviors, and policies into their planning process and campus-communities. To address this gap, this case study explores Arizona State University’s process of designing and implementing a climate resilience plan and outlines best practices other higher education institutions can utilize to create their own climate resilience plan. We critically discuss the importance of climate resilience at the higher education level, outline steps necessary for designing an inclusive and holistic climate resilience plan, and provide examples of important techniques used to design the climate resilience plan.”

Gibson, D., & Duram, L. A. (2020). [Shifting discourse on climate and sustainability: Key characteristics of the higher education fossil fuel divestment movement](#). *Sustainability*, 12(23), 10069. “In the last decade, the fossil fuel divestment (FFD) movement has emerged as a key component of an international grassroots mobilization for climate justice. Using a text analysis of





Facebook pages for 144 campaigns at higher education institutions (HEIs), this article presents an overview and analysis of the characteristics of the higher education (HE) FFD movement in the US. The results indicate that campaigns occur at a wide array of HEIs, concentrated on the east and west coasts. Primarily student led, campaigns set broad goals for divestment, while reinvestment is often a less clearly defined objective. Campaigns incorporate a mixture of environmental, social, and economic arguments into their messaging. Justice is a common theme, used often in a broad context rather than towards specific populations or communities impacted by climate change or other social issues. These insights contribute to the understanding of the HE FFD movement as ten years of campus organizing approaches. In particular, this study illustrates how the movement is pushing sustainability and climate action in HE and in broader society towards a greater focus on systemic change and social justice through campaigns' hardline stance against fossil fuels and climate justice orientation.”

Washington-Ottombre, C., Brylinsky, S. E., Carlberg, D. B., & Weisbord, D. (2019). [Climate resilience planning and organizational learning on campuses and beyond: A comparative study of three higher education institutions](#). *University Initiatives in Climate Change Mitigation and Adaptation*, 77-93. “Higher education institutions around the world are confronting challenges associated with climate change, and many are trying to model practices that support climate change mitigation and resilience. This work initiates an inventory of good practices and introduces a theoretical framework for the assessment of resilience planning in order to guide and support institutions of higher education in their efforts to plan for resilience. We analyzed the resilience planning initiatives of three higher education institutions. Smith College, a small liberal arts college, conducted participatory research to help plan for climate change. Large, research-focused Cornell University nurtured collaborations and examined its own capacity for climate action. Boston University played an important role in the efforts of the Boston Green Ribbon Commission to plan for climate resiliency in the city of Boston. We analyzed the climate change mitigation and resilience planning processes of these three institutions using a theoretical framework of organizational change, resilience thinking, and adaptive co-management. Our analysis showed that, although each institution approached the process differently, all three gained significant benefits beyond the scope of climate action. Each experienced a meaningful opportunity to engage with its community and explore the values of stakeholders, and each fostered local social capital and action while building a strong consensus on directions for the future. Aspects of the process supported the institutions' missions of education, research, and outreach and provided opportunities to pause and think deeply about how the institution chooses to engage with the world. All three organizations learned valuable lessons and experienced transformation, but Boston University in particular developed new ways to promote institutional learning on the topic of climate change, a process we describe as triple-loop learning.”





Climate & Social Justice

Kinol, A., Miller, E., Axtell, H., Hirschfeld, I., Leggett, S., Si, Y., & Stephens, J. C. (2023). [Climate justice in higher education: a proposed paradigm shift towards a transformative role for colleges and universities](#). *Climatic Change*, 176(2), 15. “Moving beyond technocratic approaches to climate action, climate justice articulates a paradigm shift in how organizations think about their response to the climate crisis. This paper makes a conceptual contribution by exploring the potential of this paradigm shift in higher education. Through a commitment to advancing transformative climate justice, colleges and universities around the world could realign and redefine their priorities in teaching, research, and community engagement to shape a more just, stable, and healthy future. As inequitable climate vulnerabilities increase, higher education has multiple emerging opportunities to resist, reverse, and repair climate injustices and related socioeconomic and health disparities. Rather than continuing to perpetuate the concentration of wealth and power by promoting climate isolationism’s narrow focus on technological innovation and by prioritizing the financial success of alumni and the institution, colleges and universities have an opportunity to leverage their unique role as powerful anchor institutions to demonstrate climate justice innovations and catalyze social change toward a more equitable, renewable-based future. This paper explores how higher education can advance societal transformation toward climate justice, by teaching climate engagement, supporting impactful justice-centered research, embracing non-extractive hiring and purchasing practices, and integrating community-engaged climate justice innovations across campus operations. Two climate justice frameworks, Green New Deal-type policies and energy democracy, provide structure for reviewing a breadth of proposed transformational climate justice initiatives in higher education.”

Mayes, E., & Center, E. (2023). [Learning with student climate strikers’ humour: Towards critical affective climate justice literacies](#). *Environmental Education Research*, 29(4), 520-538. “A marked feature of the political tactics of the transnational School Strike 4 Climate movement (also known as Fridays for Futures and Youth Strike for Climate) has been the use of humour on cardboard signs, digital memes and social media posts. Young people’s cardboard signs, memes and social media posts have frequently mobilised humour as public pedagogy and political intervention – to emotionally stir and to politically engage others. In this article, we argue that the school strikers’ creation and mobilisation of humour demonstrate a critical affective climate justice literacy that educators committed to pursuing climate justice have much to learn from. In analysing examples of humour in contemporary student climate justice activism, this article brings previous analyses of the potential of humour in social movement studies and climate change communication into conversation with calls from environmental education scholars to pay greater attention to the potency of emotion for climate justice education, beyond a rationalistic focus on climate science literacy. We outline four pedagogical propositions for





working with humour, accompanied by their own perplexities, in moving towards critical affective climate justice literacies.”

Vázquez-Villegas, P., Ruiz-Cantisani, M. I., Caratozzolo, P., Lara-Prieto, V., Ponce-López, R., Martínez-Acosta, M., ... & Membrillo-Hernández, J. (2022). [Preserving world cultural heritage: Social justice and sustainability competencies via socially-oriented interdisciplinary education](#). *Journal of Teacher Education for Sustainability*, 24(1), 49-72. “The world’s cultural heritage (customs, practices, places, objects, artistic expressions, and values that signify a legacy of the history of humanity) provides identity to communities. In Mexico, the case of the World Heritage City of Xochimilco involves a sustainable agroecological system designed by its ancient inhabitants more than 500 years ago. Currently, the biodiversity and the chinampas (floating agricultural gardens) are at risk due to inconsistent government oversight and the lack of incentives for communities to carry on with the culture of agricultural production on Lake Xochimilco. Through a Challenge-Based Learning, a culturally relevant academic experience for university students was designed to involve them in preserving biodiversity while developing research and problem-solving skills. Satisfaction surveys and course evaluations indicated that this didactic methodology encouraged students to consider their connection to social justice issues and prompted them to expand their knowledge in their different disciplines. Socially-oriented experiential learning is an effective pedagogy that fosters a sense of social responsibility in students.”

King, J., & Casanova, C. R. (2021). [Pedagogies for cultivating critical consciousness: principles for teaching and learning to engage with racial equity, social justice and sustainability](#). *No sustainability without justice*, 2. “In the context of sustainability and higher education, racial equity and social justice have received marginal attention until recently when an emerging emphasis on these issues has created new possibilities for learning, action, and change. In this context, we focus our reflection on a key area of opportunity for sustainability in higher education, specifically the pedagogies and purposes employed by instructors. Pedagogies are the philosophical approaches and practical activities that instructors use to shape educational experiences. This essay presents a series of pedagogical principles gleaned from literature on social justice and critical pedagogy that can help to infuse sustainability in higher education with tools to reimagine how and why pedagogies can shift to operate at the intersection of transformation for sustainability, racial equity, and social justice.”

Green, P. M. (2021). [Making explicit connections between experiential learning and justice: New approaches to teaching and learning through an imagination for justice](#). *Experiential Learning & Teaching in Higher Education*, 4(2), 1-8. “Beyond simply being a form of active learning, experiential learning, in its many iterations, has been promoted as a philosophy, a community development model, a theory, a professional skill training opportunity, a global education and





civic development approach, and a pedagogical strategy that leads to deep, high impact learning. Indeed, experiential learning has become increasingly specialized in the last several decades with the evolution of numerous sub-fields, such as study abroad and global immersion programs, outdoor education programs, community-based learning (both domestic and global service-learning), internship and work-integrated learning, undergraduate research experiences, and a myriad of other high-impact learning programs. The field of experiential education is vast and deep due to this variety of sub-fields. Upon exploring experiential learning and teaching in the context of higher education, several common themes emerge, but one relatively underdeveloped theme has bubbled up to the surface repeatedly in the past two decades: the theme of justice.”

Massey, K. C., Chan, A. E., Green Jr, E., & Gonzalez, M. (2021). [Cultivating true leaders: A social justice curriculum for youth development programs](#). *Journal of Youth Development*, 16(5), 269-273. “In recent years, there have been increasing calls to intentionally center diversity, equity, and inclusion within positive youth development programs. True Leaders: Culture, Power and Justice is a 4-H curriculum designed to engage young people in understanding and applying social justice concepts with the ultimate aim of nurturing their sense of self-efficacy as they work to find solutions to pressing social issues. The True Leaders curriculum is shaped by the Five Cs of positive youth development—confidence, competence, connection, caring, and character—and a social justice youth development framework. Each lesson is grounded in the critical experiential learning model, which seeks to move participants through a process of hands-on learning about social justice concepts, critical reflection, and, ultimately, collective action. The True Leaders curriculum is intended for use with middle and high school-aged youth.”

Chemistry

Etzkorn, F. A., & Ferguson, J. L. (2023). [Integrating Green Chemistry into Chemistry Education](#). *Angewandte Chemie International Edition*, 62(2), e202209768. “Full integration of green chemistry into the undergraduate curriculum is a necessity to prepare our students for a sustainable future. We discuss the reasons for the need to change the curriculum, the institutions in North America, Europe, and Asia that are leading the way towards integration with classroom resources, and the published textbooks that are currently available for both classroom and laboratory. We plead for more time for hard-pressed college professors to revamp the curriculum, and for these efforts to be valued. We feel compelled by the urgency of this need to implore the chemistry education community to participate in these efforts now.”





Zuin, V. G., Eilks, I., Elschami, M., & Kümmerer, K. (2021). [Education in green chemistry and in sustainable chemistry: perspectives towards sustainability](#). *Green Chemistry*, 23(4), 1594-1608. “Innovation in green and sustainable technologies requires highly qualified professionals, who have critical, inter/transdisciplinary and system thinking mindsets. In this context, green chemistry education (GCE) and sustainable chemistry education (SCE) have received increasing attention, especially in recent years. However, gaps remain in further understanding the historical roots of green chemistry (GC) and sustainable chemistry (SC), their differences, similarities, as well the implications of this wider comprehension into curricula. Building on existing initiatives, further efforts are needed at all levels to mainstream GCE and SCE into chemistry and other education curricula and teaching, including gathering and disseminating best practices and forging new and strengthened partnerships at the national, regional and global levels. The latest perspectives for education and capacity building on GC and towards SC will be presented, demonstrating their crucial role to transform human resources, institutional and infrastructural settings in all sectors on a large scale, to generate effective cutting-edge knowledge that can be materialised in greener and more sustainable products and processes in a challenging world.”

Hurst, G. A. (2020). [Systems thinking approaches for international green chemistry education](#). *Current Opinion in Green and Sustainable Chemistry*, 21, 93-97. “This overview outlines the recent progress made in addressing the United Nations Sustainable Development Goals through educators incorporating systems thinking approaches within green and sustainable chemistry education. A blend of programme-level and course-level approaches to embedding systems thinking into teaching is discussed together with more specific resources such as practical experiments and use of technology-enhanced and game-based learning strategies. To maximise global applicability, an emphasis has been placed on making such teaching interventions transferrable with case studies included to illustrate this. There is scope remaining to build on these case studies to create a portfolio of implementable resources that can be integrated within chemistry and related programmes at all levels from school to professional training courses.”

Aubrecht, K. B., Bourgeois, M., Brush, E. J., MacKellar, J., & Wissinger, J. E. (2019). [Integrating green chemistry in the curriculum: Building student skills in systems thinking, safety, and sustainability](#). *Journal of Chemical Education*, 96(12), 2872-2880. “Chemistry educators have a responsibility to teach students about the essential role the field of chemistry has in a sustainable future for the planet. Chemical products, such as pharmaceuticals, plastics, electronics, agrochemicals, and building materials, all benefit society yet unintended consequences resulting from the production and use of these products compel chemists to develop new technologies which minimize their harm. The Committee on Professional Training (CPT)’s recently adopted Supplement on “Green Chemistry in the Curriculum” promotes the





inclusion of green chemistry in the undergraduate curriculum. The design of safer technologies is enabled by a systems thinking approach, which analyzes the life cycle of every component of a chemical process. The skills utilized by systems thinking in green chemistry have the potential to foresee and avoid unintended consequences of new chemical products. In this article we illustrate how the inclusion of green chemistry in general and organic chemistry courses connects structure and reactivity to a chemical's impact on the environment and human health. For example, applying green chemistry principles and systems thinking concepts to safety instruction not only teaches students to assess risk for performing a reaction but also extends to sustainability considerations such as feedstocks and waste produced. The study of the life cycle of chemicals connects green metrics and system thinking tools to recognize environmental and societal impacts. Though green chemistry curriculum materials are increasingly available, there is a need for educators to develop and assess systems thinking models for the classroom and laboratory. Overall, students equipped with the knowledge and ability to apply green and sustainable principles and the ability to make connections through systems thinking will be prepared to contribute to solving today's sustainability challenges."

Mahaffy, P.G., Matlin, S.A., Holme, T.A., & MacKellar, J. (2019). [Systems thinking for education about the molecular basis of sustainability](#). *Nature Sustainability* 2, 362–370. "The primary activities of chemistry involve analysing, synthesizing and transforming matter, yet insufficient attention has been paid to the implications of those activities for human and environmental well-being. Since a core element of addressing sustainability challenges requires attention to the material basis of society, a new paradigm for the practice of chemistry is needed. Chemistry education, especially gateway post-secondary general chemistry courses, should be guided by an understanding of the molecular basis of sustainability. A Systems Thinking in Chemistry Education framework illustrates one way to integrate knowledge about the molecular world with the sustainability of Earth and societal systems."

Kanapathy, S., Lee, K. E., Sivapalan, S., Mokhtar, M., Zakaria, S. Z. S., & Zahidi, A. M. (2019). [Sustainable development concept in the chemistry curriculum](#). *International Journal of Sustainability in Higher Education*. 20(1), 2-22. "This paper aims to investigate the knowledge, attitude and behaviour of foundation chemistry learners concerning" sustainable development concepts. Chemistry students were interviewed and their curriculum was analyzed to identify what areas of sustainable development were well-covered and which were de-emphasized.

Welton, T., Thakur, V. K., Gupta, R. K., Matharu, A. S., Eilks, I., & Zuin, V. (2018). [Reuse and Recycling / UN SDGs: How can Sustainable Chemistry Contribute? / Green Chemistry in Education](#) [Special issue]. *Current Opinion in Green and Sustainable Chemistry* 13, 1-174. A journal issue with a special focus on teaching sustainability in chemistry classrooms and the intersection between chemistry and the Sustainable Development Goals. See especially





Aubrecht, K. B. [Teaching relevant climate change topics in undergraduate chemistry courses: Motivations, student misconceptions, and resources](#); Summerton, L., Hurst, G. A., & Clark, J. H. [Facilitating active learning within green chemistry](#); Armstrong, L. B., Rivas, M. C., Douskey, M. C., & Baranger, A. M. [Teaching students the complexity of green chemistry and assessing growth in attitudes and understanding](#).

Eilks, I., & Rauch, F. (2012). [Sustainable development and green chemistry in chemistry education](#) [Special issue]. *Chemistry Education Research and Practice* 13(2), 53-153. A themed journal issue centering around teaching sustainable chemistry. Topics in this special issue include: education for sustainable development (ESD) and green chemistry in high school to university-level chemistry education and ESD in chemical engineering education.

Climate

National Oceanic and Atmospheric Administration/Climate.gov (2009). [The essential principles of climate literacy](#). Washington, DC: NOAA. Key principles and concepts of climate science, especially for K-12 students.

GlobalChange.gov (n.d.) [Resources for educators](#). Washington, DC: U.S. Global Change Research Program. Collection of teaching resources for middle school through college levels, including: climate change and human health lesson plans; teaching climate using the National Climate Assessment; climate literacy framework and energy literacy framework; climate, wildfire, and wildlands toolkit; National Park Service climate change education videos.

Climate Literacy and Energy Awareness Network (CLEAN) (n.d.) [Teaching resources](#). Collection of resources for teaching climate and energy to K-college levels.

McNeal, K. S., Libarkin, J. C., Ledley, T. S., Bardar, E., Haddad, N., Ellins, K., & Dutta, S. (2014). [The role of research in online curriculum development: The case of EarthLabs climate change and Earth system modules](#). *Journal of Geoscience Education*, 62(4), 560-577. "This study reports on an effort to illustrate the coupling of educational research with ongoing curriculum development to promote effective and evidence-based online learning. The research findings have been used to inform the EarthLabs curriculum development team as they revise existing modules and create new modules, in order to represent the ways in which such research findings can be used to improve similar online curriculum materials and enhance student learning outcomes. EarthLabs curriculum is a suite of online inquiry-based activities that promote understanding of Earth system science."





Anderson, A. (2012). [Climate change education for mitigation and adaptation](#). *Journal of Education for Sustainable Development*, 6(2), 191-206. “This article makes the case for the education sector an untapped opportunity to combat climate change. It sets forth a definition of Climate Change Education for Sustainable Development that is comprehensive and multidisciplinary and asserts that it must not only include relevant content knowledge on climate change, environmental and social issues, disaster risk reduction, and sustainable consumption and lifestyles, but also a focus on the institutional environment in which that content is learned to ensure that schools and education systems themselves are climate-proofed and resilient as well as sustainable and green.”

Breitmeier, H., & Otto, D. (2012). [Understanding political processes in climate change negotiations by means of an interdisciplinary curriculum in higher education](#). *International Journal of Innovation and Sustainable Development*, 6(1), 20-30. “In its analysis of climate change as an issue of global governance, political science must be part of an approach which combines the contributions of the different disciplines to the subject. Yet, whilst there is evidence of a higher education curriculum on climate change taking on board the importance of political processes within such an interdisciplinary endeavour, more needs to be done before it is fully embedded alongside natural science in the study of the subject. In this regard, two possible ways forward are explored: collaborative curriculum production as exemplified by the LECHe project and simulation games.”

Shepardson, D. P., Niyogi, D., Roychoudhury, A., & Hirsch, A. (2012). [Conceptualizing climate change in the context of a climate system: Implications for climate and environmental education](#). *Environmental Education Research*, 18(3), 323-352. “Today there is much interest in teaching secondary students about climate change. Much of this effort has focused directly on students’ understanding of climate change. We hypothesize, however, that in order for students to understand climate change they must first understand climate as a system and how changes to this system due to both natural and human influences result in climatic and environmental changes and feedbacks. The purpose of this article is to articulate a climate system framework for teaching about climate change and to stimulate discussion about what secondary students should know and understand about a climate system.”

Communication

Milstein, T., Pileggi, M., & Morgan, E. L. (Eds.). (2017). [Environmental communication pedagogy and practice](#). New York: Routledge. Comprehensive text for teachers of environmental communication with many example lesson plans.





Crowe, K., Másdóttir, T., & Volhardt, M. D. S. (2023). [Maximise your impact: Sustainable Development Goals-focussed content in communication intervention and teaching](#). *International Journal of Speech-Language Pathology*, 25(1), 188-192. “Purpose: Communication specialists strive to develop communication skills of students and clients using evidence-based practices. There is limited discussion of the topic content of speech-language pathology interventions and language education strategies that act as the vehicle to deliver intervention/education. In this commentary we demonstrate ways materials based on the Sustainable Development Goals (SDGs; United Nations,2015) can be integrated into daily practices when working with people with communication disability and people acquiring additional languages. Result: Examples are provided as to how any or all SDGs can be used as the content base within speech-language pathology interventions and language education. A number of situations are presented illustrating SDG-focussed content across diverse settings. Conclusion: This commentary paper focuses on how content from all 17 SDGS that can be embedded into speech-language pathology and language education services to enhance the speech, language, and literacy skills and SDG knowledge of both children and adults. In addition, educational and therapy resource developers are called to rise to the challenge of creating materials based on the SDGs.”

Byrnes, D., Blum, L., & Walker, W. (2022). [Undisciplining environmental communication pedagogy: Toward environmental and epistemic justice in the interdisciplinary sustainability classroom](#). *Sustainability*, 15(1), 514. “This article moves beyond an understanding of environmental communication as merely the “translation” of scientific knowledge for the general public and advocates for environmental science and sustainability (ESS) educators to understand environmental communication as a critical practice with complex social, cultural, and political stakes. Due to the interconnectedness of environmental issues and social, political, and cultural contexts, environmental communication pedagogy is an important site of both environmental and epistemic justice. This article addresses the question: What forms of environmental communication pedagogy contribute to dynamic communication competencies for students while also promoting environmental and epistemic justice? The authors begin with a literature review of environmental communication and environmental justice research. Subsequently, they develop a theoretical argument advocating for an “undisciplining” of environmental communication pedagogy to promote critical thinking about the exclusionary politics of environmental knowledge production and communication. In doing so, the authors advocate for cultivating dynamic and ethically engaged real-world literacies for students through social and participatory media, including Wikipedia and podcasts. The article concludes with two sample assignments that instructors can adapt to their classrooms.”

Raphael, C. (2019). [Engaged communication scholarship for environmental justice: A research agenda](#). *Environmental Communication*, 13(8), 1087-1107. <https://doi.org/10.1080/17524032.2019.1591478>. “This article argues that the most appropriate approach to studying environmental justice communication is engaged scholarship, in which academics [and students] collaborate with community partners, advocates, and others to conduct research. The article reviews prior engaged communication scholarship on environmental justice, and proposes four streams of future research, focused on news and





information, deliberation and participation, campaigns and movements, and education and literacy.” The article could inform your design of student research projects.

Hansen, A., & Cox, R. (Eds.) (2015). [The Routledge handbook of environment and communication](#) (pp. 186-196). New York: Routledge. Comprehensive summary of environmental communication research, with chapters on news, campaigns and movements, risk communication, public participation in governance, etc.

McKenzie-Mohr, D., Lee, N. R., Kotler, P., & Schultz, P. W. (2012). [Social marketing to protect the environment: What works](#). Los Angeles: Sage Publications. Excellent textbook for teaching how to design communication campaigns for environmental sustainability using a social marketing approach. A free, abridged version, entitled [Fostering Sustainable Behavior](#), is available online, along with a searchable database of related research articles and case studies.

Ryan, C., & Brown, K. F. (2015). [To act in concert: Environmental communication from a social movement lens](#). In A. Hansen & R. Cox (eds.), *The Routledge handbook of environment and communication* (pp. 131-143). New York & London: Routledge. This chapter summarizes three approaches to designing communication campaigns: a social marketing model, which involves testing messages that aim to induce individual attitudinal and behavioral changes in target populations; a media advocacy model focused on advancing short-term policy objectives by mobilizing support through the mass media; and a social movement or social justice model, which prioritizes building community members’ skills so they can participate directly in communication campaigns. The social justice model, used in the Sierra Club’s “Beyond Coal” campaign and Green for All’s “Green Jobs” campaign, has proved especially apt to scholarly collaborations with environmental justice groups.

Van der Linden, S., Maibach, E., & Leiserowitz, A. (2015). [Improving public engagement with climate change: Five “best practice” insights from psychological science](#). *Perspectives on Psychological Science*, 10(6), 758-763. Introduction to and summary of research on effective climate communication.

Van der Linden, S. (2021). [The Gateway Belief Model \(GBM\): A review and research agenda for communicating the scientific consensus on climate change](#). *Current Opinion in Psychology* 42, 7-12. Summary of research on effective climate communication.

Story of Stuff Project (2010). [The story of electronics](#). Video introduction to the environmental and health impacts of communication devices and consumer electronics.

Computer Science

Mishra, A., & Mishra, D. (2020). [Sustainable software engineering education curricula development](#). *International Journal on Information Technologies & Security*, 12(2), 47–56. “Our technology influenced daily life style involves many software and apps which are used by large





society and their use is increasing than ever before. Sustainability is a significant topic for future professionals and more so for Information Technology (IT) professionals and software engineers due to its impact on the society. It is significant to motivate and raise concern among students and faculty members regarding sustainability by including it into Software Engineering curriculum.”

Koniukhov, S., & Osadcha, K. (2020). [Implementation of education for sustainable development principles in the training of future software engineers](#). “The article examines the professional training of future software engineers in higher education institutions in the context of the implementation of the Sustainable Development Goals set by the UN General Assembly, as well as the Education for Sustainable Development (ESD) principles.”

Porras, J., Rondeau, E., Andersson, K., Silva, V. M. P., & Penzenstadler, B. (2019). [Experiences from five years of educating sustainability to computer science students](#). In J. P. Davim (Ed.) *Engineering Education for Sustainability*, River Publishers. “This chapter presents a sustainability-focused ICT programme that builds on top of common SE curricula like SWEBOK and sustainability frameworks by Cai, Rusinko, and Mann. We observe across the past five years how the thesis topics as well as the prevalent industry collaborations have slightly shifted but largely covered all pillars of sustainability.”

Suryawanshi, K., & Narkhede, S. (2015). [Green ICT for sustainable development: A higher education perspective](#). *Procedia Computer Science*, 70, 701-707. “Sustainable development challenges universities around the world to rethink their missions and to reform their courses and life on campus. ICT professionals and students who are future leaders of the nation are progressively exposed to thinking of sustainability. This paper presents evolution of Green ICT and discusses the barriers in implementation of Green ICT at higher education institutions based on survey conducted in India.”

Gordon, N. (2010). [Education for sustainable development in Computer Science](#). *Innovation in Teaching and Learning in Information and Computer Sciences*, 9(2), 1-6. “In this paper we will consider some of the aspects related to the teaching of sustainable development within the Higher Education computing curriculum — including students’ views on the relevance of this to their education, grounded on the outcome from a case study on student attitudes to this topic. The inclusion of sustainable development material within the curriculum can link with the professional development and career planning of students, as well as providing an appropriate vehicle for the teaching of ethics and exploring issues of social responsibility.”

COVID-19

Cohen, M. J. (2020). [Does the COVID-19 outbreak mark the onset of a sustainable consumption transition?](#)





Wang, Q., & Su, M. (2020). [A preliminary assessment of the impact of COVID-19 on environment—A case study of China](#). *Science of the Total Environment*, 138915. “This paper takes China as a case study, comprehensively evaluating the dynamic impact of COVID-19 on the environment. The analysis results indicate that the outbreak of COVID-19 improves China's air quality in the short term and significantly contributes to global carbon emission reduction. However, in the long run, there is no evidence that this improvement will continue. When China completely lifts the lockdown and resumes large-scale industrial production, its energy use and greenhouse gas (GHG) emissions are likely to exceed the level before the event.”

Zambrano-Monserrate, M. A., Ruano, M. A., & Sanchez-Alcalde, L. (2020). [Indirect effects of COVID-19 on the environment](#). *Science of The Total Environment*, 138813. “This research aims to show the positive and negative indirect effects of COVID-19 on the environment, particularly in the most affected countries such as China, USA, Italy, and Spain. Our research shows that there is a significant association between contingency measures and improvement in air quality, clean beaches and environmental noise reduction. On the other hand, there are also negative secondary aspects such as the reduction in recycling and the increase in waste, further endangering the contamination of physical spaces (water and land), in addition to air. Global economic activity is expected to return in the coming months in most countries (even if slowly), so decreasing GHG concentrations during a short period is not a sustainable way to clean up our environment.”

Design Thinking

Delaney, E., & Liu, W. (2021, August). [Sustainability and design education: the current status of product design higher education in the UK](#). In *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference* (Vol. 85406, p. V004T04A008). American Society of Mechanical Engineers. “The aim of sustainability is to fulfil the needs of current generations without compromising the needs of future generations. It is also a rising area of concern within industry, it is therefore important that graduate designers are equipped with the skills to accommodate sustainability issues as well as demands from industry. Additionally, the product design stage during New Product Development has been identified to have the greatest impact on the sustainability of the entire product, however how educated designers are on the topic of sustainability is unclear. An initial literature review has been conducted to investigate design education on sustainability as well as teaching styles. Following this the study identifies and reviews UK Product Design courses to establish the current status of sustainability integration in higher education. The exploration into university prospectuses has





found that around half of UK universities implement sustainability in some way, however there are limited courses which dedicate specific modules to sustainability. Additionally, links with industry and accreditation organizations between UK product design courses have been confirmed, but there is no definite information to suggest that the universities use this to aid in the implementation sustainability education. From this review future research directions have been outlined.”

Terzioğlu, N., & Wever, R. (2021). [Integrating repair into product design education: Insights on repair, design and sustainability](#). *Sustainability*, 13(18), 10067. “With the pressure of growing environmental problems, the world is changing, and so is the paradigm of design. Accordingly, the calls for change in design education are increasing throughout the literature day by day. As the designers of the future, students must be prepared for alternative scenarios. This paper provides insights into students’ learning outcomes and competencies related to repair and sustainability in the context of an assignment that integrates repair into design education. This assignment has been part of the master’s degree design course at Linköping University for the last 3 years. During these 3 years, 52 repair projects, including a diverse range of products, were developed. Aiming to find out the insights of this process, focus group sessions were conducted. As a result of these focus group sessions, 12 insights were developed, such as the concepts of brokenness, designed repair, and repair-worthy objects. Findings show that practices of repair constitute complex sites of learning, technical skill and knowledge which could enable novice designers to become competent in circular design. This paper is of value for design educators and researchers, especially those concerned with the repair and circular economy, as it can facilitate future attempts to further integrate circular strategies into design education.”

Watkins, M., Casamayor, J. L., Ramirez, M., Moreno, M., Faludi, J., & Pigosso, D. C. (2021). [Sustainable product design education: Current practice](#). *She Ji: The Journal of Design, Economics, and Innovation*, 7(4), 611-637. “Current production and consumption patterns are unsustainable, causing irreversible damage to the environment and human health and well-being. Designers play a vital role in resolving this problem—their decisions affect product manufacturing, distribution, use, and disposal—and hence they must be aware of the positive and negative impacts of their design decisions. Sustainable product design education is key to developing the knowledge, skills, and responsibility required for future generations of product designers and their educators to make informed and responsible decisions within their practice, and also enhance the social and environmental performance of their creations and effectively communicate the value of such decisions within a commercial context. In this article, we present insights and challenges in contemporary sustainable product design education in higher education. We document the experiences of six academics involved in teaching and researching sustainable product design in the United Kingdom, Australia, Denmark, the Netherlands, and





the United States. We hope to provide a useful reference for academics seeking to adopt sustainable product design practices in their existing programs, develop new sustainable product design education programs, or reflect on their own existing product design practice.”

Earle, A. G., & Leyva-de la Hiz, D. I. (2020). [The wicked problem of teaching about wicked problems: Design thinking and emerging technologies in sustainability education](#). *Management Learning*, 1-23. This paper explores “the system-level challenges found in sustainability-focused education and consider how the intersections of design thinking and emerging technologies in augmented and virtual reality (AVR) can help address these. More specifically, we highlight the role of experiences across the design thinking process for generating novel solutions to the types of “wicked” problems with which students engage in sustainability education. We then use this as motivation, along with concepts from experiential learning and design thinking research, to develop a conceptual model in which AVR can integrate with more established instructional methods to help make sustainability-related challenges more salient, proximate, and tractable to students.”

Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., ... & Süßbauer, E. (2019). [Design thinking for sustainability: Why and how design thinking can foster sustainability-oriented innovation development](#). *Journal of cleaner production*, 231, 1248-1257. “Sustainability-oriented innovations (SOI) are indispensable to enable sustainable consumption and production. However, their multidimensional character makes the development of SOI an often difficult task for companies. This article addresses four major challenges which are in particular associated with SOI development, including defining an adequate innovation scope, considering various stakeholders and identifying related user needs and sustainability effects. This article explores why and how design thinking can foster the development of SOI.”

Andrews, D. (2015). [The circular economy, design thinking and education for sustainability](#). *Local Economy*, 30(3), 305-315. “The origins of the Linear Economy – the ‘take-make-use-dispose’ model of consumption – date from the Industrial Revolution and the global economy developed around this model. Various social, economic and environmental factors mean that it is no longer sustainable. A radical new model – the Circular Economy – is being advocated but as yet it is not widely practiced. This paper proposes that designers are crucial to the development of this new economic model; furthermore, this model facilitates education for sustainability and enhances employability.”

Fischer, M. (2015). [Design it! solving sustainability problems by applying design thinking](#). *GAIA-Ecological Perspectives for Science and Society*, 24(3), 174-178. Environmental and sustainability problems create an ongoing need to further develop the toolbox of sustainability science. The method “design thinking”, originally applied in design engineering and business,





serves as a tool to find the simplest and most likely explanation for a problem. It consists of a specific logical inference: starting from an observation, a theory which accounts for the observation is developed in a collaborative process.”

Young, G. (2010). [Design thinking and sustainability](#). *Zumio Meaningful Innovation*, 61(0), 1-27. “This paper briefly explores the impacts of design on business before providing a working definition and overview of the key themes of design thinking. It then outlines commonly recognised environmentally-focused sustainable design principles and considers how design thinking could be applied in support of these.”

Economics

Kahn, M. (n.d). [Environmental and urban economics](#). LegalEd. Collection of videos lectures and lessons from a UCLA Law professor.

Bergstrom, J. C. & J. C. Whitehead (2022). [Teaching environmental and natural resource economics: Paradigms and pedagogy](#). Cheltenham, UK: Edward Elgar. See Part II of the book on pedagogies for incorporating environmental justice, policy briefs, technological applications for teaching conservation biology and ecosystem service management examples, natural resource and environmental valuation techniques, energy, air pollution, and climate change.

Venkatesan, M. (2021). [Addressing the Relationship between Economics and Climate Change: A Discussion of Principles](#). *Mary Ann Liebert Inc*. “The majority of US colleges and universities have a degree requirement related to the principles of economics. As a result, nearly all college students have some exposure to economics during their undergraduate program. However, the practical applicability of economics to present observable outcomes is not often addressed in standard textbooks. This exclusion limits the opportunity to foster needed and urgent changes in human behavior and further, limits the questioning of the relationship between economics and sustainability. This article reviews the most widely used macroeconomics textbook, *Principles of Economics* by N. Gregory Mankiw, specific to the discussion of climate change. The article authors argue for the explicit inclusion of climate change in macroeconomics textbooks and conclude with survey outcomes resulting from exposure to an integrated approach of economics and sustainability at the introductory economics level.”

Venkatesan, M. (2020). [Teaching introductory economics to promote sustainability](#). *New Directions for Teaching and Learning*, 161, 53-71. “This chapter addresses how sustainability can be incorporated within the Principles of Microeconomics and Principles of Macroeconomics curriculum.”





Venkatesan, M. (2015). [Sustainability in the curriculum and teaching of economics: transforming introductory macroeconomics](#). *American Journal of Educational Research*. “Following a discussion of the impact of consumer-led growth on sustainability parameters: the environment, economic and social equity, this paper provides an explicit linkage between the measure of economic progress in universal use, GDP, and the degradation to common global resources, connecting the endogeneity present between the modeling of economic growth and the values and behaviors that support the outcome of the very same growth. A discussion of the present teaching methods specific to introductory macroeconomics provides the foundation for an innovative, replicable, and grant-funded case study for introducing sustainability.”

Venkatesan, M. (2015). [The values foundation of incorporating sustainability into the economics curriculum](#). *Sustainability: The Journal of Record*, 8(2), 76-84. “The purpose of the study was to raise awareness of the implications of individual purchasing decisions and to, specifically, initiate students in self-evaluation of their individual values and the values embedded in their individual consumption behavior. The results of the study promote the view that increasing awareness of the holistic impact of consumption behavior may be a significant catalyst to promoting sustainability.”

Mearman, A., & Plumridge, A. (2012). [Embedding sustainability in the Economics curriculum](#). *The Economics Network*. Brief guide to integrating the teaching of sustainability across the Economics curriculum, with examples and cases.

Maxfield, S. (2011). [Teaching economics to business students through the lens of corporate social responsibility and sustainability](#). *Journal Of Economic Education*, 42(1), 60-69. “Corporate “social-issues management” courses are often taught without in-depth reference to economics, but they afford an opportunity both to review ground-level microeconomics issues including pricing and profit maximization under different market structures and to introduce more advanced topics such as externalities, introductory game theory, information asymmetry, antitrust law, and network and innovation economics. In a corporate social-issues management course grounded in economics, these concepts can be taught hand-in-glove with their relevance to the practice of corporate citizenship and sustainability.”

Sahlberg, P., & Oldroyd, D. (2010). [Pedagogy for economic competitiveness and sustainable development](#). *European Journal of Education*, 45(2), 280-299. “This article argues that the bureaucratic ‘industrial’, standards-driven model of schooling currently fails to release the talents of students either for the competitiveness or collaboration that will be crucial in facing the demands of the decades ahead. It argues for policies, schools and pedagogies that promote creativity and a human capacity for innovation, not the relentless pursuit of externally imposed





measurable standards. The types of necessary learning experiences are explored and examples are provided of principles and practices that teachers and schools need to develop further. Education for economic competitiveness on one hand and education for sustainable development on the other both require similar open minds, creative skills and teaching methods to prepare students for the transformations and innovations ahead.”

Milani, S. (2023). [Teaching environmental macroeconomics to undergraduate students](#). *Eastern Economic Journal*, 1-17. “Since environmental economics is typically under the umbrella of microeconomics, there is less emphasis on macroeconomic issues in undergraduate-level environmental economics textbooks. This presents a significant content deficiency because it limits the discussion of global environmental policy and growth. In this paper, I propose a simplified version of Brock and Taylor (J Econ Growth 15(2):127–153, 2010)’s “green” Solow model that is accessible for undergraduates. I assume that the growth rate of emissions is equal to the growth rate of capital per effective worker in addition to several omissions. The result is a restatement of the model that requires no calculus or differential equations to understand. I also discuss how this stand-alone content can be taught to students of different skill levels and in various class formats as a complement to empirical applications.”

Reardon, J. (2023). [Suggestions for incorporating sustainability into Principles of Microeconomics](#). In M. Maier & P. Ruder (Eds.), *Teaching principles of microeconomics*, (pp. 108-122). Edward Elgar. DOI: [10.4337/9781800374638.00017](https://doi.org/10.4337/9781800374638.00017) “This chapter offers helpful suggestions for instructors to implement the concept of sustainability in the Principles of Microeconomics course. Students are very interested (and worried and anxious) about their future and look to economics to help them understand the world they live in, learn how they can prepare, and mitigate, and, for some, gain the power to change. Incorporating the suggestions offered in this chapter will go a long way to help students better engage in their world.”

Education

[North American Association for Environmental Education](#) - A broad array of resources for environmental educators, mostly focused on K-12, but adaptable to higher education.

Sustainability in Higher Education Journals:

- [Sustainability: The Journal of Record](#)
- [International Journal of Sustainability in Higher Education](#)
- [The Journal of Sustainability Education \(JSE\)](#)





- [Journal of Education for Sustainable Development](#)
- [Journal of Environmental Studies and Sciences](#)
- [Journal of Teacher Education for Sustainability](#)
- [Environmental Education Research](#)

K-12 Education

See also: *Campus as a Living Lab for Applied Learning*

[North American Association for Environmental Education](#) - A broad array of resources for environmental educators, mostly focused on K-12. See especially the NAAEE's [K-12 Environmental Education: Guidelines for Excellence](#) and [A Framework for K-12 Science Education](#) and [College, Career, and Civic Life Standards](#).

[Environmental and Climate Change Literacy Projects](#) - the initiative's goal is to "educate all of California's high school graduates to be literate in climate change and environmental justice issues and solutions" by working to advance "PK-12 climate and environmental literacy, justice and action through an innovative partnership between the UC-CSU systems". See their [projects](#) and [steps to get involved](#) for more information.

[Ten Strands](#) - an initiative that works "collaboratively with state government, local education agencies, environmental education providers, community-based organizations, and funders to ensure that teachers have access to high-quality instructional materials that address Common Core State Standards, Next Generation Science Standards, History–Social Science Standards, and support English language learners".

[Laudato Si' Interdisciplinary Secondary School Curriculum](#) - an example of the integration of *Laudato Si'* in grades 9-12 curriculum by the Carmelite NGO. Disciplines include Environmental Science, Theology 1 & 2, Humanities, and Social Studies.

[Spiritual Ecology Course at Bishop O'Dowd High School](#) - a religious studies class at Bishop O'Dowd High School. "This course provides students with both a conceptual and applied understanding of spiritual ecology. Through theological reflection, experiential place-based learning, and anthropological study, students will explore the spiritual dimensions of the environmental movement. Foundations of environmental stewardship in the teachings of the Catholic Church and other faith traditions will be explored in depth. Indigenous wisdom about right relationship with the earth will be contrasted with modern-day destructive cultural and





behavioral practices. The studies and activities in this course will call on students to work regularly in nature, and to develop tangible pathways to put kinship with creation into daily practice. Furthermore, the course invites students to work personally and collectively as catalysts for bringing forward an environmentally sustainable, spiritually fulfilling, socially just human presence on this planet.”

Downs, M., & Yeqhoian, A. (2021). [Charism call to kinship with creation: Story from the living lab. Digital Content Experience Platform](#). *Momentum*. This article highlights the importance of the integration of environmental education in Catholic educational institutions in relation to *Laudato Si'*. It also summarizes efforts taken by the *Laudato Si'* Action Platform's Educational Institutions Working Group to “develop frameworks for schools that exist to “promote best practice, to stimulate creativity in seeking new solutions and to encourage individual or group initiatives” (*Laudato Si'*, 137)”.

Lê, K. T. (2021). [Teaching Climate Change for Grades 6–12: Empowering Science Teachers to Take on the Climate Crisis Through NGSS](#). Routledge. “[This] book supports and enables secondary science teachers to develop effective curricula ready to meet the Next Generation Science Standards (NGSS) by grounding their instruction on the climate crisis. Nearly one-third of the secondary science standards relate to climate science, but teachers need design and implementation support to create empowering learning experiences centered around the climate crisis. [Lê] provides an overview of the teaching shifts needed for NGSS and to support climate literacy for students via urgent topics in climate science and environmental justice – from the COVID-19 pandemic to global warming, rising sea temperatures, deforestation, and mass extinction. You’ll also learn how to engage the complexity of climate change by exploring social, racial, and environmental injustices stemming from the climate crisis that directly impact students ... [A]dditional teacher resources are also available at www.empoweredscienceteachers.com/teacher-resources.html.”

Linkwitz, M., & Eilks, I. (2022). [An action research teacher's journey while integrating green chemistry into the high school chemistry curriculum](#). *Sustainability*, 14(17), 10621. “In recent years, a growing number of publications have emerged discussing how to integrate education for sustainable development (ESD) and systems thinking into science education in general, and chemistry education in particular. However, when it comes to more specific fields of chemistry education, most studies focus almost exclusively on higher education. Examples of ESD units in secondary chemistry teaching are mostly limited to single topics. They often do not explicitly deal with the theoretical concepts behind green or sustainable chemistry. This paper reports on a long-term initiative to develop secondary chemistry education. This effort attempts to thoroughly integrate ESD based on the concept of green chemistry into high school programs.





The project is based on teacher-centered action research, a cyclical development and research approach within authentic classroom practice. The process was supported by an academic chemistry education research group and a network of experienced action research teachers. The current paper describes the development of a teaching sequence for first-year upper secondary chemistry education. Elements of the development and selected findings from the accompanying feedback processes are reported.”

Steindam, C. (2022). [Healing Earth in a time of crisis: Curriculum for integral ecology](#) (*Doctoral dissertation, Loyola University Chicago*). “This intrinsic multiple case study examined secondary- and university-level educators’ experiences teaching with Healing Earth, a curriculum developed by the International Jesuit Ecology Project at Loyola University Chicago, which merges scientific, social, spiritual, and ethical analyses of pressing ecological issues. Based on the conceptual framework of integral ecology, Healing Earth is a response to Pope Francis’s (2015a) call for “a new way of thinking about human beings, life, society and our relationship with nature” (§215). This study primarily consisted of in-depth interviews with educators who have used Healing Earth in a variety of secondary and post-secondary Catholic educational contexts. A preliminary survey, which was completed by 12 educators, generated additional data. Six themes emerged in the data analysis: community and collaboration, engagement across diverse contexts, spiritual ecology in a Catholic context, perceiving Earth’s intrinsic value, generating hope, and taking action. The findings offer insight into challenges, opportunities, and hope for a courageous, truthful, spiritually and ethically grounded approach to teaching ecology in a time of crisis.”

Rushton, E. A. (2021). [Building teacher identity in environmental and sustainability education: The perspectives of preservice secondary school geography teachers](#). *Sustainability*, 13(9), 5321. “Geography teachers have an important role within environmental education and, in England, are developing their professional identities at a time when environmental education is contested. This study considers the experiences of five trainee secondary school geography teachers who are all part of a university-based teacher education programme rooted in an environmental justice approach. Data is drawn from three interviews with each of five individuals over the course of their training (15 interviews in total) and participants’ written reflections. Findings include (1) teachers draw on a range of approaches to implement Environmental and Sustainability Education (ESE), (2) teachers share and value their own and their students’ stories of and personal connections with the environment and (3) teachers seek to enable young people to bring about change to their lives and communities. The contested nature of foregrounding ESE in the geography classroom is noted, as are the tensions and emotional load that teachers experience when seeking to develop their professional identity. Reflections are shared regarding the ways in which PGCE programmes provide teachers with opportunities to build ESE identities, in particular the role of semi-structured, reflexive interviews in providing an





important space for identity work that could be usefully considered within the broader context of the newly implemented Early Career Teacher framework for England.”

Mendoza, L., Rumble, B., & Share, J. (2020). [For the love of nature: Bringing environmental justice to urban elementary students](#). *Journal of Sustainability Education*. “This essay explores the role of critical pedagogy in environmental justice education. We discuss the need for teaching a love of nature (biophilia) as an entry point for developing a caring relationship and sense of stewardship with the natural world. Place-based education and ecopedagogy offer liberatory potential to make education more transformative and focused on the intersections between social and environmental justice. After discussing theoretical approaches of ecopedagogy and indigenous perspectives, we describe a project in which a principal converts the hardscape at two schools into natural habitats and a new teacher engages her students in ecopedagogy.”

Baines, C. P. (2018). [Integrating sustainability education into a high school earth/environmental science course](#) (Doctoral dissertation, Appalachian State University). “This action research study investigated ways to incorporate sustainability education into a rural public high school’s Earth/Environmental Science course. State essential standards were organized around four sustainability themes with the goal to teach students to understand the interconnectedness of Earth’s cultural, economic, and ecologic systems. Student responses to the action were analyzed. Results revealed that sustainability-based thematic teaching allowed for space to explore complex sustainability content that interwove ecological literacy, economic system critique, and equity/social justice. It also allowed for diverse, critically questioning perspectives that were often rooted in a local context, encouraging students to become engaged, critical thinking citizens of their local and global communities. The restructured thematic course provided a more flexible curriculum that enabled more time to engage in a participatory and experiential teaching and learning process. The public action step involved the creation of a publicly accessible pacing and curriculum guide that can be utilized by other educators.”

Cosmi, C., Pietrapertosa, F., Sarricchio, G., Giordano, M., Proto, M., Tancredi, M., & Salvia, M. (2018). [Schools4energy: A living laboratory for energy awareness in schools](#). In *Proceedings of the Research and Innovation Conference Proceedings* (pp. 272-286). “Schools4energy is a laboratory of sustainable experimentation for the implementation of good practices that aims to promote conscious and virtuous energy behaviors and energy efficiency in the schools. The activities, developed in the framework of the INTERREG MED PrioritEE project, involve the students, the teachers and the staff personnel of Primary and Lower Secondary Schools of the Municipality of Potenza. The Schools4energy laboratory is made up of three integrated modules (School race, Artists for energy, Energy at stake) based on different methodologies (analytical methods, co-creation and gamification) in order to increase the interest and the involvement of





students and enhance their preferences and talents. The proposed activities pursue multiple objectives: to increase students' knowledge and skills on energy, to raise awareness on energy consumption, to encourage energy consumption reduction, to promote behavioral changes.”

Karetny, E. J. (2017). [Exploring the potential to motivate high school environmental science students with environmental justice: A mixed methods approach](#). Rowan University. “The purpose of this mixed-methods, design-based study was to explore the potential for socioscientific issues framed by the environment to motivate high school environmental science students. The embedded design began and ended with a survey of student dispositions, and included interviews of particular students in an effort to capture views of general and personal dispositions. Statistical analyses uncovered a moralistic approach to environmental decision-making, and a positive outlook of the future, including the confidence to solve environmental problems. Students revealed an abstract notion of the environment that requires innovative approaches to teaching environmental science, and view scientists as essential change agents in the face of environmental challenges. In addition, a socioscientific approach framed by environmental justice empowers as well as motivates students. However, a STEM-based approach alone is insufficient to motivate high school students. The data from this study suggests the need to changes in environmental science pedagogy as well as a critique of the Next Generation Science Standards.”

Morales-Doyle, D. (2017). [Justice-centered science pedagogy: A catalyst for academic achievement and social transformation](#). *Science Education*, 101(6), 1034-1060. “Longstanding inequities in science education across the lines of race and class remain the most intractable problem in the field. Justice-centered science pedagogy is introduced as a theoretical framework built on the traditions of critical pedagogy and culturally relevant pedagogy to address these inequities as components of larger oppressive systems. This study examines how a justice-centered advanced chemistry class in an urban neighborhood high school supported students to succeed academically while taking up urgent issues of social and environmental justice identified by their communities. The findings include evidence that curriculum organized around an issue of environmental racism supported academic achievement that exceeded the expectations of a typical high school chemistry course. The findings also document how the curriculum provided opportunities for students to move beyond academic achievement to position themselves as transformative intellectuals. As transformative intellectuals, students demonstrated complex thinking about science and social justice issues, cultivated their commitment to their communities and cultures of origin, and developed credibility as local youth knowledgeable in science. These findings have implications for teachers, teacher educators, and educational researchers who wish to engage with science education as a catalyst for social transformation.”





Fredrickson, N. (2016). [Designing a course integrating critical pedagogy, fantasy literature, and religious studies](#). *Fantasy Literature: Challenging Genres*, 57-76. “This chapter is intended as an aid for designing either a full course on the intersection of critical pedagogy, fantasy literature, and religious studies or at least material for one or two lessons along these lines in a course in religious studies or English, based on the conviction that teachers of both literature and religion may benefit from each other’s critical insights and material. Furthermore, this chapter’s proposals will hopefully be flexible enough to aid course development for high school, undergraduate, or graduate levels.”

DeFelice, A., Adams, J. D., Branco, B., & Pieroni, P. (2014). [Engaging underrepresented high school students in an urban environmental and geoscience place-based curriculum](#). *Journal of Geoscience Education*, 62(1), 49-60. “High school students in a large urban area, undergraduate students, and geoscience faculty at a local college used a place-based pedagogical approach to engage in real geoscience problem-based inquiry in a local urban park. The overarching goals of this project were to learn the potential of place-based geoscience research experiences to: influence students' science identities and increase participation of urban youth in science. Student researchers participating in the activity (N = 22) completed Likert-scale pre- and post-surveys, which were analyzed using paired t-tests. Student journal reflections were analyzed. Survey and journal reflection results showed that students' science identities were enhanced and student interest in learning science outdoors increased through participation in the program. The evaluation of the project outcomes add to the body of knowledge describing how outdoor settings and place-based pedagogies can be used to increase urban students' interest in science, and demonstrates how students working with scientists who conduct research in students' communities can be a source of motivation for studying sciences and identity development.”

Dimick, A. S. (2012). [Student empowerment in an environmental science classroom: Toward a framework for social justice science education](#). *Science Education*, 96(6), 990-1012. “Social justice education is undertheorized in science education. Given the wide range of goals and purposes proposed within both social justice education and social justice science education scholarship, these fields require reconciliation. In this paper, I suggest a student empowerment framework for conceptualizing teaching and learning social justice science education in classroom settings. I utilize this framework to analyze the case study of a high school environmental science classroom in the United States where the teacher and students created environmental action projects that were relevant to their community. I examine how social, political, and academic empowerment were or were not enacted within the classroom and argue for educators to give heed to all three simultaneously to mediate student empowerment while working toward social justice science education.”





Assessment of Student Learning

North American Association for Environmental Education - [K-12 Environmental Education Standards](#). Influential assessment framework from major environmental education association.

Rammel, C., Velazquez, L., & Mader, C. (2016). [Sustainability assessment in higher education institutions: What and how?](#) In M. Barth, G. Michelsen, M. Rieckmann, & I. Thomas (Eds.), *Routledge handbook of higher education for sustainable development*. New York: Routledge. This handbook “gives a systematic and comprehensive overview of existing and upcoming research approaches for higher education for sustainable development. It provides a unique resource for researchers engaged in the field of higher education for sustainable development by connecting theoretical aspects of the range of relevant methodologies, showing the interdisciplinary aspects of the research field and illustrating the breadth of research directions. Key relevant topics include: Research Paradigms and Methodologies, Challenges for Implementation, Action Research and Transdisciplinary Perspective, Operationalising Competencies, Outcome-Oriented Research, Curriculum Change, Organisational Change and Organisational Learning, Community and Partnerships, University Appraisal Systems and Indicators, Evaluation Approaches, Engaging Academic Teachers, Good Practice Learning and Teaching, and Transformative Leadership and Change Strategies,” and more.

Libarkin, J. C. (2014). [Evaluation and assessment of civic understanding of planet Earth](#). In D. Dalbotten, P. Hamilton, & G. Roehrig (Eds.), *Future Earth - Advancing civic understanding of the Anthropocene* (pp. 41-52). Washington, DC: American Geophysical Union. Summary of a broad range of criteria and instruments for assessing environmental education.

Stevenson, R. B., Brody, M., Dillon, J., & Wals, A. E. (2013). [International handbook of research on environmental education](#). New York: Routledge. See the introduction to and essays in section IV, which suggest assessment criteria that extend beyond mainstream measures, including indigenous ways of knowing, etc.

Caeiro, S., Leal Filho, W., Jabbour, C., & Azeiteiro, U. (2013). [Sustainability assessment tools in higher education institutions: Mapping trends and good practices around the world](#). Cham, Switzerland: Springer International Publishing. “This book contributes to debates on current sustainability practices, with a focus on assessment tools as applied in higher education institutions. These institutions are challenged to carry out management, research, and teaching, and to create settings that allow developing new competencies to address the complex global environmental, social, cultural, and economic pressures with which current and future generations are confronted.” Main topics include: Rethinking sustainability in higher education, Researching sustainability assessment frameworks, Reorienting the curricula, and more.





Educational Leadership

Burns, H., Diamond-Vaught, H., & Bauman, C. (2015). [Leadership for sustainability: Theoretical foundations and pedagogical practices that foster change](#). *International Journal of Leadership Studies*. “This paper examines and weaves together literature on leadership, leadership development, and sustainability education to suggest best practices in leadership development. A variety of suggested pedagogical practices that foster the development of leaders include: observation and self-awareness, reflection, the exploration of ecological and diverse perspectives, and learning experientially and in community.”

Bottery, M. (2011). [Refocusing educational leadership in an age of overshoot: Embracing an education for sustainable development](#). *International studies in educational administration*, 39(2). “This article argues that many of the aims and objectives of educational leadership need to be re-focused upon a largely neglected issue, that of an education for sustainable development (ESD). This article suggests one way in which this area might be conceptualised, and argues that an appreciation and development of more sustainable schools should lead to a refocusing of the work of educational leaders. Such refocusing would also present new challenges for educational leaders, for it will initiate debates about what constitutes a 'good society', about permissible levels of economic growth and consumption, about how to address current and future problems, and what actions need to be taken to achieve these.”

Science Education

Morales-Doyle, D., Childress Price, T., & Chappell, M. J. (2019). [Chemicals are contaminants too: Teaching appreciation and critique of science in the era of Next Generation Science Standards \(NGSS\)](#). *Science Education*, 103(6), 1347-1366. “This article examines the tensions that arose as teachers, scientists, youth, and community organizers worked to develop a curriculum that was responsive to community concerns and the Next Generation Science Standards (NGSS) ... Whereas the scientific enterprise and chemical industry produce harms and benefits, the NGSS focus on benefits and ignore that both harms and benefits of science are unevenly distributed. Given the pressure on teachers to implement the NGSS, this paper presents examples from collaborative curriculum development efforts that meet PEs while pushing students to ask critical questions and engage with their communities to challenge the standards' alignment with the chemical industry.”





Patterson, A., & Gray, S. (2019). [Teaching to transform: \(W\)holistic science pedagogy](#). *Theory into Practice*, 58(4), 328-337. “We offer the (W) holistic Science Pedagogy (WSP), a student-centered approach of instruction to disrupt patterns and hierarchies. The WSP approach requires 5 commitments from the teacher: A commitment (1) to an ever-developing self-awareness, (2) to science and its practices, (3) to science as a transformative agent, (4) to their students’ social emotional wellness, and (5) to restorative practices. In this article, we define the 5 commitments and present an example lesson that reflects the commitments.”

Morales-Doyle, D. (2017). [Justice-centered science pedagogy: A catalyst for academic achievement and social transformation](#). *Science Education*, 101(6), 1034-1060. “This study examines how a justice-centered advanced chemistry class in an urban neighborhood high school supported students to succeed academically while taking up urgent issues of social and environmental justice identified by their communities. The findings include evidence that curriculum organized around an issue of environmental racism supported academic achievement that exceeded the expectations of a typical high school chemistry course. The findings also document how the curriculum provided opportunities for students to move beyond academic achievement to position themselves as transformative intellectuals.”

Engineering (General, Mechanical, and Civil)

Fedkin, M. (n.d.) [Technologies for sustainability systems](#). Excellent OER courseware, with lesson plans that teach about a wide range of approaches to sustainable design and engineering.

Abd-Elwahed, M. (2020). [Sustainability awareness in engineering curriculum through a proposed teaching and assessment framework](#). *International Journal of Technology and Design Education*. “Engineers play a vital role in enabling the sustainable development of their societies. Thus, it is necessary to teach sustainability in universities, especially for engineering students, for a more sustainable future. The present work aims to measure and enhance engineering students’ awareness of sustainability by monitoring and evaluating learning and student outcomes during the last stages of an engineering curriculum and its culminating major design experience. A questionnaire to assess students’ awareness of sustainability and its tools is implemented. From this empirical study, obstacles to the awareness of sustainability through engineering education are discussed. The analysis of the results of the questionnaire implies the modification of the structure of senior projects and other capstone design courses in order to include a proposed teaching and assessment framework. This framework emphasizes students’ ability to understand and use effective sustainability tools, within the environment of their major design experience. The framework is composed of two paths. The first path concerns course





design through which sustainability concepts and methods are included in several course elements. The second path addresses the assessment of the attainment of sustainability objectives by the students.”

Talib, C. A., Aliyu, H., Aliyu, F., Maimun, A., Malik, A., Anggoro, S., & Ali, M. (2020). [Integration of robotics into STEM education for facilitating environmental sustainability](#). *Solid State Technology*, 63(1s), 767-783. “This day, increasing attention demonstrated in developing innovative tools for improved teaching and learning of Science, Technology, Engineering, and Mathematics (STEM) for environmental sustainability made robotics not only an outstanding tool for hands-on learning but of general topics in educational institutions. Robotics help learners transmute abstract scientific, engineering and technological concepts into concrete one for the understanding real-world environment, hence countries like China, Japan, Russia and the United State of America organized robotic competitions for secondary school STEM subjects to cultivate in students, the intelligence and talent in the future/upcoming generation. This study is a quantitative research that investigated the feasibility of integrating robotics into STEM education to facilitate classroom instruction in secondary schools. The undergraduate and postgraduate students of two technology based universities from different continents were chosen as the respondents of the study. The study, which adopts purposive sampling technique distributed an online survey of 357 respondents for which 197 responses were retrieved and are analyzed using Statistical Package For Social Science 25.0. The results indicated that the majority of the respondents (mode, 5) agreed that robotics could be used to teach programming, problem-solving for STEM subjects, design and even music and art to learners at all levels of their education. Moreover, over 80% strongly agreed that integrating robotics in teaching and learning processes would facilitate the classroom instructions. Thus, it is high time for educators to encourage the development and implementation of robotics in the instructional processes.”

Santiago, A. R., Pineda-Briseño, A., & Edinbarough, I. (2019, June). [Assistive technology based on IoT in building automation: A multidisciplinary engineering project](#). In *2019 ASEE Annual Conference & Exposition*. “Nowadays, most of our daily activities can be performed indoors; according to the Environmental Protection Agency (EPA), on average, an American spends 90% of their life indoors. Although multiple efforts towards sustainability have been implemented, indoor comfort and efficiency are still requiring numerous improvements. Therefore, continuous studies and advancement in building efficient design and user comfort are becoming vital to achieving the principles of sustainability, without altering the user activities and avoiding a negative impact on the environment. The green building evaluation and certification rating system Leadership in Energy & Environmental Design LEED®, developed by the United States Green Building Council (USGBC), has been committed to change the way professionals design buildings, and develop construction methods and techniques, to positively affect how the users perceive and interact with the built environment. This paper does not limit to the description of





the rating system elements, yet, it does emphasize the important role performed by the engineering technology professional in technology applications. The paper includes a preliminary description of the importance of sustainability in the built environment; it discusses how home automation provides the professionals and the users with multiple methods on technology application and adaptation, to minimize the negative impact in energy consumption, to positively affect the economics and social aspects of the built environment. Commonly used automated and control systems and the importance of a nonintrusive approach is described, for example, automation and climate (HVAC) control, energy control, and lighting control. The importance of including sustainable practices and assignments in undergraduate engineering education is described in the Assistive Design and Home Automation Technology project: a project-based learning model with the use of microcomputers as part of the teaching and learning process, developed to provide the students with a hands-on approach to test the proposed assistive automation system. An important outcome is expected from the student: to translate the technical information into energy efficient strategies associated to user comfort, by providing improvements, or modifying the methods of user interaction with the technology required for completing daily tasks.”

Schultz, S., & Hutchings, B. L. (2018, June). [Designing a sustainable large-scale project-based learning \(PBL\) experience for juniors in electrical and computer engineering](#). In *2018 ASEE Annual Conference & Exposition*. “This evidence-based paper describes a large-scale, Project-Based Learning (PBL) curriculum. PBL curriculum increases student engagement and develops deeper understanding of the material. However, most PBL experiences are limited in scope, number of students, or both. In order to gain the benefits of a PBL experience, the following criteria should be met. (1) The project needs to be authentic. This means that the project needs to be something that the ‘real-world’ would be interested in. (2) The students need to be actively engaged over an extended period of time. These criteria also require that the project be integral to the curriculum -- not peripheral. (3) The project needs to culminate in a physical realistic product. (4) The students need to work with others while still being required to understand all aspects of the project. (5) The project needs to have a high success rate. This paper presents a PBL curriculum that can handle 200 students per year without requiring an undue commitment of faculty or teaching-assistant time. This PBL experience focuses specifically on the construction of a complex laser-tag system. Laser tag is used because it is engaging and because it requires students to build and to debug a large, complex system that consists of analog circuitry, complex digital signal processing (DSP) algorithms, sensors, and thousands of lines of C code. Students complete this project over the course of their junior year. During the fall semester, students implement laser-tag specific analog circuitry in an analog electronics course; they study Digital Signal Processing (DSP) theory and simulate DSP filters in Matlab; and, students study and practice principles of embedded programming with C in an embedded programming course. During winter semester students combine the knowledge and





skills acquired during these fall-semester courses to create an advanced laser-tag game. The paper presents the following strategies for attaining the benefits of the PBL curriculum while accommodating a large number of students and while keeping the faculty and teaching-assistant commitments to reasonable levels. (1) A top-level hardware/software specification of the laser-tag system is provided to the students. Students write software and implement analog hardware while following these carefully drafted specifications. (2) Students must test their software and hardware using both their own methods and with provided test software and hardware fixtures. All tests are strictly go/no-go tests, meaning that students may not proceed until the software/hardware passes the required tests. (3) How-to and demonstration videos are provided via a dedicated YouTube channel. How-to videos demonstrate how to use compilation tools and various test equipment. Demonstration videos demonstrate pass-off criteria in unambiguous terms. (4) Students implement the laser-tag system by completing a series of scheduled milestones; each milestone consists of a specification, requirements and videos that demonstrate necessary skills and functionality. (5) The same PBL project is completed every year. Benefits accruing from this repetitive approach include: an available pool of experienced and qualified students who can serve as TAs, and continuous improvement of the content of the fall junior-year courses. Students who have taken the course in prior years understand the system and can help new students debug their implementations. In addition, if faculty or TAs detect a lack of student preparation in some topic during winter semester, the previous fall courses are updated and improved as necessary thereby providing a process of continuous improvement for the earlier fall courses. The PBL experience described in this paper is in its fourth year and has achieved the desired goals of high success rate, reasonable faculty and TA loading, enthusiastic student engagement, and constantly improving curricula in fall courses.”

Román-Ibáñez, V., Pujol-López, F. A., Mora-Mora, H., Pertegal-Felices, M. L., & Jimeno-Morenilla, A. (2018). [A low-cost immersive virtual reality system for teaching robotic manipulators programming](#). *Sustainability*, 10(4), 1102. “Laboratory tasks are a powerful pedagogical strategy for developing competences in science and engineering degrees, making students understand in a practical way the theoretical topics explained in the classroom. However, performing experiments in real conditions is usually expensive in terms of time, money and energy, as it requires expensive infrastructures that are generally difficult to maintain in good conditions. To overcome this problem, virtual reality has proven to be a powerful tool to achieve sustainability, making it easy to update laboratories without the need to acquire new equipment. Moreover, the ability to introduce practical knowledge into classrooms without leaving them, makes virtual laboratories capable of simulating typical operating environments as well as extreme situations in the operation of different devices. A typical subject in which students can benefit from the use of virtual laboratories is robotics. In this work we will develop an immersive virtual reality (VR) pedagogical simulator of industrial robotic arms for engineering





students. With the proposed system, students will know the effects of their own designed trajectories on several different robotic arms and cell environments without having to buy all of them and being safe of damaging the cell components. The simulation will be checking for collisions of the elements in the scene and alert the student when they happen. This can be achieved with a robotic simulator, but the integration with immersive VR is intended to help students better understand robotics. Moreover, even having a real robotic arm available for students, with this proposed VR method, all the students have the opportunity to manage and learn his own version of the robotic cell, without waiting times generated by having less robotic arms than students in classroom.”

Christ, J. A., Heiderscheidt, J. L., Pickenpaugh, M. Y., Phelan, T. J., Pocock, J. B., Stanford, M. S., ... & Twesme, T. M. (2015). [Incorporating sustainability and green engineering into a constrained civil engineering curriculum](#). *Journal of Professional Issues in Engineering Education and Practice*, 141(2), C4014004. “This work presents an example of how sustainability concepts were incorporated in a traditional civil engineering program administered within a constrained four-year curriculum. Using a variety of the treatments recommended in the literature, United States Air Force Academy civil and environmental engineering students learn and apply sustainability concepts at multiple points and in various frameworks during their four-year programs.”

Enelund, M., Wedel, M. K., Lundqvist, U., & Malmqvist, J. (2012, July). [Integration of education for sustainable development in a mechanical engineering programme](#). In *Proceedings of the 8th International CDIO Conference, Brisbane, Australia*. “This paper presents and analyzes the integration with progression of education for sustainable development in Chalmers University of Technology’s MScEng programme in Mechanical Engineering. The programme has an idea and structure that emphasizes employability, integration of general engineering skills, authentic engineering experiences and focus on holistic view of the complete lifecycle of products and systems. The realization of these aims stress the need of an integrated and adapted sustainable development education for mechanical engineering. To reach this goal, we applied a combined top-down and bottom-up education development process that started with the formulation of programme vision and programme level learning outcomes. Faculty meetings and workshop to formulate the course learning outcomes and to map the programme level outcomes to courses in which the outcomes are satisfied followed this.”

Sinnott, D., & Thomas, K. (2012). [Integrating sustainability into civil engineering education: curriculum development & implementation](#). “This paper describes the development and implementation of a curriculum for a new level 8 degree in Sustainable Civil Engineering in Ireland. The programme maintains the core outcomes essential for a civil engineering degree, reinforced by programme accreditation, while providing engineering graduates of tomorrow with





the new technical and non-technical competencies to become active drivers for sustainable global innovation.”

Kevern, J. T. (2011). [Green building and sustainable infrastructure: Sustainability education for civil engineers](#). *Journal of Professional Issues in Engineering Education and Practice*, 137(2), 107-112. “This paper discusses a framework for incorporating sustainable design/thinking as a new civil engineering course and experiences from the pilot offering. Important areas are outlined to aid all engineers in understanding sustainability in context with traditional engineering principles. Green-building rating systems were used to introduce the concepts of sustainability in buildings and infrastructure, highlighted by presentations from green-building professionals.”

Kumar, V., Haapala, K. R., Rivera, J. L., Hutchins, M. J., Endres, W. J., Gershenson, J. K., ... & Sutherland, J. W. (2005). [Infusing sustainability principles into manufacturing/mechanical engineering curricula](#). *Journal of Manufacturing Systems*, 24(3), 215-225. “This paper assesses the current undergraduate mechanical engineering curriculum at Michigan Tech with regard to sustainability and identifies barriers to incorporating sustainability throughout the curriculum. A benchmarking study, progress made at Michigan Tech, and a vision for the future of the mechanical engineering curriculum are presented.”

Boyle, C. (2004). [Considerations on educating engineers in sustainability](#). *International Journal of Sustainability in Higher Education*. “The understanding of sustainability engineering, however, requires a greater maturity than that of most engineering disciplines. Although the basics of this concept can be understood by anyone, the ability to understand the complex systems which exist within the environment and society as well as the constraints on those systems is only beginning to emerge at the fourth year or graduate level. Moreover, the elements necessary to achieve sustainability are derived from all aspects of engineering and, like environmental engineering, all engineering disciplines have strong roles to play in achieving sustainability. However, there is also a fundamental discourse that can be taught as a discipline in sustainability engineering. Discusses aspects of such a programme and outlines the requirements for educating engineers in sustainability.”

Environmental Engineering

Acosta-Castellanos, P. M., & Queiruga-Dios, A. (2022). [Education for sustainable development \(ESD\): An example of curricular inclusion in environmental engineering in Colombia](#). *Sustainability*, 14(16), 9866. “This paper presents a case study whose central axis is the





inclusion of the subject of education for sustainable development (ESD) in the undergraduate study plan of the environmental engineering degree at the Santo Tomas University, Colombia (USTA). This study is based on a diagnosis developed from a survey conducted among students from USTA and 43 professors from 13 universities that offer environmental engineering degrees throughout Colombia. The diagnosis showed some gaps in ESD knowledge and its applicability for both students and professors; in contrast, participants had a significant understanding of environmental education (EE). Therefore, a curriculum review was also carried out. Once the problem was identified, an ESD subject aligned with the purposes of sustainable development (SD) was proposed. Finally, the acceptance of the subject that ESD students had attended was evaluated compared to other students who had not participated this subject. This research seeks to provide a way to fill the knowledge gaps in environmental engineering among students. Relevant results include the identification of a gap in SD knowledge in environmental engineering professors. In addition, students were found to be more trained in EE than in SD. Nevertheless, the incorporation of ESD contributed to a better understanding of SD.”

Oerther, D. B. (2022). [Using modified mastery learning to teach sustainability and life-cycle principles as part of modeling and design](#). *Environmental Engineering Science*, 39(9), 784-795. “Using mastery learning as a conceptual framework, two courses were developed teaching sustainability and life-cycle principles. Course descriptions, student learning outcomes, and details of modules are provided in this case report. The results of teaching 5605: Environmental Systems Modeling over five semesters and the results of teaching 5619: Environmental Engineering Design over two semesters are summarized, including responses of students to end-of-term assessments of teaching effectiveness. Based on student performance and feedback, modified mastery learning is a valid approach to meeting the goal of teaching sustainability and life-cycle principles as part of modeling and design for environmental engineers in ABET-accredited degree programs. Future efforts should include replication with diverse student populations at additional institutions.”

Acosta Castellanos, P. M., Queiruga-Dios, A., & Álvarez, L. G. (2021). [Inclusion of education for sustainable development in environmental engineering. A systematic review](#). *Sustainability*, 13(18), 10180. “Sustainable development (SD) is a global commitment, in the economic, social, and environmental terms of the 21st century. The SD integrates conventional development models that seek economic growth and human development, within the framework of respect and sustainable use of natural resources. This challenge must involve all levels of society. Higher education is not an exception, since universities must strive for knowledge, research, and innovation to promote SD. To achieve this, education for sustainable development (ESD) has been especially promoted by the United Nations. ESD is an indirect measurement instrument for the inclusion of SD in higher education curricula. Environmental engineering is one of the areas of most recent creation and expansion of engineering, this undergraduate





program seeks to solve the environmental problems generated by the economic development of human beings, applying the theory, techniques, and technologies of engineering. With this systematic literature review (SLR), we were able to answer different research questions posed towards the most relevant competencies, techniques, and tools for the inclusion of ESD in the environmental engineering curriculum. This SLR was developed by searching the Science Direct, Scopus, and ERIC databases. We were able to identify success stories for the inclusion of ESD and some gaps in promoting ESD within undergraduate programs in environmental engineering. Likewise, we find the most applied activities, tools, and competencies within this engineering field that are part of ESD and promote SD from the curriculum.”

Fuchs, V. J., & Mihelcic, J. R. (2021, February). [Engineering education for international sustainability: Curriculum design under the sustainable futures model](#). In *2007 North Midwest Section Meeting*. “This paper proposes rhetoric to assess engineering education programs that focus on international sustainable development by using Mihelcic and Hokanson’s (2005) Sustainable Futures Model. The objective of this study is to examine international engineering education by using the Global Competency typology to see how well existing international programs fit the Sustainability Futures Model.”

Tisdale, J. K., & Bielefeldt, A. R. (2021, July). [Sustainability incorporation in courses in mechanical, civil and environmental engineering: Insights from AASHE STARS data](#). In *2021 ASEE Virtual Annual Conference Content Access*. “Sustainability incorporation into engineering education is gaining in recognition and importance. Sustainability courses provide valuable connections in the notions of sustainability and they build knowledge about sustainability. Integrating sustainability concepts throughout the curriculum gives the students a broad understanding of the field and prepares students to apply sustainability principles in their engineering decisions. This work seeks to answer the question: ‘To what extent is sustainability integration occurring in education in civil/environmental engineering and in mechanical engineering?’ The Sustainability Tracking And Reporting System (STARS) by the Association for the Advancement of Sustainability in Higher Education (AASHE) provides a source of data to probe this question. Institutions report information about sustainability incorporation into their courses to the AASHE STARS system, which provides useful knowledge of existing courses and methods of sustainability integration in the curricula. Data representing 30 universities was included in this study and shows there is approximately 4.25 times the number of courses with sustainability incorporation in civil and environmental engineering compared to mechanical engineering. An overlay of the data and course structure between the two departments yields interesting observations and areas for potential leveraging of advancements within the two disciplines.”





Borkovskaya, V. G., Roe, R., & Bardenwerper, W. (2020). [Sustainability risk management: The case for using interactive methodologies for teaching, training and practice in environmental engineering and other fields](#). In *Smart Technologies and Innovations in Design for Control of Technological Processes and Objects: Economy and Production: Proceeding of the International Science and Technology Conference "FarEastCon-2018" Volume 1* (pp. 251-260). Springer International Publishing. "Improving the quality of life and the world we live in for our posterity and ourselves is both a goal and a responsibility of engineers the world over. Forces and factors such as population growth, urbanization, technological advances and climate change pose challenges to conventional wisdom and practices for growth and development of enterprises, communities and states. While engineers typically employ risk management strategies as a routine component of projects, the complex and dynamic interrelationships between the natural environment and the human impact on it call for greater attention to risks and their management not only in discreet projects, but across the larger domains of enterprises and the communities in which they operate. Engineers and management officials in business and government can benefit from familiarity with globally tested methodologies of sustainability risk management (SRM) so that they can apply these principles and techniques to the businesses and social systems they interact with and manage. This paper will (i) put forth SRM as a recognized discipline, describing techniques for identifying and managing various categories of risk and (ii) provide illustrations of and theoretical support for interactive teaching techniques which enhance the development of insights and skills for engineers, risk managers, community leaders, and others. This paper will build upon and advance the concepts and methods introduced in a paper by these authors, Interactive Teaching of Risk Management in the Russian Construction Industry. These interactive pedagogical techniques can be effective in either academic settings or within professional training programs."

Human-Computer Interaction

Karahasanović, A., & Culén, A. L. (2023). [Project-based learning in human-computer interaction: a service-dominant logic approach](#). *Interactive Technology and Smart Education*, 20(1), 122-141. "Purpose—This study aims to propose a service-dominant logic (S-DL)-informed framework for teaching innovation in the context of human-computer interaction (HCI) education involving large industrial projects. Design/methodology/approach—The study combines S-DL from the field of marketing with experiential and constructivist learning to enable value co-creation as the primary method of connecting diverse actors within the service ecology. The approach aligns with the current conceptualization of central university activities as a triad of research, education and innovation. Findings—The teaching framework based on the service-dominant logic enabled ongoing improvements to the course (a project-based, bachelor's-level HCI course in the computer science department), easier management of stakeholders, and learning experiences through students' participation in real-life projects. The





framework also helped to provide an understanding of how value co-creation works and brought a new dimension to HCI education. Originality/value—While HCI has successfully contributed to innovation, HCI education has made only moderate efforts to include innovation as part of the curriculum. The proposed framework considers multiple service ecosystem actors and covers a broader set of co-created values for the involved partners and society than just learning benefits. Practical implications—The proposed framework and the authors' experience described herein, along with examples of projects, can be helpful to educators designing and improving project-based HCI courses. It can also be useful for partner companies and organizations to realize the potential benefits of collaboration with universities. Decision-makers in industry and academia can benefit from these findings when discussing approaches to addressing sustainability issues.”

Kuo, H. C., Tseng, Y. C., & Yang, Y. T. C. (2019). [Promoting college student's learning motivation and creativity through a STEM interdisciplinary PBL human-computer interaction system design and development course](#). *Thinking Skills and Creativity*, 31, 1-10. “In recent years, STEM (Science, Technology, Engineering, and Mathematics) has been extensively advocated and implemented in education, as it is suggested to be very impactful on student's interdisciplinary learning, which can be seen as a significant driving force for a country's advancement in scientific and technical knowledge, innovation, economy, and international competitiveness. Developing a human-computer interaction (HCI) system to solve real-world problems requires the inventors to have interdisciplinary STEM knowledge and skills. Thus a STEM Interdisciplinary Project-based Learning (IPBL) approach was applied to teach a total number of 45 college students registered in the departments of engineering and design. Inspired by Design Thinking, the 18-week STEM IPBL course was delivered through four phases, including discover, define, develop, and deliver. All the finished HCI projects applied the interdisciplinary knowledge and skills from the domains of STEM. Evidence drawn from the 6-point Likert ‘Motivated Strategies for Learning Questionnaire (MSLQ)’ indicated that the STEM IPBL course was very impactful on student's learning, which improved the participants' (a) overall learning motivation (Pre M = 4.4, Post M = 4.64; p = .012), (b) self-efficacy of learning (Pre M = 4.03, Post M = 4.43; p = .003), (c) enjoyableness of learning STEM (Pre M = 4.68, Post M = 4.75; p = .556), and (d) recognizing the significance of learning STEM on future career development (Pre M = 4.73, Post M = 4.94; p = .077). It is also found that compared with design majored students, the course had a better effect on the engineering majored students. Evidence collected from ‘Abbreviated Torrance Test for Adults (ATTA)’ indicated that the student's overall creativity was significantly improved (Pre M = 63.36, Post M = 68.44; p = .000). More specifically, among the four facets of creativity, the improvements were as follows: fluency (Pre M = 14.89, Post M = 16.2; p = .001), elaboration (Pre M = 16.69, Post M = 18.62; p = .000), flexibility (Pre M = 14.82, Post M = 16.04; p = .009), and originality (Pre M = 16.96, Post M = 17.58; p = .136). It is found that the STEM IPBL course had a different impact on the student's originality, while the





originality of engineering majored students significantly improved ($p = .006$), the originality of design majored students did not change. Some educational implications were also provided in the article.”

Paul, P. K., & Ghose, M. K. (2018). [A novel educational proposal and strategies toward promoting cloud computing, big data, and human–computer interaction in engineering colleges and universities](#). In *Advances in Smart Grid and Renewable Energy: Proceedings of ETAEERE-2016* (pp. 93-102). Springer Singapore. “Cloud computing is an important name in current Information Technology domain and responsible for the development in many perspectives. The advancement of information processing, management, delivery to software-related matter may be solved with cloud platforms. The virtualization of hardware, software, applications, etc., is in many ways dedicated for solid information infrastructure building and side by side solid information technology management. The related field of cloud computing is Big Data, which is responsible for managing large amount of data only rather software, hardware, etc. The application of Big Data is also called as Big Data Management. The complex and huge data generation results this domain and helps in data and information solutions in most of the organizations, institutions, associations, etc. Apart from these two, another important technology is human–computer interaction and partially related with the earlier mentioned technologies. It is worthy to note that these tools and technologies become common name in today’s world, but the educational opportunities are very much limited in India. The university and college level education as a full-fledged domain or specialization is more or less absent. This paper talks about cloud computing, Big Data, HCI as an overview including its current educational scenario with special focus on possible degrees, etc., in Indian context.”

English Composition (Writing)

Barrón, N. G., Gruber, S., & Huffman, G. (2022). [Student engagement and environmental awareness: Gen Z and EcoComposition](#). *Environmental Humanities*, 14(1), 219-232. “This article collaboration...focuses on the practical significance of what students’ writing and research can accomplish in and outside the classroom, and on how student involvement in the research process can create spaces for new awareness and renewed interest in active engagement with climate change discussions...With ecocomposition as an entry point, the article shows the importance of continued education about the environment and climate change, getting involved with sustainable practices, engaging with environmental awareness campaigns, and, when needed, lobbying for readjusting corporate business practices to include sustainability efforts.”





Kunz, E. L. (2021). [Ecological writing processes to promote environmental and social consciousnesses](#). In C. C. Ozaki & L. Parson (Eds.), *Teaching and learning for social justice and equity in higher education* (pp. 53-73). Palgrave Macmillan, Cham. “This chapter discusses ways a writing classroom can establish an ecological composition (ecomposition) curriculum by offering ecological teaching strategies during the reading, invention, drafting, revision, and editing phases of the writing process. Ecological composition should utilize feminist, Indigenous, and local readings; include kinesthetic movement and outdoor environment when discussing invention with students; consider instructors as travel guides to help students navigate drafting and revision within academic discourse; and understand why editing instruction should not be taught as objective knowledge but as the subjective privileging of particular ways of speaking and writing that are connected to class, gender, race, and geography.”

Hembrough, T. (2019). [Engaging in a university curriculum involving sustainability themes: A two-year case study of a first-year writing course](#). *Writing & Pedagogy*, 11(2). “How does implementing an ecomposition curriculum and sustainability topics in first-year composition affect students' writing outcomes? This article discusses a two-year, case study at a comprehensive research university of an experimental course-design model involving 1,421 students and 63 teachers. Students engaged with the university's sustainability theme in Composition I, as well as other courses. This article includes a description of Composition I's framework and its assessment practices, and raters measure the writing outcomes for the class's major essay, a literature review. Overall, teachers utilizing ecomposition practices presented students with a cohesive, relevant curriculum and assisted them in developing and organizing the literature review; writing and thinking about diverse spaces related to their experiences, majors, and futures; and forging and documenting campus and local ties, including through community-based learning. The study's results have implications for teaching ecomposition and sustainability themes in first-year composition.”

Hembrough, T. (2019). [A case study: Focusing on sustainability themes and ecomposition through student blogs in a professional and technical writing course](#). *International Journal of Instruction*, 12(1), 895-914. “Students engaged with environmental themes and ecomposition methods in an upper-division class. This article includes a description of the class's major assignment, a blog site and reflective essay, and the blog's assessment criteria, with raters measuring the blog's writing outcomes.”

Wright, M. F & Wright, B. (2010). [A holistic view of English education through the lens of sustainability](#). *English in Australia*, 45(1), 39-46. “This year-long action research study traces the journey of two teacher educators working with both primary and secondary pre-service teachers to redesign curriculum with a focus on English education through the lens of sustainability. Findings suggest that integrating sustainability issues into the English curriculum empowers





pre-service teachers with confidence and knowledge of best practices supporting an ethical stance emphasizing the socially humane objective of teaching children.”

Marx, S. (2008). [Think global, write local: Sustainability and English composition](#) “An essential element of Ecocomposition is local knowledge--engagement with one’s own particular place and time. Preparation for Ecocomposition requires teachers to be interested in their surroundings—the academic institution as not an ivory tower, but rather a physical, economic and political entity within history, situated on the land and in the community.”

Weisser, C. R., & Dobrin, S. I. (Eds.). (2001). [Ecocomposition: Theoretical and Pedagogical Approaches](#). SUNY Press. Classic handbook with a variety of approaches—like decolonizing nature, ecofeminism, service learning, and environmental restoration—to teaching writing about ecology.

Environmental Humanities

O’Gorman, E., Van Dooren, T., Münster, U., Adamson, J., Mauch, C., Sörlin, S., ... & Jørgensen, D. (2019). [Teaching the environmental humanities: International perspectives and practices](#). *Environmental Humanities*, 11(2), 427-460. “This article provides the first international overview and detailed discussion of teaching in the environmental humanities (EH). It is divided into three parts. The first offers a series of regional overviews: where, when, and how EH teaching is taking place. This part highlights some key regional variability in the uptake of teaching in this area, emphasizing important differences in cultural and pedagogical contexts. The second part is a critical engagement with some of the key challenges and opportunities that are emerging in EH teaching, centering on how the field is being defined, shared concepts and ideas, interdisciplinary pedagogies, and the centrality of experimental and public-facing approaches to teaching. The final part of the article offers six brief summaries of experimental pedagogies from our authorship team that aim to give a concrete sense of EH teaching in practice.”

Environmental Justice and Integral Ecology

Teaching Resources

[SCU Environmental Justice and the Common Good Initiative](#) - including a [guide](#) and [example projects](#) of community-driven research for environmental justice (on food, water, climate, the electronics industry, and law). [Standing up for racial and environmental justice now](#) - statements on the connections between racial and environmental justice for Black, Asian, Latinx, and disabled people, with links to current resources, organizations, and actions. (You could assign your students to research and write additional statements, and share them with the Initiative.)





[Teaching and Learning Environmental Justice](#) - teaching materials, curricula, and other resources on environmental justice and related topics—like indigenous environmentalism, ecofeminism, EJ and health, community engagement, and environmental racism—for both K-12 and higher education.

[Environmental Justice Activity Collection](#) - lesson plans and assignments for teaching environmental justice across the disciplines, like English and especially geography, at the university level. The website also provides other teaching materials for teaching sustainability through workshops and webinars.

[Teaching Sustainability and Environmental Justice in the Humanities and Social Sciences](#) - how to incorporate materials from the geosciences in humanities and social science courses at the university level.

[Environmental Justice in the Context of Sustainability](#) - includes many ideas for teaching environmental justice in the sciences with examples and guidance for different approaches at the university level.

[Online learning opportunities: A guide to digital environmental justice education in the age of COVID-19](#) - Created by West Harlem Environmental Action, this guide includes lessons for grades 9-12, some of which can be adapted for introductory college courses.

[How to construct an environmental justice lesson plan](#) - guide created by Pitzer College students includes some common class exercises used to teach EJ at the high school level or above. This may be particularly applicable to introducing environmental justice outside of the sciences.

[Equitable Sustainability Literacy Guide](#) - Learning tools and resources for teaching introductory environmental justice, including environmental racism, Indigenous rights, ecofeminism, climate migration, and food justice aimed at the both institutions and companies

[United States Environmental Protection Agency Learning Center](#) - training portal with online resources to build the capacity of EPA's partners to advance environmental justice, including instruction in how to use EPA's tools and databases like mapping and data tools, community focused tools, and guides to EPA grant applications.

[21 Day Catholic Enviro Justice Challenge](#) - Lessons and links on EJ and integral ecology, incorporating spiritual exercises, created by the Ignatian Solidarity Network. Can be used in a course or in informal learning contexts, such as student or faculty/staff organizations.

Background Readings

Robinson, J., Walker, J., & Walter, P. (2023). [Awakening sleepy knowledge: Extrarational pedagogies and transformative learning in environmental justice education](#). *Journal of*



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Transformative Education, 15413446221151045. “Centuries of settler-colonial capitalist hegemony have deeply embedded violent paradigms of separation and hierarchy in our societal structures and internalized ideologies, ultimately manifesting in global climate justice crises. We argue, therefore, that addressing the socio-ecological catastrophes we currently face necessitates an inclusive engagement with a diversity of ways of knowing often overlooked or actively repressed by dominant epistemologies. Dismantling oppressive structures begins with critically examining how they manifest within our habits of mind so we can then see beyond them—to capture what was lost, what is hidden, and what could be. Drawing on a diversity of theories, this largely conceptual paper calls for the (re)introduction of pedagogies that engage our creativity and extrarational senses to help transform our perspectives toward environmental justice. Extrarational pedagogies provide space to challenge dominant paradigms, empathetically experiment with creative alternatives, increase learners’ sense of agency, and overturn the notion that we are powerless to change our circumstances. Such pedagogies promote perspective shifts toward solidarity, compassionate accountability, and an increased awareness of the interconnectivity of our collective survival and well-being.”

Walter, M., Weber, L., & Temper, L. (2023). [The EJAtlas: An unexpected pedagogical tool to teach and learn about environmental social sciences](#). In *The Barcelona School of Ecological Economics and Political Ecology: A Companion in Honour of Joan Martinez-Alier* (pp. 211-218). Cham: Springer International Publishing. “This chapter examines how the Environmental Justice Atlas (EJAtlas), an online platform that was initially developed by ICTA-UAB—during the EJOLT international project—to make visible and systematize contemporary struggles against environmental injustice worldwide is becoming an attractive interactive tool to teach and learn about Environmental Social Sciences such as Political Ecology, Ecological Economics, Environmental Sociology, Human Geography, Critical Cartography; as well as Environmental Humanities, in Peace and Conflict studies. In this vein, the EJAtlas has unexpectedly become a tool for teaching at undergraduate and graduate levels that is already being used in diverse countries like Argentina, Bolivia, Canada, China, Mexico, Spain, Turkey, the UK, or the USA. This chapter examines why and how the EJAtlas is used for teaching/learning Environmental Social Science–related contents. We analyze the main challenges and lessons around what is taught, to whom, and why. We discuss how The EJAtlas has the potential to not only raise awareness on environmental sustainability but also to address some key concerns regarding the demotivating ‘remoteness’ students might feel due to distance from on-the-ground issues and activism, and the lack of diverse voices present in course material (particularly voices from the frontlines of environmental injustices and resistance movements), along with the difficult balance to strike between theory and practice. The Atlas offers a platform that students and educators can use to help bridge these gaps- by providing a way for students to tangibly engage with important environmental resistance movements, visibilizing diverse, frontline voices and experiences, and connecting the theoretical to the practical via a range of opportunities for promoting environmental justice work outside of the classroom including advocacy, documentation, networking, and solidarity-building.”

Cachelin, A., & Nicolosi, E. (2022). [Investigating critical community engaged pedagogies for transformative environmental justice education](#). *Environmental Education Research*, 28(4), 491-507. “Effective environmental justice education poses unique challenges to both educators





and students. For students, this pursuit is cognitively challenging at best and emotionally paralyzing at worst. It requires deconstruction of culturally produced narratives that uphold privilege, conceal complicity, and promote individual-level response to systemic problems. In this paper, we explore critical approaches to pedagogy, place, and community engaged learning, as well as their specific resonance with the challenges inherent in environmental justice education. We then thematically analyze student responses to two critically oriented community-engaged learning projects. Student experiences proved transformative as students came to see the structural elements that maintain environmental racism more clearly, demonstrated systems thinking, expressed feelings of agency, and articulated their own positionalities in thoughtful and constructive ways. From these data, we offer critical community-engaged pedagogy as transformative practice for environmental justice education.”

Vereen, E. (2022). [Exploring environmental justice and data analytics in an environmental studies lab course](#). *Ecological Applications*, e2769. “The environmental studies laboratory is an exciting place where students investigate, analyze, and reflect. Students test and apply theories and make abstract concepts concrete. As an example, ecology and environmental science are increasingly using “big data” to expand and refine research questions. This commentary reflects on the design and integration of an environmental justice and data analytics module in an environmental studies lab course. The module introduces an environmental justice framework to give students an understanding of tools and strategies to engage, assess, and intervene at multiple levels; while also developing advocacy and communication skills. Poor and minority populations have historically borne the brunt of environmental inequalities in the United States, suffering disproportionately from the effects of pollution, resource depletion, dangerous jobs, limited access to common resources, and exposure to environmental hazards. Paying particular attention to “redlining” and the ways that race, ethnicity, class, and gender have shaped the political and economic dimensions of environmental injustices, this module challenges students to critically examine redlining, socioeconomic, and environmental factors in Atlanta, Georgia (USA) to develop and explore research questions that may visually and/or statistically illuminate trends, patterns, and processes of environmental justice. This module also introduces some of the basic data handling and data analysis skills that give students an understanding of data types, descriptive statistics, sampling, and basic inferential statistics. By intentionally incorporating environmental justice activities and conversations in the classroom, instructors afford students an opportunity to engage in authentic examination of their world and make positive changes. Many of the skills learned and knowledge gained in this activity are directly transferable to post-baccalaureate studies (e.g., graduate school, medical school, professional training, etc.) and the world of employment. The module can also be adapted to various curriculum, courses, and communities.”

Roca, M. F. L., & Corcoran, P. B. (2021). [Ecology Meets Integral Ecology Meets Media Ecology: Education for Laudato Si'](#). *Journal of Communication & Religion*, 44(2). “Laudato Si’: On Care for Our Common Home has struck a deep chord with a broad audience. We explore the synergy between the ethical vision of sustainability in the Earth Charter and the encyclical. We position the document within the ecology and media landscapes. Laudato Si’ is remarkable among international statements in its explicit attention to education. We draw out the pivotal importance





of education in order for its critical message not to be lost. We argue that education for Laudato Si' can be advanced in traditional education—formal and non-formal, secular and religious—and in education through the media.”

Gilio-Whitaker, D. (2019). [*As long as grass grows: The Indigenous fight for environmental justice from colonization to Standing Rock*](#). Boston: Beacon Press. “Through the unique lens of ‘Indigenized environmental justice,’ Indigenous researcher and activist Dina Gilio-Whitaker explores the fraught history of treaty violations, struggles for food and water security, and protection of sacred sites, while highlighting the important leadership of Indigenous women in this centuries-long struggle. *As Long As Grass Grows* gives readers an accessible history of Indigenous resistance to government and corporate incursions on their lands and offers new approaches to environmental justice activism and policy.”

Raphael, C. (2019). [*Engaged scholarship for environmental justice: A guide*](#). Santa Clara, CA: Santa Clara University. See the introductory section on environmental justice and cites to relevant work there, with a focus on community-based scholarship (for students and faculty). See also the list of resources and primary source documents on EJ in the appendix.

Fuller, J., & Sharlissa, M. (2018). [*Pedagogy for the ethical dimensions of energy transitions from Ethiopia to Appalachia*](#). *Case Studies in the Environment*, 2(1), 1-7. “Education on energy ethics is a crucial part of engaging students in learning about energy systems and energy transitions that needs further development. This article describes the use of case studies and active learning tools to achieve learning outcomes related to the ethical and social dimensions of energy. It discusses a daylong workshop held for undergraduate and graduate students at Michigan State University in February 2017 and evaluates pre- and post-learning outcomes. Two case studies are described that highlight ethical trade-offs in energy transitions. An international case study on Ethiopia and the Grand Renaissance Dam illustrates the benefits and drawbacks of cross-border electricity trade related to energy access, economic growth, and the energy-water nexus. A domestic case study on coal miners and coal towns in Appalachia examines the layered influences of place attachment and the challenges of economic diversification post-peak coal extraction.”

Wells, C. W. (Ed.) (2018). [*Environmental justice in postwar America: A documentary reader*](#). Seattle: University of Washington Press. Primary source documents on EJ in U.S. history.

Holifield, R., Chakraborty, J., & Walker, G. (Eds.), (2018). [*The Routledge handbook of environmental justice*](#). London & New York: Routledge. Comprehensive overview of EJ with chapters on major issues, disciplinary approaches, research methods, and EJ in different regions of the world.

Chakraborty, J., Collins, T. W., & Grineski, S. E. (2016). [*Environmental justice research: Contemporary issues and emerging topics*](#). *International Journal of Environmental Research and Public Health*, 13, 1072-1077. An article-length introduction to current issues in EJ.





Konisky, D. M. (Ed.). (2015). [*Failed promises: Evaluating the federal government's response to environmental justice*](#). Cambridge, MA: MIT Press. Critical evaluation of U.S. government EJ laws, regulations, and policies.

Indigenous Environmental Justice

Banschbach, V., & Rich, J. L. (Eds.). (2021). [*Pipeline pedagogy: Teaching about energy and environmental justice contestations*](#). Springer Nature. “The proliferation of pipelines to transport oil and natural gas represents a major area of contestation in the landscape of energy development. Battles over energy pipelines pit private landowners, local community representatives, and environmentalists against energy corporations and industry supporters, sometimes drawing opposition and attention from well beyond the impacted regions, as in the case of the Standing Rock/Dakota Access Pipeline. Stakeholders must navigate complex government regulatory processes, interpret technical and scientific reports, and endure lengthy and expensive court battles. As with other forms of environmental injustice, the contentious construction of pipelines often disproportionately impacts communities of lower economic development, people of color, and indigenous peoples; pipelines also pose potential short and long-term health and safety threats. With the expansion of energy pipelines carrying fracked oil and gas across the United States and abroad, the moment is ripe for teaching about pipeline projects and engaging students and community members in learning about methods for mobilization. Our volume examines pedagogical opportunities, challenges, and interventions that campus-community engagement, and other kinds of community engagement, produce in relation to infrastructuring in the form of pipeline development.”

Lin, J., Hildebrand, G., Stoltz, A., & Rappeport, A. (2021). [*Environmental justice must include the rights of all species to life and respect: Integrating Indigenous knowledge into education*](#). *International Studies in Sociology of Education*, 30(1-2), 93-112. “This article focuses on the relationships between social justice, environmental justice, and sustainability from the local to global levels. We envision social and environmental justice as involving not only human beings, but also the rights of all species to life and respect. We advocate an ecological justice approach based on the equality and intrinsic value of all existence. This standpoint also forefronts core values and world views of marginalized people and epistemologies, such as Indigenous knowledge systems. With the understanding that there is much heterogeneity among Indigenous communities and individuals, we delve into core commonalities which embrace the perspective that humanity’s relation to the cosmos is ever-salient, that the Earth is a living being, and all species, as interconnected co-habitants of Earth, are intelligent, equal, and divine.”

Whyte, K. (2018). [*Critical investigations of resilience: A brief introduction to Indigenous environmental studies & sciences*](#). *Daedalus*, 147(2), 136-147. “Indigenous peoples are among the most active environmentalists in the world, working through advocacy, educational programs, and research. The emerging field of Indigenous Environmental Studies and Sciences (iess) is distinctive, investigating social resilience to environmental change through the research lens of how moral relationships are organized in societies. Examples of iess research across three moral relationships are discussed here: responsibility, spirituality, and justice. iess





develops insights on resilience that can support Indigenous peoples' struggles with environmental justice and political reconciliation; makes significant contributions to global discussions about the relationship between human behavior and the environment; and speaks directly to Indigenous liberation as well as justice issues impacting everyone.”

Ethnography

Hill, A. (2013). [The place of experience and the experience of place: Intersections between sustainability education and outdoor learning](#). *Australian Journal of Environmental Education*, 29(1), 18-32. “Drawing on research with teachers in Aotearoa New Zealand, this article explores possible intersections between sustainability education and outdoor learning. Accordingly, this article focuses on two key ideas: First, the nexus of experience and place offers significant promise for educational endeavours that seek to educate for a sustainable future. Second, traditional conceptions of wilderness as a pedagogical site, can be problematic for outdoor education programs which seek to claim the ground of sustainability.”

Kopinina, H. (2013). [Schooling the World: Exploring the critical course on sustainable development through an anthropological lens](#). *International Journal of Educational Research*, 62, 220-228. “This article reflects on formal education for sustainable development (ESD), demonstrating how critical course on culturally diverse ways of relating to nature can contribute both to an appreciation of alternative ways of relating to nature and to a more nuanced understanding of one's own cultural and ideological positioning. This article will focus on the analysis of student reactions to the film *Schooling the World*, shown to students as part of this critical course. The film stimulated the discussion of the effects of Western-style education on indigenous communities.”

Blum, N. (2008). [Ethnography and environmental education: Understanding the relationships between schools and communities in Costa Rica](#). *Ethnography and Education*, 3(1), 33-48. “This research is based on anthropological fieldwork conducted in a rural community in Costa Rica, and argues that using a wider ethnographic approach allows for a fuller exploration of the ways in which environmental education programming is negotiated and practiced.”

Fashion

Wood, J., Redfern, J., & Verran, J. (2022). [Developing textile sustainability education in the curriculum: Pedagogical approaches to material innovation in fashion](#). *International Journal of Fashion Design, Technology and Education*, 1-11. “The textile industry needs to adopt





environmentally sustainable approaches to address ecologically damaging practices. Whilst driven by initiatives such as Textiles 2030, it is current students who will carry this agenda forward. This project investigated pedagogical approaches to develop sustainable textiles for the fashion design curriculum. Pilot studies, using bacterial cellulose (BC) as a material for millinery, revealed members of the public were prepared to experiment with this novel material, and BC was compatible with traditional hat-making techniques. A further study challenged secondary school students, based on an experiential learning model, to grow their own BC biofilm, exploring this as a sustainable apparel fabric. Initial attitudes of reluctance developed into acceptance once engaged in the practical activity. This study illustrates that with appropriate communication and education strategies, the principles of sustainability in fashion, and the acceptability of novel materials, can be engendered in different audiences.”

Gam, H. J., & Banning, J. (2020). [Teaching sustainability in fashion design courses through a zero-waste design project](#). *Clothing and Textiles Research Journal*, 38(3), 151-165. “With the increased importance of learning about sustainability in fashion design curriculum, this article reports the teaching zero-waste design in existing fashion design courses that teach skills needed to create and construct garments. This study documents the development and delivery of a zero-waste design project in two different levels of fashion design courses. Data were collected before and after the zero-waste design project implementation. By learning about zero-waste design, students’ interest in sustainable living and fashion and consciousness about generating fabric waste was increased. Written comments about student experiences also supported these findings and indicated that the zero-waste design project positively influenced their awareness of sustainability practices.”

Lim, H. W. (2019). [An institutional approach to sustainable fashion: a case study of zero waste fashion](#). In: *Sustainable Apparel & Textiles (SAT) in the Circular Economy Symposium*. “The apparel brands and retailers are taking more responsibilities for their environmental impacts for sustainable fashion. According to the rise in demand, the more fashion schools, colleges and universities are reacting to these changes and educate students to have more awareness of sustainability to take forward into changing the industry. Zero waste is one of the sustainable approaches to facilitate material efficiency by minimizing fabric waste, and it can be applied to the design stage, the pattern cutting, fabric cutting, and production stages. This study is focused on evaluating the zero waste design module in BA Fashion Design course in UK high education. The teaching approach, materials, and structure of the designed module were analyzed using action research as well as questionnaire conducted by students. The assignments of students based on the practice-based learning were evaluated, and reflections from students were also analyzed. The results were interpreted as a guideline for a new focus on optimized curricula about the technical practice of zero waste.”





Payne, A. (2018). [Teaching sustainable fashion through ethics and encounters](#). *Journal of the Home Economics Institute of Australia*, 25(1), 2-9. “This article explores approaches to education for sustainable fashion and textile design. As future industry professionals - and as present wearers of clothing - students need to understand fashion's various sustainability issues in ways that are straightforward yet also draw the necessary subtle distinctions required to move beyond a simplistic understanding of the issues. Part of the challenge for educators is that an abundance of information exists about sustainable fashion. Alongside the many academic publications in the area, a growing number of activist groups, governments and non-governmental organisations are releasing reports on the topic and, at the same time, the number of brands and retailers purporting to be 'green', 'ethical' and 'sustainable' is mushrooming. Given the volume of information now available on the topic, discernment is needed to present the issues incisively while also doing justice to their complexity. This article offers a detailed overview of the present sustainable-fashion literature from both academic and non-academic sources, and frames approaches to teaching in terms of 'ethics' and 'encounters', whereby students are challenged to examine their assumptions and frame their own philosophies about what 'sustainable fashion' means to them.”

Radclyffe-Thomas, N. (2018). [Designing a sustainable future through fashion education](#). *Clothing cultures*, 5(1), 183-188. “With production moving offshore in the race to the bottom, necessary to satisfy increased demand for more garments and faster trends delivered at lower prices, fashion in the developed world has become not just fast, but disposable. One of the ‘successes’ of the twentieth-century fashion industry was to democratize fashion; by adopting mass production techniques and sourcing from low-wage economies, fashion retailers were able to produce runway looks at more affordable prices. Concurrently, developments in fashion media sped up the communication of fashion and we have seen an exponential proliferation of enticing creative imagery circulating from brands, models, online influencers and passionate amateurs. Consequently, rates of fashion consumption have risen, unacceptable working conditions continue for many, and the fashion industry is facing complex and demanding challenges including resources, climate change, waste, labour conditions and income inequality. Much as we now understand how garment design has an exponential impact on a garment’s sustainability, and recognize that incorporating sustainable design principles is paramount, so those of us in fashion education should prioritize sustainability in our curriculum design and increasingly, I have felt a responsibility to bring these issues into the classroom, to design a fashion education that acknowledges and addresses ethical and sustainable aspects of fashion.”

Food Systems and Sustainable Agriculture





Blodgett, D. M., & Feld, M. N. (2021). [Teaching an interdisciplinary course in sustainable food systems: science and history meet in “a world that works”](#). *International Journal of Sustainability in Higher Education*, 24(9), 138-158. “Purpose – The sustainability of the global food system hinges on its environmental resiliency and safety, including the health and well-being of its labor force. Single disciplinary courses in liberal arts or science often fail to highlight the overlap between environmental and social vulnerabilities that lead to food insecurity and diminish the sustainability of food systems. This paper aims to present the design and delivery of a successfully co-taught, interdisciplinary module on agricultural labor and sustainable food systems as a case study. Design/methodology/approach – The authors designed a co-taught module in which they joined each other’s respective history and science class sessions at the undergraduate business college where they teach. Innovating the cross-disciplinary content of food security, immigration status, labor exploitation and pesticide exposure, they approached sustainability from the disciplinary perspectives of labor history and environmental science to show how these elements had both unique and overlapping impacts across food systems levels. Comparisons between pre- and post-module survey responses, alongside assessments of a coauthored exam question, measured the effectiveness of this module in changing students’ perspectives as food consumers and as citizens. Findings – This module altered students’ understanding and perspectives around issues of food systems sustainability. Assessments indicated that students increased their awareness of agricultural workers at the front end of the food system, during production; students also gained awareness beyond consumption as they came to see the connections between workforce invisibility and ecosystem degradation. Originality/value – These insights are valuable to educators at all institutional levels who seek to collaborate on sustainability initiatives and teaching, both in the singular, robust modules and in building modules that will lead to the development of entire courses focused on sustainability. The module described here builds on previous demonstrations of the value, significance and effectiveness of cross-disciplinary collaborations; it pioneers the use of the food system as the link between social and environmental sustainability education.”

Greeson, K. M., & Currey, R. C. (2021). [Centering justice in a sustainable food systems master's program](#). *Frontiers in Sustainable Food Systems*, 415. “The new Master of Science in Sustainable Food Systems (MSFS) program at Prescott College was re-envisioned as part of the preferred teach out partnership with Green Mountain College that closed in 2019. In collaboration with faculty from both colleges, the new MSFS program was developed to intentionally center social justice and offer students a Food Justice concentration. Food justice is a growing movement that seeks to shift global, industrial food systems toward more equitable, just, and sustainable foodways. Using this definition, students in the Food Justice core course uncovered how forms of institutional oppression prevent certain communities from accessing healthy and culturally appropriate food. This course was designed and taught from an anti-racist, anti-colonial, and culturally sustaining pedagogical framework. The Food Justice





course frames students' investigation of the current food system and how issues of privilege, access, and identity relate to food justice throughout the MSFS program. Through experiential learning, students were asked to develop and implement a project that aligns with social justice values. In this perspective paper, we describe our experiences as sustainable food systems educators in making structural changes to the master's program. We share the values and assumptions that led to the development of the Food Justice concentration and course; detail our pedagogical frameworks; and highlight students' projects as a manifestation of the student experience."

Ferguson, B. G., Morales, H., Chung, K., & Nigh, R. (2019). [Scaling out agroecology from the school garden: The importance of culture, food, and place](#). *Agroecology and Sustainable Food Systems*, 43(7-8), 724-743. "We explore potential and limitations for agroecological scaling through formal education, using the LabVida school gardens program in Chiapas, Mexico as a case study. Through LabVida training, educators gained an appreciation of agroecology and learned to apply agroecological practices, although their understanding of agroecological principles and scientific process remained limited. The greatest program impact was on educators' eating habits, and their perception of the value of local knowledge and its relevance to school work. The case study demonstrates the potential of garden and food-system work to leverage institutional resources in ways that can improve educational outcomes, including agroecological literacy. Increased awareness of agroecology and the value of local knowledge may intersect with other drivers of scaling, including markets, organizational fabric, and policy."

Luna, J. M., Dávila, E. R., & Reynoso-Morris, A. (2018). [Pedagogy of permaculture and food justice](#). *Educational Foundations*, 31, 57-85. "We contend that the pedagogy of permaculture offers radical possibilities. In this article, we share our philosophical underpinnings of the pedagogy of permaculture using a case study of an international service learning project. We offer (1) a literature review creating a case for the use of permaculture with definitions for the ethics and principles, (2) we go deeper into permaculture versus conventional design and pedagogy leading into a (3) case study of a permaculture project: the rationale, design, and implementation of community surveys and a school-based aquaponics unit, then we analyze (4) the possibilities of the "Pedagogy of Permaculture," utilizing permaculture principles to help us think of our practice as critical STEM educators and finally, (5) we focus on the ways permaculture supported our work throughout the experience highlighted in this article. We make a call to you, the reader, to join our movement and apply the Pedagogy of Permaculture to your classrooms and lives."

Murakami, C. D., Hendrickson, M. K., & Siegel, M. A. (2017). [Sociocultural tensions and wicked problems in sustainable agriculture education](#). *Agriculture and Human Values*, 34(3), 591-606.





“Vignettes were constructed to situate four interrelated types of sociocultural tensions encountered by instructors and students. These tensions reflected forces at the individual, community, local, and global levels which interact to influence learners’ capacity to become full participants in sustainable agriculture. The study fills a gap related to affective dimensions of learning like identity in agroecology education. Dilemmas and implications related to identity, pedagogy, and epistemology are discussed.”

Hilimire, K., Gillon, S., McLaughlin, B. C., Dowd-Urbe, B., & Monsen, K. L. (2014). [Food for thought: Developing curricula for sustainable food systems education programs](#). *Agroecology and Sustainable Food Systems*, 38(6), 722-743. “We review current scholarship on food systems pedagogy and present approaches for developing and implementing food systems curricula. A literature review and our experience indicate that effective food systems program approaches include emphasizing interdisciplinarity and a systems approach and balancing experience, theory, and practical skills acquisition. We discuss strategies, challenges and opportunities for building food systems curricula.”

Jordan, N., Grossman, J., Lawrence, P., Harmon, A., Dyer, W., Maxwell, B., ... & Ahmed, S. (2014). [New curricula for undergraduate food-systems education: A sustainable agriculture education perspective](#). *Nacta Journal*, 58(4). “Here, we examine these emerging food-systems curricula, building on our collective experiences developing food-systems degree programs at University of British Columbia, Montana State University, University of California-Davis and the University of Minnesota. We present the conceptual framework that underlies our efforts, based on the premise that our degree programs should help students build “systemic” capacities that complement disciplinary training provided by various specialization “tracks.” Thus, we intend for our graduates to have a dual preparation, in both a particular specialization, and in overarching systemic capacities that enhance their ability to address complex food-system issues.”

Galt, R. E., Clark, S. F., & Parr, D. (2012). [Engaging values in sustainable agriculture and food systems education: Toward an explicitly values-based pedagogical approach](#). *Journal of Agriculture, Food Systems, and Community Development*, 2(3), 43-54. “Learning experiences that reflect the complexities, values, and challenges inherent to sustainable agriculture and food systems (SAFS) continue to evolve as faculty, staff, and students implement, experience, and modify them. We provide illustrations of practices across the education “life-cycle” — curriculum design, implementation, and evaluation — that have used values-based pedagogy to guide the development, modification, and strengthening of SAFS curricula.”

Urban Agriculture & Gardening





Joassart-Marcelli, P., & Bosco, F. J. (Ed.) (2018). [*Food and place: A critical exploration*](#). Lanham, MD: Rowman & Littlefield. “This text provides a comprehensive and critical exploration of food from the unique perspective of place. It shows that our experiences with food are deeply influenced by their cultural, social, economic, and political contexts. The authors explore a wide range of questions such as: Do GMOs threaten rural livelihoods? Why don’t we eat dogs? Does your neighborhood make you fat? Do community gardens encourage urban gentrification? Can cheese save a local economy? Why are gourmet burgers appearing on menus all over the world? How do immigrants use food to create a sense of place? Does mainstream nutrition stigmatize bodies? Is the kitchen an oppressive place? Can celebrity chefs change the food system? Critically engaged and connected to current activist and academic debates, Food and Place will be an essential resource for students across the social sciences.”

Valley, W., Wittman, H., Jordan, N., Ahmed, S., & Galt, R. (2018). [*An emerging signature pedagogy for sustainable food systems education*](#). *Renewable Agriculture and Food Systems*, 33(5), 467-480. “Sustainable food system education (SFSE) programs, have a common goal: to support post-secondary students across a range of disciplines in developing the knowledge, skills and dispositions to effectively address complex challenges in the food system. Graduates of these programs will be able to engage in collective action towards transforming the food system. As educators participating in flagship SFSE programs, we identify common pedagogical themes evident in SFSE programs, including our own. We then propose a signature pedagogy (SP) for sustainable food systems education. Signature pedagogies are conceptual models that identify the primary elements by which professional education in a specific field is designed, structured and implemented.”

Brown, M., Perez, J., & Miles, A. (Eds.) (2015). [*Teaching organic farming & gardening: Resources for instructors, 3rd ed.*](#) Santa Cruz, CA: Center for Agroecology & Sustainable Food Systems. An introduction to the material and how to use it to teach organic farming and gardening skills. Includes table of contents, list of contributors and reviewers.

Gender Studies

Russel, J. (Ed.) [*Queer Ecopedagogies: Explorations in Nature, Sexuality, and Education*](#). (2021). Germany: Springer International Publishing. “The book deepens and diversifies environmental education by providing new theoretical and methodological insights for scholarship and practice across a variety of educational contexts. Queer ecopedagogies provide important critical points of view for educators who seek broader goals centred around social and ecological justice by encouraging counter-hegemonic views of bodies, nature, and community.





The scope of this book is multi- or interdisciplinary in order to cast a wide net around what kinds of spaces, relationships, and practices are considered educational, pedagogical, or curricular.”

Maina-Okori, N. M., Koushik, J. R., & Wilson, A. (2018). [Reimagining intersectionality in environmental and sustainability education: A critical literature review](#). *Journal of Environmental Education*, 49(4), 286–296. “We seek to understand how issues of intersectionality are addressed in environmental and sustainability education (ESE) literature, focusing on how gender is discussed in relation to other social identities such as class, race, sexuality, and ability. Our analysis draws from feminist and decolonizing frameworks, and uses intersectionality to examine how ESE literature addresses issues as interconnected.”

Russell, C., Gough, A., & Whitehouse, H. (2018). [Gender and Environmental Education 2](#). *The Journal of Environmental Education*, 48(4). A second edition special journal about the intersections between gender and environmental studies in education.

Gough, A., Russell, C., & Whitehouse, H. (2017). [Gender and Environmental Education](#) [Special issue]. *The Journal of Environmental Education*, 48(1). “This special issue of The Journal of Environmental Education is devoted to the topic of gender and environmental education.” (quote from journal issue [introduction](#))

Geology

Stewart, I. S. (2021). [Integrating the ‘the triangle of geography, geology and geophysics’ into sustainable development](#). “In the context of tackling climate change in the eastern Mediterranean and Middle East, HRH Prince EI-Hassan bin Talal has called for an integrated approach to human and natural resources management that takes account of ‘the triangle of geography, geology and geophysics’. The lack of application of geoscientific knowledge to sustainable development issues is surprising given that advancing human progress lies at the roots of modern geoscience and aligns with the intellectual mindsets and technical skills that geoscientists are trained in. Applying this Earth science toolkit to the challenges of long-term sustainability will require the global geoscience community to repurpose its principles and practices, in particular: (1) better communicating what geoscientists know and do, and how that is socially useful; (2) reaching out to other disciplines more engaged in sustainability issues; and (3) re-designing Earth science education and training programmes to place sustainability and human wellbeing at the heart of a 21st century geoscientist’s professional purpose.”

Stewart, I. S., & Gill, J. C. (2017). [Social geology—integrating sustainability concepts into Earth sciences](#). *Proceedings of the Geologists’ Association*, 128(2), 165-172. “Most geologists would





argue that geoscientific knowledge, experience, and guidance is critical for addressing many of society's most acute environmental challenges, yet few geologists are directly engaged in current discourses around sustainable development. Firstly, the geoscience community needs to substantially broaden its constituency, not only forging interdisciplinary links with other environmental disciplines but also drawing from the human and behavioral sciences. Secondly, the principles and practices of 'sustainability' need to be explicitly integrated into geoscience education, training and continued professional development.”

Metzger, E. P., & Curren, R. R. (2017). [Sustainability: Why the Language and Ethics of Sustainability Matter in the Geoscience Classroom](#). *Journal of Geoscience Education*, 65(2), 93–100. “The purpose of this commentary is to synthesize perspectives from the geosciences and philosophy to provide a rationale for including the ethical dimensions of sustainability in geoscience education and to clarify the nature and ethics of sustainability... We supply a compilation of relevant teaching approaches and materials to help geoscience educators connect the enumerated concepts and principles to classroom practice and we conclude with a call for further cross-disciplinary conversations among geoscientists, philosophers, and social scientists who share a commitment to including sustainability concepts and ethics in their teaching.”

Walsh, E. O., & Davis, E. C. (2017). [The Geology and Sociology of Consumption: Team-Teaching Sustainability in an Interdisciplinary First-Year Seminar](#). *Journal of Geoscience Education*, 65(2), 126-135. “The complex consequences of current consumption practices, such as climate change and ecosystem degradation, necessitate increased interdisciplinary exploration. In order to raise student awareness of these consumption-related issues, we designed a first-year team-taught seminar on sustainability. This innovative interdisciplinary course links geology and sociology in examining real-world problems through a variety of reflective, experiential, and collaborative activities.”

Peppoloni, S., & Di Capua, G. (2016). [Geoethics: Ethical, social, and cultural values in geosciences research, practice, and education](#). In G. R. Wessel, & J. K. Greenberg, *Geoscience for the Public Good and Global Development* (pp. 17-22). Boulder, Colorado: The Geological Society of America. “Geoethics, which investigate the ethical, social, and cultural implications of geoscience research, practice, and education, represents a new way of thinking about practicing earth sciences, focusing on issues related to the relationship of the geoscientist with the self, colleagues, and society in the broadest sense. In this paper, we define some of the main values relevant to geoethics.”

Feinstein, N. W., & Kirchgasser, K. L. (2015). [Sustainability in science education? How the Next Generation Science Standards approach sustainability, and why it matters](#). *Science Education*,





99(1), 121-144. “In this essay, we explore how sustainability is embodied in the Next Generation Science Standards (NGSS), analyzing how the NGSS explicitly define and implicitly characterize sustainability. We identify three themes (universalism, scientism, and technocentrism) that are common in scientific discourse around sustainability and show how they appear in the NGSS. [...] One compelling alternative is a systematic collaboration between science educators and social studies educators, in which the complementary pedagogical strengths of both fields are combined to provide realistic and powerful preparation for future sustainability challenges.”

McNeal, K. S., Spry, J. M., Mitra, R., & Tipton, J. L. (2014). [Measuring student engagement, knowledge, and perceptions of climate change in an introductory environmental geology course](#). *Journal of Geoscience Education*, 62(4), 655-667. “This research examines a semester-long introductory environmental geology course, which emphasized climate science using an Earth systems approach and employed a multipronged teaching strategy comprising lecture, movie viewing, class dialogues, and journaling. Evidence of student engagement during various pedagogical approaches (e.g., movie viewing, lecture, and class dialogues) was measured using skin sensors on a subset of student participants in order to gauge student engagement. Measurement of student pre- and post-climate change knowledge, confidence, and perceptions revealed that the combined pedagogical approach supported student learning gains about climate science.”

Information Literacy

Mertens, D. (2022). [Designing mixed methods studies to contribute to social, economic, and environmental justice: Implications for Library and Information Sciences](#). In P. Ngulube (Ed.), *Handbook of Research on Mixed Methods Research in Information Science* (pp. 173-189). IGI Global. 10.4018/978-1-7998-8844-4. “The severity of wicked problems, manifest in climate disasters, a global pandemic, and an increasing gap between rich and poor heightens awareness of the need for researchers to support an increase in social, economic, and environmental justice. Perhaps it is not immediately obvious how library and information scientists can play a role in addressing such problems. However, access to information, criteria to judge the quality of information, and inclusion of the voices of marginalized and vulnerable populations fall within the realm of responsibilities for these disciplines. Transformative mixed methods designs have the potential to support the identification of culturally responsive solutions. In this chapter, a transformative framework is presented that prioritizes addressing issues of justice and supporting transformative change. This framework is then illustrated by examples of mixed methods studies that could be designed to contribute to increased justice in these disciplines.”





Svensson, T., Wilk, J., & Åman, K. G. (2022). [Information literacy skills and learning gaps—Students' experiences and teachers' perceptions in interdisciplinary environmental science](#). *The journal of academic librarianship*, 48(1), 102465. “Despite the ease of accessing information in the digital age, environmental science students need information literacy (IL) to competently tackle complex problems and sustainability challenges. Students' experiences and teachers' perceptions of student IL skills in an environmental science program were investigated through student questionnaires and teacher interviews to identify students IL competence and eventual learning gaps in the program. Students expressed confidence in IL, more strongly in basic skills such as information search and source criticism than advanced skills; critical thinking and analysing, interpreting, and creating information. They found formulating problems and locating and assessing information to be challenging, despite repeated training in tutorial groups. Teachers similarly perceived students to be most competent in accessing relevant information while using information is more challenging. This could be linked to the complexity and interdisciplinarity environmental science. Findings suggest that IL learning gaps could be bridged by greater focus on systematic IL training, intentional training on advanced skills, and iterative training of both basic and advanced skills by strengthening faculty and librarians collaborative teaching.”

Repanovici, A., Rotaru, C. S., & Murzea, C. (2021). [Development of sustainable thinking by information literacy](#). *Sustainability*, 13(3), 1287. “Developing the sustainable thinking of students is an important preoccupation of specialists, teachers, and civil society. Information literacy represents the development of students' skills to search, identify, evaluate, and ethically use scientific information. Is there a connection between sustainable thinking (ST) and information literacy (IL)? Through a scientometric study in the Web of Science (WOS) database, the authors identify clusters of keywords, analyze the articles identified in WOS, and identify the main research directions and the existing concepts. At the same time, a qualitative research study is performed regarding the opinions of students who participated in the IL class. By corroborating and interpreting the results obtained by the two previously mentioned research, the authors demonstrate a close correlation between the two, thus creating an extended map of these concepts, a limited map of the concepts used, and a theoretical map of the concepts. The connection between information literacy and the development of ST is demonstrated, thus creating the premise for a new research direction.”

Aubrecht, K. B. (2020). [Information Literacy and Science Communication in undergraduate courses that connect Chemistry to sustainability](#). In *Chemistry Education for a Sustainable Society Volume 2: Innovations in Undergraduate Curricula* (pp. 1-14). American Chemical Society. “Information literacy and science communication, while important skills in all chemistry courses, are particularly relevant in courses that address connections between chemistry and





issues of sustainability. This chapter presents a course learning outcome focused on information literacy for a 100-level non-science majors' chemistry course, a multiphase assignment to develop students' information literacy skills in the context of issues of sustainability, and a discussion of how the assignment and students' ability to evaluate the validity of sources are assessed. The chapter presents a course learning outcome focused on science communication for a 300-level chemistry course, an assignment in which students evaluate how scientific aspects of sustainability challenges are presented to general audiences, and discussion of how the assignment is assessed."

Languages and Cultures

de la Fuente, M. J. (Ed.) (2022). [*Education for sustainable development in foreign language learning: Content-based instruction in college-level curricula*](#). Taylor & Francis. "This unique volume utilizes the UNESCO Education for Sustainable Development (ESD) framework to illustrate successful integration of sustainability education in post-secondary foreign language (FL) learning. Showcasing a variety of approaches to using content-based instruction (CBI) in college-level courses, this text valuably demonstrates how topics relating to environmental, social, and cultural dimensions of sustainability can be integrated in FL curricula. Chapters draw on case studies from colleges throughout the US and consider theoretical and practical concerns relating to models of sustainability-based teaching and learning. Chapters present examples of project-, problem-, and task-based approaches, as well as field work, debate, and reflective pedagogies to enhance students' awareness and engagement with sustainable development issues as they acquire a foreign language. Insights and recommendations apply across languages and highlight the potential contribution of FL learning to promote sustainability literacy amongst learners."

Gonglewski, M., & Helm, A. H. (2014). [*Sustainability pedagogies for the business language classroom*](#). *Global Business Languages*, 19(1), 2. "This article examines the notion of sustainability pedagogies framed within three key aspects of sustainability education noted in the scholarship: interdisciplinarity, transformative learning, and experiential learning. In each of these areas, we provide an example of how the sustainability pedagogies can be implemented in business language courses."

Sacco, S. J., Jones, A. M., & Sacco, R. L. (2014). [*Incorporating global sustainability in the business language curriculum*](#). *Global Business Languages*, 19(1), 3. "International business and its academic twin, foreign languages for business and economics, can play a critical role in the teaching of global sustainability. In this article, the co-authors describe the teaching of global sustainability in foreign language classrooms through the use of case studies. The co-authors





specifically created case studies with Africa as the continental canvas. Embedded within the case study collection are case studies on the empowerment of women via entrepreneurship, a critical branch of global sustainability. The case studies in the collection entitled *Global Problem Solving: Africa* are designed for use in Business English, Business French, and Business Arabic courses. All cases feature a student-centered approach through its main activity entitled *Taking the Role of the Decision Maker*, in which students must analyze problems and propose solutions to those globally oriented problems.”

Melin, C. (2014). [Program sustainability through interdisciplinary networking: On connecting foreign language programs with sustainability studies and other fields](#). In *Transforming Postsecondary Foreign Language Teaching in the United States* (pp. 103-122). Springer, Dordrecht. “This essay outlines the structure for redesigning the undergraduate major as a ‘tools-based’ curriculum that concentrates work in three core areas: skill in language and literacy, knowledge of context and media, and development of critical literacy and global understanding. It advocates a complex approach to fostering translingual and transcultural competence and describes the development of course offerings in the environmental humanities as an example. By recognizing the emerging mosaic structure of undergraduate education and embracing opportunities to collaborate with other disciplines, foreign language departments can engage in productive curriculum reform.”

Melin, C. (2013). [Climate change: A “green” approach to teaching contemporary Germany](#). *Die Unterrichtspraxis/Teaching German*, 46(2), 185-199. “This article describes a newly designed upper division German language course, ‘Contemporary Germany: Food, Energy Politics,’ and two sampling methods of assessment for measuring parallel gains in German skills and sustainable development (SD) thinking. Second Language Acquisition (SLA) informed course design, key assignments, and multi-media teaching resources are discussed and presented. A content-based pedagogical model is advocated as an effective approach to creating a sustainability- and foreign language-infused curricula that make a valuable contribution to the liberal arts undergraduate education as a whole.”

Ter Horst, E. E., & Pearce, J. M. (2010). [Foreign languages and sustainability: Addressing the connections, communities, and comparisons standards in higher education](#). *Foreign Language Annals*, 43(3), 365-383. “This article describes an interdisciplinary collaboration that combined the study of German language with instruction in environmental issues (sustainable development). The project, involving both an independent study and a classroom unit, allowed students to make connections between disciplines, establish contact with German-speaking communities outside the university, and make cultural and linguistic comparisons. By expanding the German-language content on the Web site Appropedia.org, which is devoted to global





sustainable development, students took an active role in learning by creating content that can be read and used by the global community of German speakers.”

Ideas for ESL and French pedagogy that could be adapted to teaching other languages:

- [Greening ESL](#)
- [Environmental Issues Lesson Plans for English Language Teachers](#)
- [Environmental Education in French](#)

Spanish Language

Barbas-Rhoden, L. (2021). [Sustainability and the pluriverse: From environmental humanities theory to content-based instruction in Spanish curricula](#). In M.J. de la Fuente (Eds.), *Education for Sustainable Development in Foreign Language Learning* (pp. 17-33). Routledge.

“Environmental humanities scholarship theorizes and interrogates ways of thinking, being, and doing that have shaped socioenvironmental pasts and present, and which must be engaged for inclusive human futures. Thinking with the environmental humanities, particularly in its most critical expressions, opens abundant possibilities for content-based instruction (CBI) in modern languages. This chapter makes an argument for environmental humanities approaches to college, content-based foreign language education. It introduces key concepts from the field and gives examples of their application and insights to the design and praxis of teaching and learning in an advanced Spanish course based on community-engaged learning, a high-impact educational practice in which students learn with community partners. This approach deepens students’ awareness about sociospatial dynamics at a global, hemispheric, local, and personal level where sustainability actions can happen.”

Seijas, J. M., & Parra, M. L. (2021). [Engaging students with social, cultural, and environmental sustainability topics in the Spanish-speaking world: A reimagined beginner Spanish curriculum](#). In M.J. de la Fuente (Eds.), *Education for Sustainable Development in Foreign Language Learning* (pp. 87-104). Routledge. “This chapter describes the theoretical and pedagogical underpinnings of the curricular redesign of a second-semester beginner Spanish course at a Northeastern university. Couched within content-based instruction (CBI) and the multiliteracies pedagogical framework, the new course looks to develop students’ language proficiency and literacies while engaging them with social, cultural, and environmental sustainability issues faced by local, national, and global Spanish-speaking communities. Four thematic units are presented herein, detailing how compelling and often complex content was selected and scaffolded through various tasks and project-based assessments that make it accessible to beginning Spanish learners. The evaluations of the first iteration of the course indicate that students believe that they met the course’s literacy, linguistic, cultural, and sustainability goals,





in significant part because they were able to delve into and critically analyze authentic and sophisticated content related to sustainability in the Spanish-speaking world.”

Vasseur, R., & Sepúlveda, Y. (2021). [Beyond the language requirement: Implementing sustainability-based FL education in the Spanish foundations program](#). In M.J. de la Fuente (Ed.), *Education for Sustainable Development in Foreign Language Learning* (pp. 105-123). Routledge. “In 2015, the World Education Forum sought agreement from the international education community to promote inclusive and equitable education with sustainable development goals. In particular, by 2030, all learners would acquire the knowledge and skills needed to promote sustainable development, including human rights, gender equality, and the appreciation of cultural diversity and a culture’s contribution to sustainable development. This chapter describes the pedagogical design and implementation of a fourth-semester Spanish curricular project carried out at Texas Tech University with these goals in mind. Grounded on content-based pedagogy, the project focused on sustainability-based foreign language education through learners’ discussion and reflection on migration. Harvard Graduate School of Education’s Project Zero’s thinking routines and the ‘Re-imagining Migration’ framework were used for scaffolding students’ reflections and analyzing data. Examples of student growth, challenges in implementing curricular changes, and suggestions for overcoming said challenges are discussed.”

Law

Kennedy, A., du Plessis, A., Fowler, R., Hamman, E., & Warnock, C. (2021). [Teaching and learning in environmental law: Pedagogy, methodology and best practice](#). Cheltenham, UK: Elgar. “This unique book focuses specifically on teaching and learning in environmental law, exploring theory and practice as well as innovative techniques, tools and technologies employed across the globe to teach this ever more important subject. Chapters identify particular challenges that environmental law poses for pedagogy. It offers practical guidance and serves as a source of authority to legal scholars who are seeking to take up, or improve, their teaching and knowledge of this subject.”

Robertson, H. G. (2021). [Strategies & techniques for teaching environmental law](#). Wolters Kluwer Law & Business. A brief guide to teaching environmental law courses.

Yang, L., & Cheng, Y. (2021, January). [How to keep pace with the times in the teaching of environmental law for engineering majors](#). In *2020 3rd International Seminar on Education Research and Social Science (ISERSS 2020)* (pp. 478-481). Atlantis Press. “Taking the teaching of environmental law for safety engineering major of Jiangsu University as an example,





this paper mainly discusses how to set up the teaching syllabus relevant to environmental law under the background of safety engineering major responding to the certification of engineering education major, and analyzes how to keep pace with the times in the teaching and examination methods of environmental law course.”

Bork, K., & Burmeister, K. (2018). [Cases and places: A field-based approach to teaching natural resource and environmental law](#). *J. Legal Educ.*, 68, 338. Outlines a field-based approach to teaching environmental law, drawing on an example course taught in and about California.

Coplan, K. S. (2016). [Teaching substantive environmental law and practice skills through interest group role-playing](#). *Vermont Journal of Environmental Law*, 18(2), 194-221. “Law students accustomed to the bipolar model of common-law legal development and who expect statutory law to consist of a simple reading of clear statutory texts can find [the] interest group pluralist model of [environmental] law development bewildering. One way to help give context to this complex interaction is to place students in the roles of the various advocates and decision-makers in the environmental law processes. Assigning students to adopt the perspective of various distinct players in the regulatory process, such as agency lawyer, industry lawyer, and environmental NGO lawyer, helps make this complex interaction more accessible to students. This also provides an introduction into the skills of statutory interpretation and regulatory implementation.”

Stenzel, P. L. (2013). [Teaching environmental law and sustainability for business: from local to global](#). *Journal of Legal Studies Education*, 30(2), 249-293. Law professor describes her own course and principles of course design for environmental law and business.

Abbot, C., & Booton, D. (2009). [Using patent law's teaching function to introduce an environmental ethic into the process of technical innovation](#). *Georgetown International Environmental Law Review*, 21(2), 219-255. While not about how to teach patent law, this article argues for adding an environmental information disclosure to patent applications, which aims to teach applicants to consider the impacts of their innovations on sustainability.

Robinson-Dorn, M. (2007). [Teaching environmental law in the era of climate change: A few whats, whys, and hows](#). *Wash. L. Rev.*, 82, 619. Addresses skills and dispositions needed by environmental lawyers to address climate change, and the use of interdisciplinary seminars, cases, simulations, and clinical experiences to teach about climate law issues.

Literature





Krieg, C. P. (2022). [Teaching Jesmyn Ward and William T. Vollmann in Finland: Genres of environmental justice](#). In *Contemporary American fiction in the European classroom: Teaching and texts* (pp. 237-250). Cham: Springer International Publishing. “This chapter focuses on Jesmyn Ward and William T. Vollmann, two U.S. authors whose works can be taught in such ways as to probe thematically and formally the material limits of environment and society. Krieg argues that, in the European classroom in particular, these authors offer opportunities to introduce environmental approaches to the study of U.S. literature and politics in a transnational context, since environmental justice has become an increasingly important framework for addressing overlapping social and ecological crises in the twenty-first century. By foregrounding the relationship between literary narrative and histories of environmental injustice, these authors allow teachers to showcase literary genre as a critical and cultural response to anthropogenic environmental crises under global capitalism.”

Bartosch, R. (Ed.). (2021). [Cultivating sustainability in language and literature pedagogy: Steps to an educational ecology](#). London: Routledge. “Drawing on scholarship in the environmental humanities and practice-oriented research in education and literature pedagogy, chapters address the challenges of climate change and the demand for sustainability and environmental pedagogy from the specific perspective of literary and cultural studies and education, arguing that these perspectives constitute a crucial element of the transdisciplinary effort of ‘cultivating sustainability.’”

Myren-Svelstad, P. E. (2020). [Sustainable literary competence: Connecting literature education to education for sustainability](#). *Humanities*, 9(4), 141. “It is commonly assumed that education based on ecocritical readings of literature will change the attitudes and actions of pupils and students and thus contribute to forming environmentally aware and sustainable citizens. However, this article proposes an alternative view on the interaction between sustainability and literature education ... to argue that literature education needs to take the polysemy of literary texts and the unpredictability of readers’ encounters with such texts into account. By linking this to a specified set of sustainability competences and a dialogic concept of literary competence, the aim of the main discussion is to highlight the many potentially fertile overlaps between literature education and the competences needed in a sustainable citizen.”

Garrard, G. (Ed.). (2014). [The Oxford handbook of ecocriticism](#). Oxford University Press. A comprehensive handbook on critical techniques and theory for ecocriticism, with sections on history, theory, genre, and ecocriticism around the world.

Marketing

Kemper, J. A., Ballantine, P. W., & Hall, C. M. (2020). [The role that marketing academics play in advancing sustainability education and research](#). *Journal of Cleaner Production*, 248. “This





qualitative research seeks to understand the experiences of marketing faculty engaged with sustainability and their perceived ability to create impact in their own institution and the larger academic community... The contribution of this research lies in its discussion of a framework which explores how academic actions may be classified according to their perceived and anticipated reward and societal impact, as well as tactics which can be employed by academics to create institutional change.”

Kemper, J. A., Ballantine, P. W., & Hall, C. M. (2019). [Combining the ‘why’ and ‘how’ of teaching sustainability: the case of the business school academics](#). *Environmental Education Research*, 25(12), 1751-1774. “Faculty are key to bringing about ‘bottom-up’ change for sustainability education. Yet, research is still needed on the backgrounds and experiences of change agents in universities and the challenges they face. This study focuses on the marketing discipline, a field fraught with epistemological tensions in seeking to integrate sustainability, mainly revolving around profit maximisation and continuous consumption while living on a planet with finite resources. Semi-structured interviews were conducted with sustainability marketing academics in Australasia, Europe and North America. The contribution of this paper lies in the development of a sustainability educator typology linking why and how integration occurs.”

Borin, N., & Metcalf, L. (2010). [Integrating sustainability into the marketing curriculum: Learning activities that facilitate sustainable marketing practices](#). *Journal of Marketing Education*, 32(2), 140-154. “In response to political, social, and competitive forces, many firms are developing sustainable marketing strategies. Marketing educators can play an important role in assisting these firms by developing curricula that build the knowledge and skills required to enable marketing graduates to contribute to sustainable marketing efforts. Marketing graduates must not only understand but also be equipped to apply a sustainable marketing thought process to the challenges businesses face today. The authors assist in this goal by (a) presenting key learning objectives in the area of sustainable marketing, (b) describing learning activities that will help students achieve the learning objectives identified, and (c) providing resources that not only support the learning objectives but also connect them to traditional marketing concepts, as well as to concepts from other disciplines.”

Bridges, C. M., & Wilhelm, W. B. (2008). [Going beyond green: The “why and how” of integrating sustainability into the marketing curriculum](#). *Journal of Marketing Education*, 30(1), 33-46. “Teaching sustainable marketing practices requires that curricula advocate a ‘triple bottom line’ approach to personal and marketing decision making, emphasizing requirements for a sustainable lifestyle, company, economy, and society... In this article, the authors suggest how marketing educators might incorporate these sustainability principles into marketing pedagogy. Toward that end, the authors (a) offer a formal definition of the term sustainability, (b) examine the current role of sustainability in marketing strategy at the firm level, (c) present a brief history





of academic literature relevant to this topic and review current initiatives at academic institutions, (d) offer resources for integrating sustainability into marketing curricula, and (e) propose and describe the implementation of an MBA-level marketing elective dedicated to the topic of sustainability.”

Mathematics

[SISL - Teaching Sustainability in Mathematics/QR](#) - Excellent page of links to mathematics and quantitative reasoning curricula, text books, lesson plans, articles, etc.

DIMACS (Rutgers University) - [Sustainability-themed math modules](#).

Tom Pfaff - [Sustainability Math](#). Resources for teaching math and sustainability.

Mathematical Association of America - [Search for resources on sustainability](#).

Innabi, H. (2018, July). [Teaching statistics for sustainability](#). In *Proceedings of the 10th International Conference on Teaching Statistics, Kyoto, Japan* (pp. 8-13). “The concept of sustainability is viewed as spirally shaped, it continues to grow and expand upon its original meaning of remaining and continuing. The variation theory of learning has been adopted to explain teaching statistics for sustainability. The concern is the generative learning that continue and prepare for the future. For this to occur, a focus on variation thoughts in teaching and learning statistics is a necessary condition for all grades and levels. To teach variation in a powerful way, students’ awareness levels should be considered in regard to instruction and assessment. Dynamic visual tools are significant for helping students see variation . Also, Statistics has to be taught not as isolated discipline but rather within a context of complex real life issues.”

Roe, J., DeForest, R., & Jamshidi, S. (2018). [Mathematics for Sustainability](#). Cham, Switzerland: Springer. Undergraduate textbook designed for a new general education math course at Penn State that engages students a quantitative approach to sustainability questions. “Topics are grouped in themes of measurement, flow, connectivity, change, risk, and decision-making. Mathematical thinking is at the fore throughout, as students learn to model sustainability on local, regional, and global scales. Exercises emphasize concepts, while projects build and challenge communication skills. With no prerequisites beyond high school algebra, instructors will find this book a rich resource for engaging all majors in the mathematics classroom.”





Hamilton, J., & Pfaff, T. J. (2014). [Sustainability education: The what and how for mathematics](#). *Primus*, 24(1), 61-80. “In this article we provide a simple way to think about the concept of sustainability and provide a number of examples for incorporating sustainability education into commonly taught mathematics courses. The mathematics community is strongly positioned to be a foundational part of this effort because of the large percentage of students that take at least one mathematics course, in particular, calculus and statistics. A concise set of five learning objectives for sustainability education can be overlain upon almost any mathematics course while not sacrificing appropriate content. Use of carefully constructed, data-rich, real-life examples allows for increased student engagement and provides for opportunities to pursue mathematics while focusing at least some of our efforts on the areas of greatest societal need.

Peace Studies

Brantmeier, E. J. (2013). [Toward a critical peace education for sustainability](#). *Journal of Peace Education*, 10(3), 242-258. “This article proposes the need for peace education as a field to embrace critical power analysis of place in efforts toward social and environmental sustainability. Rather than status quo reproduction, a critical peace education for sustainability should both elucidate and transform the power dynamics inherent in structural violence and cultural violence. The inherent rights of people, plants, and ecosystems to live with dignity and to prosper are proposed. Practically speaking, the article offers perspectives from a critical pedagogy of place and an earth connections curriculum unit as vehicles for transformative education.”

Philosophy and Ethics

Green, F., & Brandstedt, E. (2020). [Engaged Climate Ethics](#). *The Journal of Political Philosophy*, 0(0), 1-25. An overview of applied climate ethics.

Curren, R. (2018). [Sustainability ethics across the curriculum](#). *Ethics across the curriculum—pedagogical perspectives*, 273-287. “This chapter identifies confusion about the normative dimensions of sustainability as an important obstacle to teaching the ethics of sustainability across the curriculum. It aims to overcome this obstacle by presenting a framework of sustainability ethics consisting of principles derived from the most basic commitments of common morality. Four rationales and related models for teaching ethics across the curriculum are identified, and an argument for infusing education at all levels with education in sustainability and sustainability ethics is framed on this basis. The prescribed model involves cross-curricular integration and collaborative public service projects, where possible.”





Derksen, C. (2018). [Reflections on teaching applied environmental ethics in a philosophy course](#). *American Association of Philosophy Teachers Studies in Pedagogy*, 4, 116-133. “I designed and executed an environmental ethics course intended to provide a useful product to a municipal partner. In teaching the course I had an opportunity to get concrete experience in experiential teaching. I share my experiences with being a philosopher in an applied program and tie it to the models of experiential learning. My experience indicates that the important work is not the abstract conceptualization or the concrete experience, but the bridging between them.”

Goralnik, L., Millenbah, K., Nelson, M., & Thorp, L. (2012). [An environmental pedagogy of care: emotion, relationships, and experience in higher education ethics learning](#). *Journal of Experiential Education*, 35(3), 412-428. “Field philosophy is interdisciplinary experiential environmental humanities learning. It grows from a community-focused conception of environmental ethics and place-based environmental education, and it aims to help students develop an awareness of the role of environmental ethics in environmental issues, as well as cultivate an empathetic environmental ethic that might enable them to participate in environmental problem solving. The emotional, cognitive, and physical relationships with people, place, and ideas at the core of field philosophy necessitate a pedagogy that attends to affective learning objectives and relationship building. A shared focus connects literature in experiential education, educational psychology research on emotional engagement, and the ethic of care. A synthesis of this literature grounds an environmental pedagogy of care with meaningful potential for field philosophy.”

Physics

El Kharki, K., Berrada, K., & Burgos, D. (2021). [Design and implementation of a virtual laboratory for physics subjects in Moroccan universities](#). *Sustainability*, 13(7), 3711. “Laboratory experimentation has a vital role in science education. With the potential offered by information and communication technologies for the educational domain, virtual laboratories have emerged as a valuable alternative to face-to-face, hands-on laboratories. Moreover, the possibility of virtual laboratories opens new perspectives for higher education sustainability. They are a perfect approach for training learners to understand scientific principles in many fields of science by offering them the possibility to illustrate the scientific phenomena through automated and virtual practical activities that employ computer simulation. In this work, we present the use of computer simulation combined with the JavaScript programming language for the development of a low-cost virtual laboratory integrated into an interactive learning environment based on the Moodle platform. The methodology was based on the instructional design model





ADDIE (Analysis, Design, Development, Implementation, and Evaluation), which structures the development planning of online teaching resources in different stages (analysis, design, development, implementation, and evaluation). The virtual laboratory was developed by Moroccan universities, with the help of European partners, and it was implemented in the 12 science faculties in Morocco. It presents a great choice for supporting laboratory activities for learners in the first year of their bachelor's degree program. This virtual laboratory includes 12 virtual practical activities mapped to the physics curriculum, and they can be operated via the Internet on computers. The proposed virtual learning environment was evaluated by teachers and learners from the science faculties. The obtained results, together with similar findings from other studies, indicate the positive impact of the use of a virtual laboratory on learning outcomes, and support the adoption of the proposed learning environment in laboratory educational procedures as an alternative to physical laboratories.”

Allen-Gil, S., Walker, L., Thomas, G., Shevory, T., & Elan, S. (2005). [Forming a community partnership to enhance education in sustainability](#). *International Journal of Sustainability in Higher Education*, 6(4), 392-402. “To provide an example of how colleges can partner with local EcoVillages to further sustainability curriculum on campus and the educational mission of the EcoVillages, and to strengthen ties with the community. Describes four structured courses developed for the Environmental Studies Program, including sustainable communities, sustainable land use, sustainable energy and environmental futures. Additionally, independent research opportunities in wind energy, solar photovoltaics, and GIS/GPS developed as part of the curriculum. Describes numerous ancillary activities that have promoted sustainability across campus and the community. Provides information about how to develop educational partnerships with community groups, foster sustainability education on campus, recruit additional faculty involvement, and influence college operations with respect to sustainability.”

Physical Science

Ramnarain, U., & Ramaila, S. (2012). [Mentoring as a viable and sustainable form of professional development for physical science teachers](#). *Education as Change*, 16(2), 255-268. “This study reports on mentoring as a form of professional support for South African Physical Sciences teachers coping with curriculum reforms. Using a case study method, we investigated two cases of mentoring. The first case explored a traditional mentoring relationship between a novice teacher and a more experienced and competent teacher whom we referred to as a ‘keystone species’ of the profession. The second case described a more collaborative form of mentoring between two experienced teachers who exploited each others’ strengths in overcoming some of the deficiencies in their practice. The findings of the case study suggest that mentoring although complex does provide a viable means through which professional





development efforts can be consolidated, and may be considered as an alternative to the cascade model of in-service training consisting of short one-shot workshops that assumes a 'one size fits all' approach that has been common practice in South Africa.”

Tlali, M. F. (2013). [Transformational learning of physical science through service learning for sustainability](#) (Doctoral dissertation, University of the Free State). “This participatory action research, conducted within the critical emancipatory theoretical framework, formulates a strategy to transform the learning of Physical Science such that it is sustainable. The mode of teaching in many schools currently, including the one where the study is conducted, is mainly teacher centred, traditional and not emphasising on making knowledge functional and transferable. This is a challenge to transformation of the learning of Physical Science such that it is more learner-centred, in keeping with the best practices internationally. This need requires teaching to emphasise knowledge which is responsive to real life needs of the learner and his/her community. In this study I identify and formulate the transformational strategy that is grounded in the use of service learning. This requires learners to provide a service to the community in response to its real life problems. This is in turn based on the theme(s) they are expected to learn as provided for in the Physical Science curriculum statement. I also show the importance of understanding circumstantial factors that make the service learning based strategy to work effectively. I identify potential risks and threats that could distract the strategy from its intended goals. I also show how to incorporate ways of anticipating and responding to them in the strategy itself. Finally the strategy is implemented to ascertain its applicability. This helps to find out whether it leads to sustained and better learning of Physical Science. Critical emancipatory research (CER) couches this study as a theoretical framework. Thus I illustrate how CER could assist the study to achieve its five objectives, namely; to explore the need for a transformational service learning strategy to make the learning of Physical Science sustainable, to explore what other strategies have been formulated before to transform the learning of Physical Science as envisaged, to understand circumstantial factors making the study to be successful as well as to implement the strategy to find out if it brings about the desired positive changes in the learning of Physical Science. Critical emancipatory research is also used as the perspective from which I define and understand important operational concepts in the study. From this perspective I then reviewed relevant and related literature which assisted me to develop constructs in order to make sense of the empirical data. This review included looking at best practices relating to making the learning of Physical Science to be sustainable, starting from South Africa, the Southern African Development Community (SADEC), the African continent and internationally. I then followed the participatory action research methods and designs to collect data. For analysis I used Van Dijk’s socio-cognitive discourse analytic procedures. This enabled me to operationalise the theory of critical emancipatory research. For instance, the participants were involved from the beginning through the various phases and steps of the study until its conclusion. Accordingly, I was the facilitator while the participants





were co-researchers who drove and owned the research process. This was done in accordance with the theory that argues that people who have the problem are the same people who have the solution. As a researcher, I merely created appropriate contexts for the participants to discover and use the power they have to transform the teaching of Physical Science. As the outcome of this study the strategy entails; establishing a team; encouraging team members' democratic and respectful reflections on the aim of their working together, through brainstorming and information sessions; embracing practices that encourage them to contribute and debate issues as equals. These interactions led to the emergence of the vision and strategic plan detailing all priorities with the relevant and respective activities.”

Politics and Political Science

Payne, C. L. (2022). [The \(Coffee\) grounds of change: An experiential learning approach to sustainable development](#). *Journal of Political Science Education*, 18(4), 570-583. “Drawing on six years of experience teaching Political Science classes with field experiences in the Dominican Republic, I discuss the design and implementation of effective sustainable development projects. What started as a one-off field experience has grown into a long-term relationship with the coffee growing community of El Naranjito, which provides opportunities for students to learn through purchasing our campus coffee and collaborating with producers on navigating the international specialty market. Beyond efforts to assist farmers raise their standard of living through the sale of their primary commodity, students are also involved in projects addressing quality of life issues, such as access to reliable, affordable solar energy and safe drinking water—all funded from profits of our College-branded Warrior Coffee. Discussion includes learning objectives specific to Political Science and how an intentionally crafted experience can assist in the development of students' cultural competence, global awareness, and soft skills—including effective communication, teamwork, and resilience. Finally, special attention is paid to the importance of building collaborative, mutually beneficial relationships with host communities in order to ensure sustainable economic and community development that seeks to avoid dependency and neocolonial power dynamics. The lessons learned can be applied to other contexts.”

Allam, N., Gallagher, J., Sidney, M., & Josephson, J. (2021). [Outside-in political science: Implementing community-engaged pedagogy across the political science major](#). *PS: Political Science & Politics*, 54(2), 377-380. “As political science rethinks the undergraduate major for the twenty-first century, it is important to renew the civic-engagement aspects of the discipline, including new ways to approach service learning, internships, and other civically engaged pedagogies. We developed a model of civically engaged pedagogy that furthers the goals of the discipline and of Rutgers University–Newark to deepen our relationships with community





organizations and provide students with hands-on learning experiences in courses across the subfields of the discipline. This article discusses our approach.”

Psychology

Scott, B. A., & Kroger, S. M. [Teaching Psychology for Sustainability](#). A website with resources including articles on the intersection of sustainability and psychology, suggested readings for students, and sample syllabi.

Nielsen, K. S., Clayton, S., Stern, P. C., Dietz, T., Capstick, S., & Whitmarsh, L. (2021). [How psychology can help limit climate change](#). *American Psychologist*, 76(1), 130. “The Intergovernmental Panel on Climate Change (IPCC) has encouraged psychologists to become part of the integrated scientific effort to support the achievement of climate change targets such as keeping within 1.5C or 2C of global warming. To date, the typical psychological approach has been to demonstrate that specific concepts and theories can predict behaviors that contribute to or mitigate climate change. Psychologists need to go further, and in particular to show that integrating psychological concepts into feasible interventions can reduce greenhouse gas emissions far more than would be achieved without such integration. While critiquing some aspects of current approaches, we describe psychological research that is pointing the way by distinguishing different types of behavior, acknowledging sociocultural context, and collaborating with other disciplines. Engaging this challenge offers psychologists new opportunities for promoting mitigation, advancing psychological understanding, and developing better interdisciplinary interactions.”

Malt, B. (2019). [Educating Students on the Psychology of Sustainability](#). *APS Observer*, 32(4). “Psychology courses have long served to open undergraduate students’ eyes to many issues critical to modern society: racial bias and gender bias, cultural diversity, aging, principles of learning and education, intergroup conflict, stress and coping, mental illness, and brain disorders including Alzheimer’s disease. Conspicuously absent from this list, though, is the human impact on the natural environment. With varied [course topic] opportunities, every department can ensure that students complete their undergraduate experience with an understanding of how principles of psychological science feed into environmental problems and solutions.”

Watkins, M., Ciofalo, N., & James, S. (2018). [Engaging the struggle for decolonial approaches to teaching Community Psychology](#). *American Journal of Community Psychology*, 62(3-4),





319–329. “Community psychology’s history has traditionally been described within the context of U.S. history, silencing contributions from people of color from the Americas, Asia, the Pacific Islands, and Africa... Turning to Indigenous psychologists, decolonial and critical race theorists, and cultural workers within the U.S. and from the Global South, we are attempting to challenge coloniality in the social sciences, community psychology, and in our own thinking and teaching to unmask hegemonic assumptions and open space for decolonial theory and practice. In this paper, we explore ways in which we are working with our graduate students and faculty to co-construct a decolonial curriculum that integrates decoloniality so that knowledges from historically silenced locations, as well as anti-racist and other decolonial praxes can co-exist and thrive.”

Jones, A. T., & Segal S. S. (2018). [Unsettling Ecopsychology: Addressing Settler Colonialism in Ecopsychology Practice](#). *Ecopsychology*, 10(3), 127-136. “This article identifies settler colonialism as a phenomenon existing outside of awareness in the field of ecopsychology and begins to explore what “unsettling” ecopsychology may entail. Unsettling the field is a process of revealing how ecopsychology reproduces and reinforces settler colonialism. This process requires deep reflection among practitioners regarding how they can challenge the dominant colonial narratives that underpin settler privilege within the field itself. Offered as additional points of engagement in the process of unsettling are practices of accountability and relationality through the learning of history and cultural protocols and engagement in acts of solidarity with Indigenous land-based resurgence. By opening up this dialogue, we (the authors) seek to make a critical contribution to the field of ecopsychology and, as non-Indigenous/settler practitioners, to encourage a discussion of accountability for those doing therapeutic land-based nature connection work as visitors on traditional Indigenous territories.”

Koger, S. M., & Scott, B. A. (2016). [Teaching psychology for sustainability: The why and how](#). *Psychology Learning & Teaching*, 15(3), 214-225. “The behavioral sciences can make vital contributions to environmental sustainability efforts, as relevant basic and applied psychological research has grown considerably over the past dozen years. Recently, conservation biologists, environmental policy makers, and other experts have recognized the importance of engaging with experts on human behavior (i.e., psychologists) in order to effect behavioral change in a sustainable direction. Lagging behind this trend, however, is the curricular integration of psychology and environmental sustainability in most psychology or environmental science/studies programs (ESS). Consequently, most psychology majors are graduating with no background in applying the field to promoting sustainability, and ESS students lack explicit education focused on understanding and changing human behavior. This paper provides an introduction to the rationale for integrating sustainability topics into psychology courses, and psychological concepts into ESS classes, along with some strategies for doing so at the level of individual course units as well as full courses.”





Adams, M., & Jordan, M. (2012). [Taking a Problem-Based Learning Approach to Teaching Ecopsychology](#). *Ecopsychology*, 4 (2), 87-93. “This paper emerges from our experience of delivering a course in ecopsychology to final-year undergraduate psychology and social science students at the University of Brighton in the United Kingdom. Our course in ecopsychology utilizes an inquiry or problem-based learning (PBL) approach alongside more traditional teaching methods, as we consider there to be a good fit between the subject matter of ecopsychology and the practice of PBL. In what follows we first offer a short account of why we wanted to teach ecopsychology in the first place, followed by an outline of the specific educational context in which the course is taught. We then describe how we have approached the structure, content, and delivery of the course more specifically, including the rationale and pragmatics of the problem-based learning component.”

Public Health and Healthcare

See also *Psychology; COVID-19*

Teherani, A., Nicastro, T., Clair, M. S., Nordby, J. C., Nikjoo, A., Collins, S., ... & Weiser, S. D. (2023). [Faculty development for education for sustainable health care: A university system-wide initiative to transform health professional education](#). *Academic Medicine*, 10-1097. “Health professionals (HPs) are increasingly called upon to care for patients experiencing the health impacts of climate change, while working in the high eco-footprint health care system, which is starting to embrace a culture of sustainability. HPs are uniquely positioned to drive health care culture toward ecological responsibility and, consequently, improve patient care, health equity, and public health. Education for sustainable health care (ESHC or ESH) is the first step in developing health care practitioners able to think critically about and act upon the health impacts of the climate crisis. University of California Education for Sustainable Healthcare (UC-ESH) Faculty Development Initiative was developed to address the following goals: educate faculty on eco-medical literacy, empower faculty to build community and lead ESH at their institutions, and expand coverage of ESH to reach students beyond those for whom sustainability is already a focus. The initiative provided training to faculty across health professions and six health science campuses to integrate ESH into their courses using the train-the-trainer model, key knowledge and pedagogical skills, and longitudinal guidance and networking opportunities. Using a survey, questionnaire, and interviews the initiative was evaluated using the process/elements and product/outcomes steps of the Context, Input, Process, and Product evaluation model. The UC-ESH educated over 100 faculty members and led to ESH integration into 99 existing and new courses that subsequently reached over 7,000 learners. The UC-ESH increased empowerment, awareness, and knowledge about the climate crisis, and built an ESH





community of practice. Initiative elements that contributed to these outcomes included engaging training; creation of supportive group dynamics; helpful resources and activities; ongoing support; and integration approaches to ESH. This university-system-wide initiative provides a transferable model to institutions, schools, and departments seeking to develop eco-medical literate faculty who educate their students about the climate, ecosystem, and health crisis.”

Webb, J., Raez-Villanueva, S., Carrière, P. D., Beauchamp, A. A., Bell, I., Day, A., ... & Vaillancourt, C. (2023). [Transformative learning for a sustainable and healthy future through ecosystem approaches to health: Insights from 15 years of co-designed ecohealth teaching and learning experiences](#). *The Lancet Planetary Health*, 7(1), e86-e96. “This paper presents insights from the work of the Canadian Community of Practice in Ecosystem Approaches to Health (CoPEH-Canada) and 15 years (2008–2022) of land-based, transdisciplinary, learner-centred, transformative learning and training. We have oriented our learning approaches to Head, Hands, and Heart, which symbolise cognitive, psychomotor, and affective learning, respectively. Psychomotor and affective learning are necessary to grapple with and enact far-reaching structural changes (eg, decolonisation) needed to rekindle healthier, reciprocal relationships with nature and each other. We acknowledge that these approaches have been long understood by Indigenous colleagues and communities. We have developed a suite of teaching techniques and resources through an iterative and evolving pedagogy based on participatory approaches and operating reciprocal, research-pedagogical cycles; integrated different approaches and ways of knowing into our pedagogy; and built a networked Community of Practice for continued learning. Planetary health has become a dominant framing for health-ecosystem interactions. This Viewpoint underscores the depth of existing scholarship, collaboration, and pedagogical expertise in ecohealth teaching and learning that can inform planetary health education approaches.”

Capetola, T., Noy, S., & Patrick, R. (2022). [Planetary health pedagogy: Preparing health promoters for 21st-century environmental challenges](#). *Health Promotion Journal of Australia*, 33, 17-21. “Multiple interconnected drivers threaten the health and wellbeing of humans and the environment, including biodiversity loss, climate change, pollution, rapid urbanisation and displacement. This requires enhanced literacy on health of the environment and innovation in problem conceptualisation and cross-sectoral solutions. Contemporary mandates (eg, Ottawa Charter) task health promoters to tackle the human and environmental health crisis. To address the complex determinants across multiple settings, health promotion graduates require competencies in interdisciplinary collaboration grounded in systems thinking. They also require knowledge and agility to leverage multiple gains from health promotion action that benefits people and planet. Similarly, health promotion practitioners are currently aware of the need for skills to deliver co-benefits to people and planet. Planetary health, as theory and framework, provides a socio-ecological focus, systems thinking approach, co-benefits framework for action





and foundational basis to enhance health promotion graduates' skills and competencies to address multiple health and planetary challenges. To date, there have been limited practical attempts to address these challenges. A bespoke model, the Sustainability Wheel of Fortune, combined with constructive interactive teaching approaches, adds interdisciplinary collaboration and systems thinking approaches to the knowledge and practice of planetary health. A postgraduate microcredential fast-tracks knowledge and skills acquisition for recent graduates and established practitioners interested in upskilling for planning planet and population health co-benefits. The Sustainability Wheel of Fortune provides health promotion students with a model for understanding, and addressing, complex global and local challenges. The microcredential builds on health promotion competencies to develop interdisciplinary and systems-based approaches to planetary health challenges.”

Dunlop, L., & Rushton, E. A. (2022). [Education for environmental sustainability and the emotions: implications for educational practice](#). *Sustainability*, 14(8), 4441. “Increasing attention is being paid to the emotions in education and in communication about the climate crisis and other sustainability challenges. This has tended to focus on the relationship between emotions and environmental perceptions and behaviours. In this study, we understand emotions as evaluative feelings which meaningfully connect people and their environment. We draw on data from teachers, teacher educators, and young people (n = 223) to describe educationally-relevant emotions and identify the implications for educational practice. We argue that emotionally-responsive pedagogies are needed to identify responsibilities, develop coping potential, and improve future expectations. These pedagogies must act on the causes and consequences of environmental damage and develop teachers’ and students’ capabilities to take action and ultimately transform emotional appraisals. A more enabling policy environment is needed for teachers to adopt these approaches and empower them to take action relating to climate and ecological crises.”

Shaw, E., Walpole, S., McLean, M., Alvarez-Nieto, C., Barna, S., Bazin, K., ... & Woollard, R. (2021). [AMEE consensus statement: Planetary health and education for sustainable healthcare](#). *Medical Teacher*, 43(3), 272-286. “The purpose of this Consensus Statement is to provide a global, collaborative, representative and inclusive vision for educating an interprofessional healthcare workforce that can deliver sustainable healthcare and promote planetary health. It is intended to inform national and global accreditation standards, planning and action at the institutional level as well as highlight the role of individuals in transforming health professions education.”

Alang, S., Hardeman, R., Karbeah, J. M., Akosionu, O., McGuire, C., Abdi, H., & McAlpine, D. (2021). [White supremacy and the core functions of public health](#). *American Journal of Public Health*, 111(5), 815-819. “Public health is organized in a framework of three core functions -





assessment, policy development, and assurance - and [10 essential public health services](#) (EPHSs) ... The EPHSs are taught in our classrooms, are used for performance measurement and evaluation, and have helped to communicate to the public and policymakers what public health is about. The revised EPHSs were recently released, 25 years after the original framework was developed. The most important change is that the framework now centers equity, defined as a 'fair and just opportunity for all to achieve good health and well-being.' In the equity statement, racism is mentioned as one of the 'forms of oppression' that the EPHSs should address. Living up to the potential of equity requires directly addressing structural racism and White supremacy. We provide examples of strategies in the core functions and EPHSs to do so."

Iyengar, R., & Shin, H. (2020). [Community-based programs to tackle environmental education and COVID-19: A case study from Millburn, New Jersey](#). *Prospects*, 1-11. "Contextual and social realities must be built into any educational program for activism to take place. This case study examines an education and environment program which has adapted to the social distancing measures of COVID-19, resulting in an even more community-reliant and community-driven program than the program designers initially intended. The Eco Ambassador Program uses environmental activism within a space that supports mental health during COVID-19 social isolation. While community engagement and action have been elements of the program, the program has transformed to utilize new levels of social capital in the program's network, to overcome the obstacles presented in regular programming. Many aspects of the critical pedagogy of space are utilized to conceptualize this educational program during the pandemic. The limitations of in-person interactions in defined learning spaces led to more technology-reliant programming, hence broadening the space of place-based learning, while enabling personal spaces and personal environments to become new learning spaces."

Sims, L., Rocque, R., & Desmarais, M. É. (2020). [Enabling students to face the environmental crisis and climate change with resilience: Inclusive environmental and sustainability education approaches and strategies for coping with eco-anxiety](#). *International Journal of Higher Education and Sustainability*, 3(2), 112-131. "As university educators, we should educate students to be able to address the challenges presented by the environmental crisis and climate change by being responsible eco-citizens, and creative, solution-oriented thinkers. We have a responsibility to create inclusive environmental and sustainability educational (ESE) approaches that are enabling, emotionally supportive, engaging, and praxis-oriented. Herein we describe ESE approaches that are considered beneficial and provide specific strategies to cope with eco-anxiety, to help students develop emotional resilience in the face of this crisis. We then explore aspects that are mutually complementary between inclusive ESE and the proposed coping strategies for eco-anxiety followed by a discussion on the implications for postsecondary teaching and learning."





Tun, S., Wellbery, C., & Teherani, A. (2020). [Faculty development and partnership with students to integrate sustainable healthcare into health professions education](#). *Medical Teacher*, 42(10), 1112-1118. “Partnership between students and faculty can enhance faculty development as students bring fresh ideas and possibly greater knowledge of the climate and ecological crisis. Under supervision, they can co-create the necessary new learning. Students can also act as partners in advocating for social and environmental fairness and systemic change toward a sustainable healthcare system. We summarize the impact of various activities of health professions students around the world which advocate for institutional change and enhance faculty development in education for sustainable healthcare. Through diverse case studies from different countries, we illustrate faculty development in education for sustainable healthcare, highlighting student involvement which has enhanced educators’ learning.”

Huss, N., Ikiugu, M. N., Hackett, F., Sheffield, P. E., Palipane, N., & Groome, J. (2020). [Education for sustainable health care: From learning to professional practice](#). *Medical Teacher*, 42(10), 1097-1101. “This paper addresses two main issues, humanistic learning and the application of knowledge acquisition to clinical practice. Humanistic learning principles can be used to emphasize learner-centered approaches, including knowledge acquisition and reflection to increase self-awareness. Applying humanistic principles in everyday life and clinical practice can encourage stewardship, assisting students to become agents for change. In terms of knowledge and skills application to clinical practice, an overview of varied and novel approaches of how sustainable education can be integrated at different stages of training across several health care professions is provided. The Health and Environment Adaptive Response Taskforce (HEART) platform as an example of creating empowered learners, the NurSusTOOLKIT, a multi-disciplinary collaboration offering free adaptable educational resources for educators and the Greener Anaesthesia and Sustainability Project (GASP), an example of bridging the transition to clinical practice, are described.”

Parker, G., Berta, W., Shea, C., & Miller, F. (2020). [Environmental competencies for healthcare educators and trainees: A scoping review](#). *Health Education Journal*, 79(3), 327-345. “Environmental competencies that align with general management skills were most frequent (40%), followed by research skills (37%). Three competencies specific to the environment (22%) were identified: resource stewardship (n=16), systems thinking (n=14) and social and environmental justice (n=7). The majority of work was identified in nursing, medicine and public health. Competencies were most commonly embedded in existing curricula or offered as new courses or workshops. ... Our findings that environmental competencies align with previously validated health-care competencies support the perspective that these competencies represent essential knowledge and skills for the health-care workforce.”

Lopez-Medina, I. M., Álvarez-Nieto, C., Grose, J., Elsbernd, A., Huss, N., Huynen, M., & Richardson, J. (2019). [Competencies on environmental health and pedagogical approaches in the nursing curriculum: A systematic review of the literature](#). *Nurse education in practice*, 37,





1-8. “It has been suggested that climate change is the biggest threat to public health for the 21st Century; increased demand on health services will impact on already overstretched resources and systems will need to be able to respond. However limited attention is given to climate change and sustainability in nursing education; there is no clear guidance on curricula content for nurses or recommendations regarding the skills and competencies that will be required. Literature published in Dutch, English, German, and Spanish was searched and 32 papers met the inclusion criteria for the review. Results suggest that holistic/systems thinking is relevant to healthcare so bringing a ‘sustainability lens’ to nursing curricula could be seen as being consistent with wider determinants of health. The literature review has identified the educational approaches necessary to provide a broad based curriculum and a cross-disciplinary approach. The findings suggest that topics such as the use of resources, food, health promotion, globalism, disease management, and the environmental impact of delivering healthcare, if embedded in nursing education could support the nursing profession's response for this new and important aspect of healthcare.”

Tun, S. (2019). [Fulfilling a new obligation: Teaching and learning of sustainable healthcare in the medical education curriculum](#). *Medical Teacher*, 41(10), 1168-1177. “Aims: Leading the growing international recognition of the need for sustainability in healthcare delivery, the UK medical regulator has mandated that newly qualified doctors must be able to apply the principles of sustainable healthcare to medical practice. This original research investigates how best to incorporate this new learning into the medical curriculum. Methods: Data from multiple sources were triangulated to generate themes through grounded theory. Meetings were held with representatives of key stakeholder organizations, relevant documents were reviewed and semi-structured interviews were conducted with diverse medical educators who teach sustainable healthcare ... Conclusions: Practical recommendations for implementation in any medical school include: teaching sustainability as a cross-cutting theme rather than a topic, clinicians and students learning from each other in this developing field, and embedding into assessment the wider determinants of disease. Sustainable healthcare emphasizes prevention rather than late intervention, with benefits to the environment on which health depends, healthcare systems and patients.”

Jones, R., Crowshoe, L., Reid, P., Calam, B., Curtis, E., Green, M., ... & Ewen, S. (2019). [Educating for indigenous health equity: An international consensus statement](#). *Academic Medicine*, 94(4), 512. “This article seeks to examine the factors underpinning medical education’s role in Indigenous health inequity, to inform interventions to address these factors. The authors developed a consensus statement that synthesizes evidence from research, evaluation, and the collective experience of an international research collaboration including experts in Indigenous medical education. The statement describes foundational processes that limit Indigenous health development in medical education and articulates key principles that can be applied at multiple levels to advance Indigenous health equity.”





Lawrence, M., Burlingame, B., Caraher, M., Holdsworth, M., Neff, R., & Timotijevic, L. (2015). [Public health nutrition and sustainability](#). *Public Health Nutrition*, 18(13), 2287-2292. Introduction to a special issue on sustainability and public health nutrition that discusses the macro-level environments, physical environments, and social environment levels of analysis, as well as other individual factors.

Barrett, M. A., Bouley, T. A., Stoertz, A. H., & Stoertz, R. W. (2011). [Integrating a One Health approach in education to address global health and sustainability challenges](#). *Frontiers in Ecology and the Environment*, 9(4), 239-245. “Emerging infectious diseases are economically, socially, medically, and environmentally costly, as evidenced by the H1N1 influenza pandemic. Their broad consequences demand interdisciplinary solutions. One such solution, known as the One Health approach, is a growing global strategy that is being adopted by health organizations and policy makers in response to this need. It recognizes the interconnected nature of human, animal, and environmental health in an attempt to inform health policy, expand scientific knowledge, improve healthcare training and delivery, and address sustainability challenges. Education will play a particularly important role in realizing the One Health concept; however, a shortage of collaborative student programs, insufficient environmental training for health professionals, and a lack of institutional support impede progress. As a group of students from ecology, medicine, veterinary medicine, and global public health, we offer a vision for improving tertiary education to prepare environmental and health professionals to address a changing world.”

Religious Studies

Business and Religious Studies

See the [Journal of Management, Spirituality, and Religion](#)

Gundolf, K., & Filser, M. (2013). [Management research and religion: A citation analysis](#). *Journal of Business Ethics*, 112(1), 177-185. “We conduct a citation analysis of 215 articles and 7,968 cited references to examine the citation structure and make out the most-influential publications that have shaped research most so far. On the basis of the analysis it is to be assumed that three research streams affect progress: Best practices regarding performance issues, religion at work as well as religion, and personal ethics. Finally, the publications that each topic-cluster contains are reflected and discussed to achieve a structural overview of the state of the art of research.”





Bouckaert, L., & Zsolnai, L. (Eds.) (2011). [*Handbook of spirituality and business*](#). London: Palgrave Macmillan. “[A]n interdisciplinary overview of the emerging field of spirituality and business. It uses insights from business ethics, theology, neuroscience, psychology, gender studies, and philosophy to economics, management, organizational science, and banking and refers to different religious convictions including Christianity, Judaism, Islam, Hinduism, Buddhism, Confucianism, the Baha’i faith, and the North-American aboriginal worldview. The authors argue that the materialistic management paradigm has failed. They explore new values for post-materialistic management: frugality, deep ecology, trust, reciprocity, responsibility for future generations, and authenticity.”

Religion and Activism

Jenkins, W., Berry, E., & Kreider, L. B. (2018). [*Religion and climate change*](#). *Annual Review of Environment and Resources*, 43, 85-108. “Understanding the cultural dimensions of climate change requires understanding its religious aspects. Insofar as climate change is entangled with humans, it is also entangled with all the ways in which religion attends human ways of being. Scholarship on the connections between religion and climate change includes social science research into how religious identity figures in attitudes toward climate change, confessional and constructive engagements of religious thought with climate change from various communities and traditions, historical and anthropological analyses of how climate affects religion and religion interprets climate, and theories by which climate change may itself be interpreted as a religious event. Responses to climate change by indigenous peoples challenge the categories of religion and of climate change in ways that illuminate reflexive stresses between the two cultural concepts”

Witt, J. D., & Taylor, B. (2017). [*Religion and eco-resistance movements in the 21st century \(special issue\)*](#). *Journal for the Study of Religion, Nature, and Culture*, 11(1). Topics in this special issue include a variety of moral ecologies in diverse social movements like grassroots environmental movements and the Deep Green Resistance organization, and environmental activism.

Taylor, B., & Johnston, L. F. (2016). [*Religion and the rise of environmental politics in the twentieth century*](#). In B. A. McGraw (Ed.), *The Wiley Blackwell companion to religion and politics in the U.S.* (pp. 350-368). Malden, MA: Wiley Blackwell. “In the twentieth century, religion, broadly defined, has played a significant role in environmental politics, both promoting and hindering environmental causes. Scholars observing these trends have offered explanations ranging from claims that religions in general (and often Christianity in particular), given their anthropocentrism and otherworldly orientations, devalue this world and promote indifference to





environmental conservation. Other scholars contend that religions in general or certain religions in particular express and promote values that enjoin environmental protection, if properly understood, or creatively modernized to incorporate contemporary environmental understandings. Still others argue that new forms of nature-related spirituality were born in this century that are rooted in and consecrate scientific understandings and that are often inspiring the quest for environmental sustainability and social equity. Herein we trace the role religion has played in the rise of environmentalism and resistance to it, and the competing views of this history and the role of religion in it.”

Witt, J. D. (2016). [Religion and resistance in Appalachia: Faith and the fight against mountaintop removal coal mining](#). Lexington, KY: University Press of Kentucky. “Examines how religious and environmental ethics foster resistance to mountaintop removal coal mining. Drawing on extensive interviews with activists, teachers, preachers, and community leaders, Witt's research offers a fresh analysis of an important and dynamic topic. His study reflects a diversity of denominational perspectives, exploring Catholic and mainline Protestant views of social and environmental justice, evangelical Christian readings of biblical ethics, and Native and nontraditional spiritual traditions. By placing Appalachian resistance to mountaintop removal in a comparative international context, Witt's work also provides new outlooks on the future of the region and its inhabitants. His timely study enhances, challenges, and advances conversations not only about the region, but also about the relationship between religion and environmental activism.”

Johnston, L. F. (2014). [Religion and sustainability: Social movements and the politics of the environment](#). London & New York: Routledge. “Historically, religion has been a significant part of many visions of sustainability. Pragmatically, the inclusion of religious values in conservation and development efforts has facilitated relationships between people with different value structures. Despite this, little attention has been paid to the interdependence of sustainability and religion, and no significant comparisons of religious and secular sustainability advocacy. *Religion and Sustainability* presents the first broad analysis of the spiritual dimensions of sustainability-oriented social movements. Exploring the similarities and differences between the conceptions of sustainability held by religious, interfaith and secular organizations, the book analyses how religious practice and discourse have impacted on political ideology and process.”

Smith, C. (2014). [Disruptive religion: The force of faith in social movement activism](#). New York: Routledge. “Religion has long played a central role in many social and political movements. Solidarity in Poland, anti-apartheid in South Africa, Operation Rescue in the United States--each of these movements is driven by the energy and sustained by the commitment of many individuals and organizations whose ideologies are shaped and powered by religious faith. In many cases, religious resources and motives serve as crucial variables explaining the





emergence of entire social movements. Despite the crucial role of religion in most societies, this religious activism remains largely uninvestigated. Disruptive Religion intends to fill this void by analyzing contemporary social movements which are driven by people and organizations of faith. Upon a firm base of empirical evidence, these essays also address many theoretical issues arising in the study of social movements and disruptive politics.”

Ignatian Pedagogy for Sustainability

Leighter, J. L., & Smythe, K. R. (2019). [Ignatian Pedagogy for Sustainability: An Overview](#). *Jesuit Higher Education*, 8(1), 3-11. “A group of faculty and staff associated with Jesuit higher education developed themes for teaching sustainability and related fields that are aligned with the Ignatian Pedagogy Paradigm.”

Leighter, J., & O’Keefe, J. (2019). [Ascetical Practice and Ignatian Pedagogy for Sustainability: Tools for Teaching Sustainable Living](#). *Jesuit Higher Education*, 8(1), 28-35. “Inspired by Laudato Si’, we outline an application of the Ignatian Pedagogy for Sustainability for our course, Sustainable Practice: The Examined Life. [...] In the course, we draw from the notion of ascetical practice, an approach for students as they strive for incorporating more sustainable practices into their daily living. We concentrate on four domains of asceticism: attention, sustenance, materials, and energy. Additionally, we argue that mindfulness through meditation is a necessary activity for students pursuing sustainable practices and an examined life.”

McCallum, D. C., & Horian, L. (2013). [A Leadership Education Model for Jesuit Business Schools](#). *Journal of Jesuit Business Education*, 4(1), 1-15. The purpose of this article is “to reinforce the case for how a Catholic, Jesuit [business school] education is more comprehensive than the traditional [business] school in producing a mature, self-aware, ethically informed graduate who is equipped to be an innovative, influential, excellence-seeking leader committed to the service of others,” and to offer “a model of leadership education that builds on the work of Chris Lowney, author of Heroic Leadership (2005), who proposes Four Pillars of Leadership: self-awareness, ingenuity, heroism, and love.”

Christian Theology

Schade, L. D. (2022). [Who is my neighbor? Developing a pedagogical tool for teaching environmental preaching and ethics in online and hybrid courses](#). *Religions*, 13(4), 322. “As theological education has moved increasingly to online and hybrid settings (both by choice and by pandemic necessity), practical theologians committed to teaching ecological theological





education must navigate a paradox. How do we teach about interconnectivity and interdependence between the human and other-than-human inhabitants of a particular place when our classrooms are in disembodied digital spaces? This article examines a case study of a pedagogical tool developed by the author called the “Who Is My Neighbor” Mapping Exercise that enables students to explore and articulate how they conceptualize themselves and their faith communities embedded within their larger ecological contexts. This paper assesses the use of the mapping exercise in four different course contexts: three online and one hybrid online–immersion course. The author provides an overview of each of the four course contexts in which the tool was used, includes descriptions of how students engaged the tool, and assesses its effectiveness. The author uses three types of criteria for assessment of the pedagogical exercise: student feedback, level of competence demonstrated in student assignments (sermons, worship services, teaching events), and personal observations, particularly around the differences between online and onsite contexts. The author suggests that the mapping exercise is a tool that can be used by others teaching practical theology to help students understand their relationships within Creation and their communities, critically engage environmental justice issues, and apply what they learn to their ministry contexts.”

Antonopoulou, E., & Tsalampouni, E. (2021). [Designing a green curriculum of orthodox theology: A modest proposal](#). In C. Nellist (Eds.), *Climate Crisis and Creation Care: Historical Perspectives, Ecological Integrity and Justice*, (pp. 329-348). Cambridge Scholars Publishing. This chapter discusses “the role of education in forming a robust ecological ethos among Orthodox Christians.”

Tang, K. (2021). [Education for sustainable development from the perspective of Christianity: Pedagogies and prospects](#). *European Journal of Education Studies*, 8(4). doi:10.46827/ejes.v8i4.3678. “With rising arguments on the fluid idea of education for sustainable development where an established framework is lacking, this review aims to look into the Christian bible for messages of sustainability and how these messages could enhance education for sustainable development in themes and pedagogies. This review examined only the old and new testaments of the bible common to most, if not all Christian denominations. It examined verses with clear connection to sustainability encompassing the environmental, social and economic aspects, particularly the environmental aspect. Discourse analysis of the verses comprising instructions, dialogues and lines of letters was conducted by delving into the historical and sociocultural contexts of the verses to exegete their sustainability implications. This review yielded ten verses with sustainability themes ranging from human responsibilities, ecological value, balance and Conservation, responsible consumption and production, conservation of resources, traditional wisdom, equity, social welfare and sustainability to anthropogenic causes of environmental degradation. The main pedagogies for education for sustainable development implicated from this review are problem-based learning, experiential





learning, exploratory learning, scenario-and-simulation-based learning, reflective learning and deep learning, with specific references to the biblical sustainability themes. This review constitutes one of the very few literature probing sustainability and its pedagogies from Christianity's perspective by qualitatively examining the most pertinent biblical verses. It contributes to the enrichment of sustainability education and pedagogies through religious wisdom. It is crucial in advancing sustainability education in religious studies.”

Hitzhusen, G. (2006). [Religion and Environmental Education: Building on Common Ground](#). *Canadian Journal of Environmental Education*, 11(1). “Environmental educators are beginning to consider how to incorporate religious resources into their curricula. Common concerns about religion pose a challenge for integration, but these concerns are manageable. Reflection on the precursors of environmental citizenship behaviour provides a framework for considering some of the ways that religious elements can enhance environmental education. Furthermore, faith-based environmental education programs have existed for decades, and their practices can suggest some starting points. Abundant ecotheology resources also exist, including environmental policy statements within most denominations. These resources can provide a common ground between religion and environmental education.”

Social Movements for Sustainability

McGregor, C., & Christie, B. (2021). [Towards climate justice education: views from activists and educators in Scotland](#). *Environmental Education Research*, 27(5), 652–668. “In the context of a resurgence of civic activism to address climate change, we present findings from an exploratory research project on climate justice education (CJE). We conducted deliberative focus groups and interviews with activists, advocacy workers and educators in order to address three broad aims: to consider the ways in which different stakeholders conceptualise climate justice; to examine how teachers and activists perceive challenges to, and opportunities for, developing climate justice education; to explore the potential for recognising activism and civic engagement as an educational process, considering both activists' views on education and educators' views on activism in this context. Activists recognised the potential for CJE which is connected to social movements (especially youth-led movements), local communities, and addresses the affective dimensions of the climate crisis.”

Lupinacci, J. J. (2020). [Teacher Education in a Dangerous Time:\(Re\) Imagining Education for Diversity, Democracy and Sustainability](#). *Northwest Journal of Teacher Education*, 15(2), 12. “This article amplifies the importance of social movements like Black Lives Matter and diverse critical educator responses to social suffering, COVID-19, and related critiques of current





dominant assumptions of teacher education and Western industrial schooling. The author offers an ecocritical conceptual framework that aims to emphasize the importance of how teachers, and teacher educators, can take action as leaders (re)imagining education as supportive of valuing diversity, democracy, and sustainability. This article calls for an ecocritical pedagogical (re)imagining of how teacher education might be (re)constituted through more local activist teaching and diverse collaborations with social movements in support of social justice, multispecies equity, and sustainability.”

Kruger, T. M., McCreary, N., Verhoff, B. L., Sheets, V., Speer, J. H., & Aldrich, S. P. (2020). [College students' understanding of social justice as sustainability](#). *International Journal of Sustainability in Higher Education*. “The purpose of this study was to explore college students’ understanding of sustainability and, specifically, the extent to which students see social justice as being integral to sustainability.” Findings showed that “college students tend not to recognize the integral nature of social justice or the relevance of food to sustainability, providing an opportunity for universities to better prepare their students for a sustainable future.” The study “explicates college students’ understanding (or lack of understanding) of the essential nature of concern for the environment, economics and social justice to the concept of sustainability.”

Howieson, W. B., Burnes, B., & Summers, J. C. (2019). [Organisational leadership and/or sustainability: Future directions from John Dewey and social movements](#). *European Management Journal*, 37(6), 687–693. “In this paper, we suggest that organisational leadership that is based (generally) on a neoliberal paradigm has contributed to an ‘intolerable situation’ that was recognised at the United Nations (2015a) Paris Agreement on Climate Change. We, therefore, attempt to re-frame organisational leadership based on a sustainability paradigm. In doing so, we draw on John Dewey’s thinking on publics: due to the need for greater stakeholder involvement in identifying how sustainability could be achieved and increasing pressure from governments, campaigning groups and public opinion for organisations to expand their boundaries further to interact with, and take seriously, the needs of the communities that they affect. Then—and for the implementation of this re-frame and cognizant of the community requirement—we will offer that guidance may be drawn from the emerging social movements literature, specifically the importance of narration, mobilisation and organisation. Finally, we present a revised framework for organisational leadership that is based on this sustainability paradigm.”

Social Work

Rambaree, K. (2020). [Environmental social work: Implications for accelerating the implementation of sustainable development in social work curricula](#). *International Journal of*





Sustainability in Higher Education. “Purpose – Environmental social work (ESW) is an approach and a perspective in social work focusing on ecological and environmental sustainability and justice within the context of sustainable development (SD). This study aims to analyze students’ reflective tasks on challenges for ESW education and practice from a critical theory perspective. The purpose of this study is to discuss the implications of the findings for accelerating the implementation of SD in social work curricula.”

Papadopoulos, A. (2019). [Integrating the natural environment in social work education: Sustainability and scenario-based learning](#). *Australian Social Work*, 72(2), 233-241. “This article presents an approach to curriculum design that incorporates natural environmental content into social work education using sustainability principles. The curriculum development project outlined here used scenario-based learning (SBL) to integrate sustainability themes into contemporary social work practice challenges. SBL offers a flexible pedagogical strategy to integrate environmental content and explore social complexity. Importantly, it presents eco-social concerns as a central consideration of all contemporary social work practice.”

Pandey, U. C., & Kumar, C. (2018). [A SDG compliant curriculum framework for social work education: Issues and challenges](#). *Implementing Sustainability in the Curriculum of Universities: Approaches, Methods and Projects*, 193-206. “Goal 4 of the Sustainable Development Goals (SDGs) calls for Inclusive and equitable quality education and promoting lifelong learning opportunities for all. We have enough reasons to believe that education has significant bearing on others SDGs. This brings the issue of curriculum development to the core of sustainable development. Among all the disciplines, Social Work carries specific importance, primarily because the competence of Social Work Practitioners will have direct impact on the pursuit of SDGs. Hence there has been a realization that curriculum planning for social work education need to be suitably aligned to the requirements of Sustainable Development Goals. It will equip the Social Workers with required skills and competencies to work with the target communities. Furthermore, SDGs have created new opportunities for social workers to advance their professional pursuits in a global perspective. There is need to identify such new opportunities for social work professionals, incorporate them in their professional curriculum and create pedagogical tools to connect to new target groups of Social Work Education. It will equip the social workers to effectively deal with the concerns of SDGs while working with target communities. This study reviews the existing research literature and identifies the new ingredients for curriculum planning for social work education. An indicative framework has been presented for the curriculum development for Social Work profession.”





Study Abroad, Immersion Trips, and Tourism

Quan, T., Diao, W., & Trentman, E. (2023). [Returning to normal?: Reimagining study abroad and language learning for a sustainable and equitable future](#). *L2 Journal*, 15(2). “Due to health and travel restrictions, COVID-19 has presented unusual challenges to international education. Meanwhile, the pandemic has also become a historical juncture overlapping with other political and cultural moments (e.g., renewed Black Lives Matter movement, resurgence of anti-Asian racism, extreme weather phenomena). These events have propelled a reconsideration of the complex relationship between access to and participation in study abroad, language learning, and social and environmental justice. In this paper, we draw on our collective experiences as practitioners and researchers across three languages (Arabic, Mandarin, Spanish) to argue that study abroad must be a part of equitable and sustainable world language education curricula. We begin by reflecting on existing issues related to access and participation in U.S.-based study abroad and the underlying ideologies that reinforce them. We then provide possibilities – within our spheres of influence – to reconceptualize study abroad from critical and translingual perspectives in an effort to contest ideologies and shift towards a more diverse and inclusive study abroad programming. Lastly, we suggest possible ways to better integrate at home, virtual, and study abroad opportunities in language learning curricula, some of which may serve as alternatives to study abroad, especially in an environmentally and politically volatile world where social privilege shapes access to international education.”

Tarrant, M., Schweinsberg, S., Landon, A., Wearing, S. L., McDonald, M., & Rubin, D. (2021). [Exploring student engagement in sustainability education and study abroad](#). *Sustainability*, 13(22), 12658. “[S]tudent engagement (Deep Learning) is more likely to increase with sustainability (than non-sustainability) courses and with study abroad (than non-study abroad/campus courses). Findings provide empirical support for university initiatives that seek to incorporate sustainability coursework and study abroad opportunities into the undergraduate curriculum as means to enhance students’ overall engagement and academic success. The paper provides insights into where sustainability education and study abroad courses have broad potential to promote engagement and, as such, should be considered part of the general learning requirement of university education.”

Séraphin, H., & Yallop, A. C. (2021). [Overtourism and tourism education](#). London: Routledge. Several chapters (especially chapters six, seven, eight, and ten) examine designing immersions, field trips, and virtual visits to teach about sustainable tourism.

Séraphin, H., & Gowreesunkar, V. G. (2021). [Special issue: Tourism: how to achieve the sustainable development goals?](#) *Worldwide Hospitality and Tourism Themes*, 13(1). Focuses on





case studies in diverse locations and lessons for how tourism and tourism education might meet the UN SDGs.

Ayers, J. (2020). [Competence literate but context lacking? Investigating the potential of study abroad programs to promote sustainability competence acquisition in students](#). *Sustainability*, 12(13), 5389. “The study’s findings suggested that students did acquire sustainability competencies during the program, but also that students may become competence-literate but context-lacking as they acquire competency skillsets without understanding their purpose for use as sustainability tools or to promote sustainability outcomes ... This study suggests that contextualisation can occur in a number of ways, including the use of defined sustainability principles as boundary conditions to frame learning environments, the use of sustainability epistemic teachers as ‘guides’ to connect learning to sustainability and the facilitation of student experiences with unsustainability to promote personally motivated action towards sustainability.”

McLaughlin, J. S. (2020). [Teaching environmental sustainability while transforming study abroad](#). *Sustainability*, 13(1), 50. “Course-based Undergraduate Research Experiences (CUREs) are a proven methodology for transforming short-term study abroad to yield higher impact and quality student outcomes, especially as they relate to teaching environmental sustainability. This paper offers a review of tested pedagogical frameworks, provides evidence to substantiate this statement from assessment data, and offers insights on how to develop and implement an international CURE. It also shares how embedding CUREs into innovative and high-quality short-term study abroad experiences can work to positively transform the post COVID-19 era of short-term study abroad. Several case studies are presented that document how students’ hands-on involvement in developing questions about real-world sustainability issues, devising and carrying out group research, and presenting their findings affect their acquisition of scientific skills and a sustainability-oriented mindset.”

Schott, C. (2017). [Virtual fieldtrips and climate change education for tourism students](#). *Journal of Hospitality, Leisure, Sport & Tourism Education*, 21, 13-22. “[T]he paper presents the concept of a VR-based virtual fieldtrip as an innovative and carbon-sensitive type of (educational) travel. The paper not only makes the case for virtual fieldtrips as a meaningful learning tool but also explores both the virtual fieldtrip’s impact on Greenhouse Gas emissions and climate change-related learning. On both accounts the initial findings in this paper are very encouraging.”

Moscardo, G., & Benckendorff, P. (2015). [Education for sustainability in tourism: A handbook of processes, resources and strategies](#). Springer. Major parts include core topics like tourism and sustainability and ethics in tourism, education for sustainability in tourism in the formal sector





(i.e. educational institutions) and key stakeholders (i.e. communities and businesses), and practices and tools for education for sustainability in tourism.

Dvorak, A. M., Christiansen, L. D., Fischer, N. L., & Underhill, J. B. (2011). [A necessary partnership: Study abroad and sustainability in higher education](#). *Frontiers: The Interdisciplinary Journal of Study Abroad*, 21, 143-166. “In this article, we will explore two case studies of programs abroad that seriously engaged both the contradictions and opportunities inherent in the idea of sustainable international education. The first examines environmental politics and ecology in New Zealand and the Cook Islands and the second compares sustainable urban practices in Canada and the United States. Based on the lessons learned from these case studies, we will argue that partnership between internationalization and sustainability efforts is necessary to help institutions of higher learning become both global and ‘green.’ To that effect, we discuss specific and concrete ways to ‘green’ study abroad courses ...”

Sustainability Across the Curriculum

Otto, E. C., Wohlpert, S. L., Bevins, B., Bondehagen, D., Marcolini, J. P., Roca, M. F. L., ... & Yazici, H. J. (2021). [Infusing Sustainability Across the Curriculum](#). In *Making the Sustainable University: Trials and Tribulations* (pp. 79-98). Singapore: Springer Nature Singapore. “Issues of sustainability cut across disciplinary boundaries, requiring creative ideas and solutions from all fields of study. This chapter explores how individual colleges and programs at Florida Gulf Coast University (FGCU) infuse sustainability into the curriculum. A University-wide initiative called the Integrating Sustainability Across the Curriculum Academy offers faculty from diverse disciplines an opportunity to discover the relevance of sustainability within their fields and to enrich courses using a sustainability lens. For example, an operations management course required of all Business majors embeds sustainability using a number of core assignments and learning experiences with real businesses. Courses in FGCU’s College of Arts & Sciences, Lutgert College of Business, College of Education, U.A. Whitaker College of Engineering, and Marieb College of Health & Human Services also integrate sustainability in ways that help students see the importance of attending to social, economic, and environmental issues in their lives and careers.”

Pompeii, B., Chiu, Y. W., Neill, D., Braun, D., Fiegel, G., Oulton, R., ... & Singh, K. (2019). [Identifying and overcoming barriers to integrating sustainability across the curriculum at a teaching-oriented university](#). *Sustainability*, 11(9), 2652. “This research collects and analyzes student and faculty knowledge and perceptions toward sustainability education at a predominately undergraduate, teaching-oriented university. In-depth, qualitative methods





distinguish low- and high-knowledge student and faculty cohorts, identify perceived barriers to sustainability education in each cohort, and recognize strategies to overcome the barriers identified by each cohort. Data collected from recorded and transcribed semi-structured interviews of student and faculty subjects underwent analysis via repeated readings to uncover key themes. Results required developing metrics for student and faculty sustainability knowledge and attitudes across disciplines, determining discipline-specific gaps in sustainability knowledge and differences in attitudes, and relating implementation barriers to general or specific knowledge gaps and attitudes. Findings identified low and high levels of sustainability knowledge within the student and faculty subject population and revealed barriers in pursuing interdisciplinary sustainability curricula across disciplines and among both students and faculty at the study university. Overall, higher sustainability knowledge participants tend to identify barriers related to institutional accountability while lower sustainability knowledge participants tend to identify barriers related to personal responsibility. Distributing barriers and solutions along a continuum from personal responsibility to educational institution responsibility reveals more recognition of barriers at the personal level and more solutions proposed at the institutional level. This result may reflect a common tendency to deny personal responsibility when addressing sustainability challenges.”

Hill, L. M., & Wang, D. (2018). [Integrating sustainability learning outcomes into a university curriculum: A case study of institutional dynamics](#). *International Journal of Sustainability in Higher Education*. “Purpose – Higher education institutions increasingly have gained momentum in integrating sustainability into university curricula. The purpose of this paper is to elucidate the approval, implementation and management process of the new university-wide, general education requirement in sustainability at the University of Vermont (UVM). The intent is to provide a case study to inform other institutions seeking to create similar university-wide sustainability requirements. Design/methodology/approach – The authors applied a process framework focused on institutional dynamics and values to analyze UVM’s success in instituting a sustainability requirement across the curriculum. These two frameworks can provide a more general application of this case study to other institutional contexts. Findings – The case study suggests that in the context of a diverse disciplinary and administrative environment at a university, the strategic unfolding, approval and implementation of UVM’s university-wide, general education sustainability requirement can provide a general model for other universities seeking to embed sustainability across the curriculum. Originality/value – It is uncommon for research universities with multiple professional schools to offer a university-wide requirement in sustainability. This case study analyzes the creation of a sustainability requirement at UVM by using a process framework to organize the complex, multi-stakeholder activities and events that eventually resulted in a successful curricular change. Thus, it is potentially instructive for institutions seeking to integrate a learning outcomes-based sustainability requirement into a





university curriculum because it is generalizable to other institutions and pushes forward our understanding of institutional change.”

Sustainable Consumption

Frank, P., & Stanszus, L. S. (2019). [Transforming consumer behavior: Introducing self-inquiry-based and self-experience-based learning for building personal competencies for sustainable consumption](#). *Sustainability*, 11(9), 2550. “Despite growing educational efforts in various areas of society and albeit expanding knowledge on the background and consequences of consumption, little has changed about individual consumer behavior and its detrimental impact. Against this backdrop, some scholars called for a stronger focus on personal competencies, especially affective–motivational ones to foster more sustainable consumption. Such competencies, however, are rarely addressed within the context of education for sustainable consumption. Responding to this gap, we suggest two new learning formats that allow students to systematically acquire affective–motivational competencies: self-inquiry-based learning (SIBL) and self-experience-based learning (SEBL). We developed these approaches at Leuphana University Lüneburg, Germany, since 2016, and applied them within the framework of two seminars called Personal Approaches to Sustainable Consumption. Conducting scholarship of teaching and learning, we investigated the potential of SIBL and SEBL for cultivating personal competencies for sustainable development in general and sustainable consumption in particular. Our results indicate that SIBL and SEBL are promising approaches for this purpose.”

McGregor, S. (2019). [Education for sustainable consumption](#). *Canadian Journal of Education/Revue canadienne de l'éducation*, 42(3), 745-766. “Social reconstructivism is suggested as an appropriate curriculum philosophy for education for sustainable consumption (ESC). Couched in framing the consumer culture as a powerful social institution that needs to be challenged and reformed, the position paper begins by defining sustainable consumption, including symptoms of unsustainable consumption and barriers to consuming sustainably. This is followed by a description of the social reconstructivist curriculum philosophy and model. Related contributions include ESC values, principles, and issues, the notion of catalytic education, and a description of instructional strategies recommended to help put social reconstructivism-informed ESC curricula into motion. The intent is to create a generation of learners who see themselves as social change agents by assuming that ownership of learning leads to ownership of actions.”

Sahakian, M., & Seyfang, G. (2018). [A sustainable consumption teaching review: From building competencies to transformative learning](#). *Journal of cleaner production*, 198, 231-241. “Sustainable consumption (SC) is a growing area of research, practice and policy-making that





has been gaining momentum in teaching programs among higher education institutions. Understanding how, in what way, and what we consume, in relation to environmental integrity and intra/inter-generational equity, is a complex question, all the more so when tied up with questions of social change, justice and citizenship. To understand and address (un)sustainable consumption, different disciplines and related methodologies are often brought together, ranging from sociology, economics and psychology, to political science, history and environmental engineering. Combining and indeed transcending disciplinary approaches is necessary, and what better place to explore these approaches than in the classroom? In this article, a review of sustainable consumption teaching is presented in relation to learning competencies, with discussions around emerging topics related to this theme, as well as promising approaches towards transdisciplinary learning. Examples of how action-oriented, learner-centered and transformative approaches can be put into practice are also provided. In the conclusion, emerging trends are discussed, along with challenges and opportunities for teaching sustainable consumption in the future.”

Systems Thinking

Córdoba-Pachón, J.-R., Mapelli, F., Taji, F. N. A. A., & Donovan, D. M. (2021). [Systemic Creativities in Sustainability and Social Innovation Education](#). *Systemic Practice & Action Research*, 34(3), 251–267. “The aim of this paper is to aid educators in sustainability or social innovation to make sense of their creativity [...] We adopt a view of creativity as a systemic phenomenon. This means that creativity emerges as the by-product of knowledge interactions between creators and other relevant individuals or groups. We use a systems model of creativity... to identify and enquire into the activities, relationships and emerging issues that (could) be influencing, or influenced by, educators of sustainability or social innovation.”

Weatherhead, N. K. (2020). [Integrated Techniques to Increase Systems Thinking for Sustainability Education of High School Science Students Using Educational Design Research](#) (Doctoral dissertation, University of South Carolina). “This study used a design research framework to teach secondary high school science students about environmental sustainability. A high school teacher and researcher collaborated to design a two week environmental science unit to help students make sense of complex environmental sustainability issues.” Although conducted among high school students, its findings may also be relevant to the university setting.

Bernier, A. (2018). [How Matching Systems Thinking with Critical Pedagogy May Help Resist the Industrialization of Sustainability Education](#). *Journal of Sustainability Education*, 18. “This theoretical and conceptual article explores the connection between systems design in





education, specifically curriculum design, and critical pedagogy, the educational adaptation of critical theory... While there have been great gains in sustainability education, it is self-defeating to the systems thinking nature of sustainability to have sustainability instruction follow traditional linear formats. The author discusses some essential concepts to systems thinking and systems design, and then explores many of the preeminent authors of critical pedagogy and their respective viewpoints. In the discussion, the author interweaves how a systems approach to curriculum design can help meet calls made by critical pedagogy theorists, possibly alleviating some of the oppressive curricular norms assumed by industrialized linear education.”

Warren, A., Archambault, L., & Foley, R. W. (2014). [Sustainability Education Framework for Teachers: Developing sustainability literacy through futures, values, systems, and strategic thinking](#). *Journal of Sustainability Education*, 6(4), 23-28. “The Sustainability Education Framework for Teachers (SEFT) intends to build a capacity for educators to be able to understand: (i) the broad, complex nature of sustainability, (ii) the problem-oriented, solution driven nature of sustainability, and (iii) how sustainability connects to them as both citizens and classroom teachers.”

Littledyke, M., Manolas, E. & Littledyke, R.A. (2013), [A systems approach to education for sustainability in higher education](#). *International Journal of Sustainability in Higher Education*, 14(4), 367-383. “The purpose of the research is to investigate education for sustainability (EfS) practice and perceptions in three university contexts in England, Australia and Greece with a view to identify a suitable systems model for effective EfS across the university.”

Hiller Connell, K. Y., Remington, S. M., & Armstrong, C. M. (2012). [Assessing systems thinking skills in two undergraduate sustainability courses: a comparison of teaching strategies](#). *Journal of Sustainability Education*, 3. “The purpose of this study was to determine systems thinking skill development among undergraduate students and assess the effectiveness of two different instructional methods for increasing these skills”—a one-time intervention and a more extended and holistic intervention.

Córdoba, J. R., & Porter, T. (2009). [Education in Sustainability through Systems Thinking](#). In C., Wankel, J. Arthur, & F. Stoner (Eds.). *Management Education for Global Sustainability* (139-158). Charlotte, North Carolina: Information Age Publishing. “This chapter draws on key contributions of systems thinkers and highlights some differences between three different notions and uses of systems, with particular attention to their pedagogical applications in business education. The three different approaches to systems thinking have differing cultural overtones that can influence the insights they offer. The implications of these overtones are discussed as the chapter examines the three systems schools in a holistic and systematic





fashion: focusing on theory, research, and practice; and, most importantly, drawing implications for learning and teaching practice.”

Theatre and Dance

Kusanovich, K. (2019). [Resources](#). tUrn Project. See section entitled “Artists Drawing Down” for examples of musical, dance, and theatrical responses to climate change.

Inwood, H., Heimlich, J. E., Ward, K. S., & Adams, J. D. (2016). [Environmental arts](#). *Essays in urban environmental education*. Cornell University Civic Ecology Lab and NAAEE, Ithaca, 71-79. “This chapter provides an overview of some of the ways that the arts—visual arts, drama, dance, and music—are transforming environmental education in urban centers, and helping bring about cultural shifts toward sustainability.”

Davis, S., & Tarrant, M. (2014). [Environmentalism, stories and science: exploring applied theatre processes for sustainability education](#). *Research in Drama Education: The Journal of Applied Theatre and Performance*, 19(2), 190-194. “The 2012 Research in Drama Education (RiDE) themed edition on Environmentalism (Heddon and Mackey 2012) and the response by Forgasz (2013) draws attention to some of the issues and dilemmas that arise when considering how to work with Applied Theatre practices to explore human/environment relationships, climate change and sustainability issues. This response shares initial findings from a pilot programme that has involved undergraduate students participating in a study abroad programme with a particular focus on sustainability education. Some of the dilemmas faced include balancing the provision of ‘scientific’ and environmental learnings within site-specific experiences and those that aim to provide a sense of connection to place and environment. Other issues for consideration include the purpose of using fictional frames when the real-life frame is already quite powerful. This is particularly so when working with students who are not drama or arts students. Issues familiar to educational theatre in general also emerge, such as audiences becoming critical of and alienated by work that appears to be too didactic.”

Heras, M., & Tàbara, J. D. (2014). [Let’s play transformations! Performative methods for sustainability](#). *Sustainability Science*, 9(3), 379-398. “In this paper, we assess the potential as well as the limitations of innovative theatre-based participatory tools and methods aimed at supporting sustainability learning and agent transformation. To this aim, we first review a series of experiences using theatrical performance and introduce the notion of performative methods. Second, we assess to what extent these new approaches can be of relevance in environmental action research and sustainability science, practice and learning. Finally, we list a series of key





research questions to further guide methodological innovation in this promising area of sustainability science and practice.”

Urban Planning

Oh, J., & Seo, M. (2022). [Evaluation of citizen–student cooperative urban planning and design experience in higher education](#). *Sustainability*, 14(4), 2072. “The purpose of this study is to explore the implementation and evaluation of cooperative education, which is emphasized as a means of developed citizen participation in the areas of urban planning and design, and to present implications by analyzing and discussing the results thereof. To this end, this study observed three cooperative education classes in which general citizens and students participated to learn how to cooperate planning processes for fostering experts in relevant fields in higher education courses. Additionally, the study established a research model through multiple educational performances and monitoring to review participants’ opinions. The results were quantitatively and qualitatively analyzed based on a questionnaire, and the methodology was compliant with prior research. The analysis demonstrated statistical differences in communication between students and citizens going through the same curriculum, as well as differences in the satisfaction of the two groups. Citizens and students found difficulties in coordinating opinions and reaching a consensus with counterparties. Nevertheless, all the participants expressed satisfaction over their collaboration to produce the results and ensured that related attempts were continuously made thereafter. Based on these results, this study proposed methods to enhance cooperative education for citizens in the future.”

Park, H. Y., Licon, C. V., & Sleipness, O. R. (2022). [Teaching sustainability in planning and design education: A systematic review of pedagogical approaches](#). *Sustainability*, 14(15), 9485. “Sustainable development principles are being increasingly incorporated into university planning and design education. This paper evaluates how university planning and design programs teach sustainability and how these various approaches may influence future planners and designers. This systematic review quantitatively analyzes 5639 empirical research documents published from 2011 to 2020, including peer-reviewed papers and reports related to planning and design disciplines in higher education institutions. Key findings include differences in how planning and design curricula include and emphasize sustainability topics, as well as how various modes and teaching approaches correlate with sustainability values. This research offers a comprehensive understanding of how sustainable development approaches and teaching methods may influence how students and emerging professionals approach complex planning and design problems.”





Solis, M., Davies, W., & Randall, A. (2022). [Climate justice pedagogies in green building curriculum](#). *Curriculum Inquiry*, 52(2), 235-249. “This article draws on environmental justice frameworks located in urban planning (Agyeman et al., 2002; Pellow, 2007) and critical place inquiry (Tuck & McKenzie, 2014) to focus on the relationship between green building curriculum, career and technical education, and climate justice. Green building—a rapidly growing field within the architecture, planning, and design fields—seeks to mitigate the consequences of climate change by reducing the built environment’s impact on the natural world. Green building involves technical learning and is often carried out by credentialed professionals. We thus ask, how do we advance climate justice through green building curricula? We draw insights from a green building education program from a Career and Technical Education classroom to discuss the need to engage high school students’ knowledge about the connectivity between their communities and green building plans. We identify the consideration of erasure and futurities in green building curricular efforts, youth as co-planners and co-designers, and organizational learning and change as central to reimagining responses to ecological precarity in justice oriented-ways.”

Hurlimann, A., Cobbinah, P. B., Bush, J., & March, A. (2021). [Is climate change in the curriculum? An analysis of Australian urban planning degrees](#). *Environmental Education Research*, 27(7), 970-991. “The profession of urban planning contributes to the design and spatial arrangement of cities, and has been recognized as a key potential facilitator of action on climate change. Yet, there has been limited research to understand if, or how, urban planning students are being educated for climate change competency. This paper investigates the coverage of climate change in the curriculum of professionally accredited urban planning university degrees in Australia. Climate change coverage was assessed across three fields: (1) explicit climate change issues; (2) sustainable urban form issues (e.g. contributing to climate change by reducing greenhouse gas emissions), and (3) education for sustainability (with links to professional competencies relevant to climate change action). A content analysis was undertaken of: (1) the Planning Institute of Australia’s Policy for the Accreditation of Urban Planning Qualifications, and (2) a sample of nine accredited urban planning degrees. Limited coverage of explicit climate change issues and sustainable urban form issues was found. Coverage of education for sustainability themes (liberal education; civics; interdisciplinarity; cosmopolitanism) was stronger. Results indicate that the professional accreditation policy, and the content of urban planning degrees should be revised to include greater coverage of explicit climate change issues.”

Dujardin, S. (2019). [Planning with Climate Change? A Poststructuralist Approach to Climate Change Adaptation](#). *Annals of the American Association of Geographers*, 1-16. “This article calls for a stronger engagement by geographers with the concept of socionature as a vehicle for guiding adaptation thinking in development planning. Drawing on literatures from





poststructuralist geographies, it argues for a relational, hybrid ontology of climate change adaptation grounded in multiple perspectives, knowledges, and more-than-human relations. Going beyond this stance, a framework based on the idea of planning with climate change is proposed for a revised approach to adaptation that calls for more-than-social planning practices embedded in radically more integrative planning processes and the redistribution of power across the climate and planning systems.”

Ramaswami, A., Weible, C., Main, D., Heikkila, T., Siddiki, S., Duvall, A., ... & Bernard, M. (2012). [A social-ecological-infrastructural systems framework for interdisciplinary study of sustainable city systems: An integrative curriculum across seven major disciplines](#). *Journal of Industrial Ecology*, 16(6), 801-813. “Cities are embedded within larger-scale engineered infrastructures (e.g., electric power, water supply, and transportation networks) that convey natural resources over large distances for use by people in cities. The sustainability of city systems therefore depends upon complex, cross-scale interactions between the natural system, the transboundary engineered infrastructures, and the multiple social actors and institutions that govern these infrastructures. These elements, we argue, are best studied in an integrated manner using a novel social-ecological-infrastructural systems (SEIS) framework.

Jabareen, Y. (2012). [Towards a sustainability education framework: Challenges, concepts and strategies—The contribution from urban planning perspectives](#). *Sustainability*, 4(9), 2247-2269. “This paper proposes a new conceptual framework, Sustainability Education Framework, which is composed of concepts that derived from different disciplines. At the heart of the conceptual framework rests the normative category and its concepts. The epistemological foundation of the conceptual framework of education for sustainability is based on the unresolved paradox between ‘sustainability’ and ‘development’.”

Kevern, J. T. (2011). [Green building and sustainable infrastructure: Sustainability education for civil engineers](#). *Journal of Professional issues in engineering education and practice*, 137(2), 107-112. “This paper discusses a framework for incorporating sustainable design/thinking as a new civil engineering course and experiences from the pilot offering. Important areas are outlined to aid all engineers in understanding sustainability in context with traditional engineering principles. Green-building rating systems were used to introduce the concepts of sustainability in buildings and infrastructure, highlighted by presentations from green-building professionals. By providing a better understanding of sustainability through education, civil engineers can provide proactive solutions to a growing global infrastructure.”

Lyth, A., & Nichols, S., & Tilbury, D. (2007). [Shifting towards sustainability: Education for climate change adaptation in the built environment sector](#). *Australian Research Institute in Education for Sustainability*. “The document reports on a scoping study which investigated the professional





training and development needs of architects, landscape architects, planners and engineers in climate change adaptation through engaging relevant accrediting institutions in an action inquiry process. The project sought to go further than a normal scoping study would, as it aimed to also assist the professional institutions involved to begin to think about, and take action on, professional development in climate change adaptation.”

Virtual Reality

West, M., Yildirim, O., Harte, A. E., Ramram, A., Fleury, N. W., & Carabias-Hütter, V. (2019). [Enhancing citizen participation through serious games in virtual reality](#). In *Real Corp 2019: is this the real world? Perfect Smart Cities vs. Real Emotional Cities, Karlsruhe, Germany, 2-4 April 2019* (pp. 881-888). Competence Center of Urban and Regional Planning. “The “Virtual Smart City Hero” is currently under development and still in the design phase. It is planned that after playing the game, the players are encouraged to join a web based innovation platform. There, they can conceptualize and discuss new ideas and participate in bottom-up initiatives. The platform will promote collaborations between different actors - citizens, administrations, research institutes and the private sector. Impact assessments will be made and it will be analyzed how the platform has to be designed for citizens to become active Smart Citizens.”

Earle, A. G., & Leyva-de la Hiz, D. I. (2020). [The wicked problem of teaching about wicked problems: Design thinking and emerging technologies in sustainability education](#). *Management Learning*, 1-23. This paper explores “the system-level challenges found in sustainability-focused education and consider how the intersections of design thinking and emerging technologies in augmented and virtual reality (AVR) can help address these. More specifically, we highlight the role of experiences across the design thinking process for generating novel solutions to the types of “wicked” problems with which students engage in sustainability education. We then use this as motivation, along with concepts from experiential learning and design thinking research, to develop a conceptual model in which AVR can integrate with more established instructional methods to help make sustainability-related challenges more salient, proximate, and tractable to students.”

Atwa, S. M. H., Ibrahim, M. G., Saleh, A. M., & Murata, R. (2019). [Development of sustainable landscape design guidelines for a green business park using virtual reality](#). *Sustainable Cities and Society*, 48, 101543. “The main focus of this research is developing a methodology of the GBPs` landscapes, in order to guide the stakeholders in the decision-making process. Moreover, getting users` and experts` opinions using Virtual Reality (VR) techniques plays an essential role to correctly predicting how a space will perform. By considering these contexts





and their significance to sustainable development in a hot-dry climate area, the study evaluates the practice of landscape design for a GBP in terms of compactness and greenness.”

Boulos, M. N. K., Lu, Z., Guerrero, P., Jennett, C., & Steed, A. (2017). [From urban planning and emergency training to Pokémon Go: applications of virtual reality GIS \(VRGIS\) and augmented reality GIS \(ARGIS\) in personal, public and environmental health](#). *International Journal of Health Geographics*, 16:7. “From smart urban planning and emergency training to Pokémon Go, this article offers a snapshot of some of the most remarkable VRGIS and ARGIS solutions for tackling public and environmental health problems, and bringing about safer and healthier living options to individuals and communities. The article also covers the main technical foundations and issues underpinning these solutions.”

Jamei, E., Mortimer, M., Seyedmahmoudian, M., Horan, B., & Stojcevski, A. (2017). [Investigating the role of virtual reality in planning for sustainable smart cities](#). *Sustainability*, 9(11), 2006. “This study can assist urban planners, stakeholders, and communities to further understand the roles of planning policies in creating a smart city, particularly in the early design stages. The significant roles of technologies, such as VR, in targeting real-time simulations and visualization requirements for smart cities are emphasized.”

Waste

Kowasch, M. (2022). [Circular economy, cradle to cradle and zero waste frameworks in teacher education for sustainability](#). *International Journal of Sustainability in Higher Education*. “Purpose – Sustainability is a major concern in education policies. This paper aims to describe how alternative economic education including concepts of the circular economy (CE), cradle to cradle (C2C) and zero waste can be addressed by teacher education. The author asks to what extent such alternative concepts contribute to sustainability education and transitions and empower students and future teachers, through field trips. Design/methodology/approach – Field trips to three extracurricular learning places in Graz (Austria) – a plastic waste disposal facility, an upcycling design atelier and a supermarket without packaging – were organized as part of a university seminar on economy and sustainability. Based on student essays reflecting the field trips, this praxeological paper provides insights on how students perceive awareness-raising and innovative responses to mass consumption, recycling/upcycling and waste prevention issues. Findings – Including alternative economic frameworks, such as CE/C2C and zero waste, into teacher education contributes to reflections on the economic growth paradigm and promotes more sustainable futures. In various statements, students highlighted social-ecological change and awareness-raising. They rather focussed on recycling,





upcycling and (plastic) packaging than on the problematic eco-efficiency of downcycling. Originality/value – Alternative economic concepts can be addressed and critically reflected in sustainability education, even if rarely taught. Although the extracurricular learning places described offer partial solution from the perspective of degrowth, they can serve as an eye-opener and promote alternative economic education, where students can share experiences, knowledge and creative ideas to engage in sustainability transitions.”

Zhang, N., Williams, I. D., Kemp, S., & Smith, N. F. (2011). [Greening academia: Developing sustainable waste management at Higher Education Institutions](#). *Waste Management*, 31(7), 1606-1616. “Higher Education Institutions (HEIs) are often the size of small municipalities. This paper critically reviews why sustainable waste management has become a key issue for the worldwide HE sector to address and describes some of the benefits, barriers, practical and logistical problems. As a practical illustration of some of the issues and problems, the four-phase waste management strategy developed over 15 years by one of the largest universities in Southern England – the University of Southampton (UoS) – is outlined as a case study.”

Smyth, D. P., Fredeen, A. L., & Booth, A. L. (2010). [Reducing solid waste in higher education: The first step towards ‘greening’ a university campus](#). *Resources, Conservation and Recycling*, 54(11), 1007-1016. “Comprehensive solid waste management programs are one of the greatest challenges to achieving campus sustainability. Conducting a waste characterization study is a critical first step in successful waste management planning and advancing the overall sustainability of an institution of higher education. This paper reports on a waste characterization study that was conducted at the Prince George campus of the University of Northern British Columbia (UNBC). Various educational and policy techniques, which may be used to promote campus community waste minimization behaviours in the long term, are discussed.”

McMillin, J., & Dyball, R. (2009). [Developing a whole-of-university approach to educating for sustainability: Linking curriculum, research and sustainable campus operations](#). *Journal of education for sustainable development*, 3(1), 55-64. “Institutions of higher education are poised to play a significant role in the search for a more sustainable future. Most universities are tackling sustainability issues in a compartmentalised manner, sustainability education is confined to specific courses, education is often isolated from research, and neither is likely to be linked to sustainable campus operations. Universities can optimise their role as agents of change with regard to sustainability by adopting a ‘whole-of-university’ approach to sustainability.”





Water

Marques, R. C., da Cruz, N. F., & Pires, J. (2015). [Measuring the sustainability of urban water services](#). *Environmental Science & Policy*, 54, 142-151. "This paper discusses the concept of 'sustainable water services' and suggests a multicriteria method to assess it."

LeVasseur, T. (2014). [Teaching sustainability via the environmental humanities: Studying water, studying ourselves](#). *Journal of Sustainability Education*, 7. "The dawning anthropocene requires innovation and organizational change across all types of institutions, including in higher education. One area where innovation can occur is in curricula building, and the offering of pertinent classes for sustainability education. This paper approaches sustainability education within the classroom from the perspective of the environmental humanities, focusing especially on the discipline of religion and nature/ecology. Scholarly tools from these domains provide teaching and research opportunities to help build on campus and campus-community sustainability networks and initiatives. Three readings are analyzed to explore how teaching about sustainability via the environmental humanities is an integral part of campus sustainability initiatives, both in the classroom, in the community, and with facilities. The readings are international in scope and focus on water resource management."

McDonald, W. M., Dymond, R. L., Lohani, V. K., Brogan, D. S., & Clark, R. L. (2014). [Integrating a real-time remote watershed monitoring lab into water sustainability education](#). In 121st ASEE Annual Conference & Exposition (pp. 15-18). "The LabVIEW Enhanced Watershed Assessment System (LEWAS) research lab at Virginia Tech (VT) includes an interdisciplinary research group that has developed a real-time watershed monitoring lab in Stroubles Creek on VT Campus. The LEWAS components of water and weather monitoring instruments, renewable power supply, data collection hardware and data processing software are integrated to provide real-time sustainable watershed data on an accessible platform to many types of user groups. The LEWAS lab is being used for watershed sustainability research and hands-on classroom education. The lab has been used in a senior level undergraduate Hydrology course in fall 2012 and spring 2014 by incorporating LEWAS-based hands-on modules into the course. These learning modules introduce students to watershed sustainability concepts, a real world application of LabVIEW, and handson data collection and analysis projects."

Beck, M. B., & Walker, R. V. (2013). [On water security, sustainability, and the water-food-energy-climate nexus](#). *Frontiers of Environmental Science & Engineering*, 7(5), 626-639. "The role of water security in sustainable development and in the nexus of water, food, energy and climate interactions is examined from the starting point of the definition of water security offered by Grey and Sadoff. The paper discusses two important facets of security, i.e.,





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diversity of access to resources and services (such as sanitation) and resilience in the behavior of coupled human-built-natural systems.”



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