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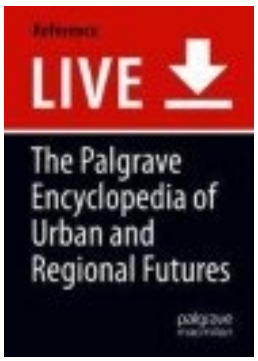

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Sustainability Competencies in Higher Education

Jessica Ostrow Michel[1], Katja Brundiers[2], Matthias Barth[3], Daniel Fischer[2], Yoko Mochizuki[4], Aaron Redman[2] and Michaela Zint[1]

[1] School for Environment and Sustainability, University of Michigan, Ann Arbor, MI, USA

[2] School of Sustainability, Arizona State University, Tempe, AZ, USA

[3] Leuphana University, Lüneburg, Germany

[4] UNESCO, Paris, France

Synonyms

Attributes; Capabilities; Capacities; Learning Outcomes

Introduction

The number of undergraduate and graduate programs focused on sustainability continues to grow in higher education. The emerging interdisciplinary field of study can be strengthened through a shared set of competencies that students develop in structured academic programs and curricula to successfully master real-world sustainability challenges in personal, civic, and professional domains. This entry summarizes half a decade of progress on defining, using, and assessing competencies as a guiding framework for the design of higher education sustainability programs.

Policymakers have deemed higher education a critical avenue for cultivating a more sustainable future and, in recent years, for contributing to the achievement of the Sustainable Development Goals (SDGs), adopted by the UN in 2015. Landmark scholarship, as far back as environmental educator David Orr's (2004) *Earth in Mind*, has contended that we are in urgent need of fundamentally different educational systems, given that our current ones have contributed to the unsustainability of today's world. Orr (2004) suggested that "education for sustainability" contains several aspects, including the need to accept the probability of survival of our species; an attitude of care and stewardship – particularly an "uncompromising commitment to life and its preservation" (p. 133); the

knowledge necessary to comprehend interrelatedness of "disciplines and of the disparate parts of personality: intellect, hands, heart" (p. 137); and the practical competence required to act on these sets of values.

While the necessary radical shift in education has not occurred, and change to current education systems will most likely occur incrementally and at a slow pace, new sustainability degree programs have been introduced in institutions of higher education throughout the world. The potential of these programs to produce leaders and agents of change in the field of sustainability can be improved, however, by the development of an agreed-upon set of competencies that identify what students ought to be learning from their inter- and transdisciplinary studies in this field. To date, higher education is generally not producing students equipped to manage environmental and sustainability crises, for example. In addition, stakeholders – including students, employers, educators, and administrators – continue to question what it is that students ought to know and be able and willing to do to solve sustainability problems. In response to this question, the notions of *competence* or *key competencies* have emerged as a holistic concept to describe desired learning outcomes in the field.

Stimulated by the intensive scholarship, the concept of key competencies has also found its way into educational policy debates. In the United States, the National Council for Science and the Environment (NCSE) launched a process in 2018 to complete a census of program objectives for sustainability and sustainability-related fields. Additionally, NCSE is currently developing a consensus statement for core competencies to be endorsed by academic deans and directors of environmental programs across the country.

History of Emerging Competencies for Sustainability

Agreement on a set of key competencies for sustainability has occurred over time as several strands of research and practice have come together. The renewed interest in competence as the framing for learning outcomes is closely tied to educational reform in general, in particular the shift to outcomes-based education. The discussion of competence as a learning outcome has a rich history that goes back decades and reflects different interdisciplinary understandings of the term. Popularized by the scientist and philosopher Noam Chomsky's work on linguistic development as mastery of a system of rules in the 1960s, and later adopted by the sociologist Jürgen Habermas in his work on the formation of communication (1970s and 1980s), the concept of competence was used to mark a substantive distinction between a generative system (competence) and a behavioral

outcome (performance) (Klieme et al. 2008). Today's understanding of competence is largely shaped by vocational and occupational psychologists' work on understanding employees' responses to particular work-related challenges (Hyland 1993).

While educational psychologists called for a stronger recognition of learning outcomes that are relevant across different domains in life (vocational, personal, and social) in the early 1970s, it took more than a quarter of a century for this approach to key competencies to gain broader international traction when the Organisation for Economic Co-operation and Development (OECD) launched the Definition and Selection of Competencies (DeSeCo) initiative (Rychen and Salganik 2000). While the use of competencies has spread far beyond the auspices of the OECD, the organization's continued emphasis on them through activities such as the Programme for International Student Assessment (PISA), has propelled adoption internationally. It is worthy of mention that the OECD's work was in the context of primary and secondary education.

Defining Competencies for Sustainability in Higher Education

While competencies have emerged as a predominant approach within sustainability education research and practice, there has also been a "sea of labels" (Sterling et al. 2017, 153). The term competencies itself is understood dissimilarly in different cultural and disciplinary contexts. While sustainable or environmental literacy is utilized in some places, and attributes or learning outcomes in others, these approaches have not gained global adoption. The difference between these approaches and that of competencies is likely to be mostly semantic, though research exploring this is mostly lacking.

A competence has come to be understood as "a complex combination of knowledge, skills, understanding, values, attitudes and desire which lead to effective, embodied human action in the world, in a particular domain" (Crick 2008, 313). In application to the interdisciplinary field of sustainability, *sustainability competencies* are the specified cluster of the desired and related knowledge, skills, and attitudes that students graduating from a sustainability program ought to possess. Mastery of sustainability competencies would mean that graduating students are able to successfully solve real-world sustainability problems.

Building upon competencies, *key competencies* are a cluster of related competencies that are relevant across different domains and are essential for achieving successful performance in diverse contexts. Therefore, while graduates of higher education sustainability programs will need many general competencies (e.g., communication skills),

the emphasis on key competencies highlights those competencies most critical to sustainability. Moreover, *key competencies for sustainability* emphasize specific competencies considered to be critical for sustainability and build on those competencies (like critical thinking), which are shared across academic programs. Some of the competencies are present in other traditional programs (e.g., values thinking competency is prevalent in the humanities, and systems thinking competency is shared across many programs). What distinguishes the key competencies in sustainability is that they cannot stand alone; they come as "package-deal" (i.e., as a framework of related competencies) in which knowledge, skills, and attitudes are interrelated and used together.

Scholarship on Key Competencies for Sustainability

Although the need to reorient the purpose of education systems to embrace sustainability was endorsed by global leaders in the United Nations' 1992 action plan for development, called Agenda 21, a coherent approach to translate these ambitions into learning outcomes was lacking. A critical development was the adoption of DeSeCo's competency approach in sustainability education. This was pioneered by Gerhard de Haan (2006), a professor at the Free University in Berlin, which was soon followed by its tentative specification for higher education in 2007 with an inaugural qualitative study by the scholars Matthias Barth, Jasmin Godemann, Marco Rieckmann, and Ute Stoltenberg (2007). Results of the work of Barth and his colleagues reinforced the definitional elements of competencies being based on cognitive (such as interdisciplinary knowledge acquisition) and the so-called noncognitive dispositions (such as motivating oneself and motivating others). This study convincingly described how a key competency could meet the goals of education for sustainable development. Along this line, scholars began to attempt to define key competencies (though not always using that particular terminology). Some focused on sustainability programs, whereas others developed competencies for sustainability as applied to other disciplines, in particular engineering, teaching, and business. This trend of parallel development within both disciplinary and interdisciplinary settings continues to this day.

In 2011, sustainability educators Arnim Wiek, Lauren Withycombe, and Charles Redman conducted a comprehensive literature review of scholarship on key competencies for sustainability. To review the proposed synthesis of competencies for sustainability, they administered a survey and conducted a full-day workshop at the American Association for the Advancement of Science (AAAS) Forum in 2010. The resulting article, *Key*

Competencies in Sustainability: A Reference Framework for Academic Program Development is often recognized as the most frequently cited synthesis on sustainability competencies in higher education and as one of the most influential in the field of sustainability education research overall. Wiek and his colleagues define key competencies for postsecondary sustainability programs and provide a framework that explains how these competencies relate to sustainability outcomes. They also reinforce the notion that the goal of key competencies are "problem solving with respect to real-world sustainability problems, challenges, and opportunities" (2011, 204).

This work contributes to the literature a coherent sustainability problem-solving framework, including the five competencies derived from their synthesis: systems-thinking, anticipatory/futures-thinking, normative/values-thinking, strategic-thinking, and interpersonal/collaboration thinking. These competencies are outlined below.

1. Systems-thinking: The "ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features related to sustainability issues and sustainability problem-solving frameworks" (Wiek et al. 2011, 207).
2. Anticipatory/Futures-thinking: The "ability to collectively analyze, evaluate, and craft rich 'pictures' of the future related to sustainability issues and sustainability problem-solving frameworks" (Wiek et al. 2011, 208–209).
3. Normative/Values-thinking: The "ability to collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets" (Wiek et al. 2011, 209).
4. Strategic-thinking: The "ability to collectively design and implement interventions, transitions, and transformative governance strategies toward sustainability" (Wiek et al. 2011, 210).
5. Interpersonal/Collaborative: The "ability to motivate, enable, and facilitate collaborative and participatory sustainability research and problem solving" (Wiek et al. 2011, 211).

Since publication, Wiek and his colleagues have added an additional competence, entitled meta-competence, which consists of "meaningfully using and integrating the [other] five key competencies" to "[solve] sustainability problems and [foster] sustainable development" (2016, 243).

Since this study, additional research on sustainability competencies have been published. For example, scholars have developed additional studies focusing on intercultural perspectives on key competencies, the link between pedagogies and key competencies, and applications of key competencies to sustainability challenges like consumption.

Future Scholarship on Sustainability Competencies

To advance scholarship in the field of sustainability competencies in higher education, the research community needs to take into consideration the missing elements of past research, the importance of key competencies, the need for accurate assessment in the classroom, and the question of applicability across cultures. New research also needs to look into how findings are integrated into the curriculum, as well as how graduates utilize their education in the real world.

Consolidating Scholarship on Key Competencies for Sustainability

The political nature and origin of sustainability education (such as political declarations committing higher education institutions to sustainability as a policy imperative) have resulted in a research landscape that is characterized by experimentation, resulting in a large number of (often descriptive) case studies as well as conceptual (or even just programmatic) proposals. This situation has been intensively discussed as a challenge in the field and it is reflected in the competence literature. In a critical perspective it can be acknowledged that what is needed is consolidation and empirically rigorous research that goes beyond descriptive single-case studies to explore how these competencies can be assessed and developed in teaching and learning settings.

Advancing Key Competencies for Sustainability

While work on key competencies for sustainability has continued to advance, much of the current scholarship lacks either rigorous conceptual development or empirical data. Despite this large body of work, the key competencies framework described by Wiek and his colleagues is yet to be displaced as the standard within the field. Rather than emphasize continued restating of the key competencies, we see interesting developments aiming at addressing other limitations related to sustainability competencies.

Assessing Key Competencies for Sustainability

Assessing competencies has proven a challenge for educators in general and has received insufficient attention within sustainability education specifically. In light of this, future research ought to measure students' mastery of the knowledge, skills, and attitudes to

address the real-world sustainability challenges. Such work, may in turn, yield substantial new insights into how to advance the current, mostly conceptual body of knowledge on key competencies for sustainability.

Diversifying Perspectives in Key Competencies for Sustainability

The dominance of North American and European scholarship has raised questions about the universality of competencies being proposed, as they may be culturally biased. We recognize this limitation in the scholarship completed to date, and call for further research involving more diverse scholars from additional countries and cultures (such as Africa, Asia, and South America), in particular from the Global South.

Supporting Pedagogies to Aid in Competency Development

Developing competencies for sustainability education may also imply the need for new pedagogies, and thus the research community has responded with a growing body of literature on the topic. So far, though, much of this work is either conceptual or consists of descriptive case studies of pedagogical enactments. Empirical studies investigating the links between specific pedagogical practices and the successful (or not) mastery of key sustainability competencies, have begun, but many more are needed.

Transitioning from Theory to Practice

Several higher education institutions have already begun to adopt competency frameworks for their sustainability programs, primarily drawing on those developed by Wiek and his colleagues. This use of competencies by universities presents a key frontier of future research. Moreover, what happens once students leave campus is almost completely unknown, leaving us with little insight about how students translate sustainability competencies into real-world action after graduation.

Conclusion

Through a diversity of methods (literature reviews, empirical research such as action research, case studies, and Delphi studies), and locations (Canada, Europe, Latin America, and the United States), scholars have proposed sustainability competencies through large-scale literature reviews and to a lesser extent empirical research. Consistent key competencies have emerged as a result (e.g., systems thinking and interdisciplinary knowledge), suggesting an emerging consensus. Yet little evidence exists that these competencies are being used to guide academic learning outcomes.

For the field to move toward establishing the competencies that will ultimately anchor it, several developments are needed. First, more research and praxis (as empirically informed practical solutions) will be needed to assess in how far the development of competencies takes place. Second, more tailored teaching and learning settings can and must be developed on the microlevel of courses and the macrolevel of programs that support explicitly the key competencies. And third, an agreed upon set of key competencies can and should be the foundation for accreditation measures and to ensure the comparability of programs across universities and regions, (i.e., to support the mobility of students). Overall, much work remains to be done on this front to ensure that competency-driven sustainability education will fulfill its promise in higher education, and in turn, to cultivate a more sustainable future.

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